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# DO AIRLINE BANKRUPTCIES REDUCE AIR SERVICE?

Severin Borenstein
Nancy L. Rose

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**ABSTRACT**

The airline industry's current financial crisis has raised concerns over the ramifications of airline bankruptcies for air service and the economy. Such bankruptcies, however, nearly always occur when demand is weak, and, thus, when even healthy airlines are inclined to reduce flights. Moreover, from a consumer and policy perspective, the real concern is total air service offered, not the number of flights offered by a particular airline. We study all major U.S. airline bankruptcies since 1984 in order to estimate the effect of bankruptcy on air service, controlling for demand fluctuations and recognizing that competing airlines may increase service in response to a reduction in flights by a bankrupt airline. We do not find substantial effects of bankruptcy on flights offered or destinations served at large and small airports, but do find an impact at medium sized airports. We estimate, however, that service changes due to bankruptcy are not large in comparison to typical quarter-to-quarter fluctuations in service that occur at airports in the absence of carrier bankruptcies.

Severin Borenstein
Haas School of Business
University of California
Berkeley, CA 94720-1900
and NBER
borenste@haas.berkeley.edu

Nancy L. Rose
Department of Economics
MIT, E52-371B
50 Memorial Drive
Cambridge, MA 02142-1347
and NBER
nrose@mit.edu

The current financial crisis in the commercial airline industry has engendered an active debate over appropriate governmental policies. Proponents of government support – instrumental in legislating a \$5 billion cash transfer and \$10 billion loan guarantee fund for U.S. carriers following September 11, 2001, and advocating additional support for the industry today – point to the critical role that airlines play in the U.S. economy and the devastating effects airline failures could have on air service.[1] Others argue that most airlines continue to operate through bankruptcy resolution and that even a complete shutdown of a major carrier, which rarely occurs, would stimulate expansion by other airlines to replace its abandoned flights.

This debate highlights the need to understand the *causal* effect of airline financial distress on airline operations. Firms may efficiently respond to falling demand or rising production costs by contracting output or exiting the market altogether. Declining profitability in leveraged firms may induce covenant violations or default on debt obligations, triggering a bankruptcy filing. Without careful analysis, the coincidence of output changes and bankruptcy or other measures of financial distress could be misinterpreted as causal, when in fact both result from worsened economic fundamentals that imply an efficient reduction in the equilibrium level of overall service. If observed service reductions result solely from firms' efficient responses to adverse economic shocks, government transfers to distressed airlines enrich airline stakeholders while providing little benefit to consumers and possibly postponing necessary industry adjustments. While determining whether there is a causal link between financial distress and reduced service is crucial, it does not in itself resolve the policy debate. Even if financial distress induces some service reduction, its implications for government intervention are far from obvious, as we describe in the following section.

In this paper, we focus on airline Chapter 11 bankruptcy filings, an extreme measure of financial distress. We use data from 1984 through 2001 to evaluate the effect of major bankruptcies on the number of nonstop domestic flights and destinations served from U.S. airports. Our results suggest that bankruptcy induces modest declines in service levels that are statistically and economically significant at midsize airports.

## I. The Impact of Financial Distress

The standard neoclassical model of competitive markets abstracts from capital struc-

[1] See, for example, U.S. Representative James Moran of Virginia on USAir's loan guarantee application: "The worst-case scenario is they go bankrupt, 40,000 people lose their jobs and more than 200 cities lose their air service" (Eilperin, 2002, p. E1.)

ture and financing decisions. In this model, adverse production cost or demand shocks reduce profitability and generally imply lower equilibrium levels of industry output. Firms responding to these conditions may reduce output or exit the industry. Decisions are forward-looking, and sunk gains or losses, such as changes in the capitalized value of industry-specific assets, do not affect operational decisions. Service reductions in this model are socially efficient responses to new equilibrium conditions.

Introducing capital markets and debt financing into the neoclassical model highlights the difficulty of disentangling the effect of financial distress from that of underlying adverse economic conditions. The reduced profitability associated with lower demand or higher costs may lead to both equilibrium output reductions and financial distress, perhaps causing more-leveraged firms to default on debt obligations and triggering a bankruptcy filing. In this case, financial distress and output reductions may be correlated even in the absence of any direct causal link, but controlling for "economic distress" would reveal no incremental impact of financial distress or bankruptcy on the firm and its decisions. Andrade and Kaplan (1998) find some empirical support for this conclusion in their study of leveraged buy-outs.

Moving beyond the neoclassical model raises the possibility that financial distress in general, and bankruptcy filings in particular, may have independent effects on firm decisions. When a firm files for Chapter 11 bankruptcy protection, its operations are put under the authority of a bankruptcy judge responsible for overseeing negotiations among the firm's stakeholders and development of a reorganization plan for the firm. Ideally, this protection would preserve the value of the firm, allowing economically viable firms to restructure operations and financing to emerge from bankruptcy protection, and inducing economically nonviable firms to be liquidated in an efficient, value-preserving manner. There is considerable debate within the policy, legal, and academic communities over the extent to which the operation of bankruptcy law achieves that ideal, as well as the implications of possible shortcomings.

Service reductions associated with financial distress may indeed be beneficial. Competition for consumers through more frequent flights and larger networks may lead to excessive service relative to the social optimum, as recognized by scholars throughout the industry's long history. Reducing service would then increase overall welfare. Moreover, distress may be been induced in part by inferior management. If management at the failed airline was mistaken in offering as much service as it did in certain markets, the bankruptcy process may force the airline to correct its prior misjudgments, perhaps even to replace key managers. By compelling the firm to scale back its overly ambitious or optimistic operational plans, the process moves the airline toward a more efficient outcome. As rival airlines recognize these misjudgments, they will choose not to replace the withdrawn capacity, and aggregate service in affected markets will fall.

Yet, not all constraints imposed by financial distress or bankruptcy administration may be beneficial or even benign. A growing literature suggests that capital structure and financial distress may have significant consequences for product market decisions. In her study of supermarkets, for example, Chevalier (1995) finds that highly-leveraged supermarkets are likely to price much less aggressively, as the firm focuses on short-term profits at the expense of long-term value. Kahl (2002) develops a model in which creditor uncertainty about which distressed firms are economically viable may lead to a tradeoff between learning about the firm's fundamentals and quick resolution of distress. In this model, distress may be allowed to persist, with consequent negative effects on investment, while creditors attempt to assess firm type. Hendel (1996) argues that firms might price more aggresively when in financial distress in order to generate liquidity. More generally, firms operating under Chapter 11 protection may face a set of constraints imposed by bankruptcy judges or creditor committees that prevent them from offering service that would maximize long-term value.

The empirical evidence on airline bankruptcies does little to resolve this uncertainty. Borenstein and Rose (1995) find that airlines approaching bankruptcy tend to reduce average fares, though rivals' prices are largely unaffected and the price discount in general dissipates after a Chapter 11 filing. This work suggests that distressed carriers may experience temporarily reduced demand, which could lead to reduced operations, though that is not explored in that 1995 paper.[2] Pulvino (1999) finds that aircraft sold by distressed airlines are sold at significant discounts, but that these discounts are even greater for airlines operating under bankruptcy protection. He argues that the incremental discounts suggest probable inefficiencies in the administration of bankruptcy protection: rather than preserving firm value, managers of cash-constrained bankrupt firms may be encouraged to may have an incentive to accept "low-ball" bids on assets, using the proceeds strategically to improve the chances for approval of their reorganization plan. If aircraft sales are used to generate cash (the ability to do so depending on whether the airline owns or leases its equipment), reduced fleet size may limit schedules and operations.

While this discussion has focused on the service offered by a specific carrier in financial

[2] Some studies find that rivals also are affected by a pending bankruptcy filing, though the decline in rivals' sales is smaller than that for the filing firm; see for example, Kennedy (2000) for a cross-industry study.

distress, the general policy concern has been over the aggregate air service that will remain when a carrier goes into distress. Financial distress or bankruptcy constraints, even if present, will influence aggregate service levels only if service reductions by a constrained firm are not offset by expanded service offered by competitors. If reduced operations by a distressed or bankrupt carrier are rapidly replaced by its rivals, aggregate service may be unaffected. This is less likely to be the case if firms are not homogeneous or entry costs are substantial.[3] With heterogeneous firms, one firm may be uniquely positioned to supply a flight, and its decision not to do so may lead to a reduction in total service. This is more likely in network industries such as airlines, where there are strong production complementarities across routes. In this case, inefficient reductions by the constrained firm may not be offset. The analysis below focuses on the response of airport-level service to bankruptcies by carriers operating at that airport, in an effort to identify this aggregate effect.

## II. Empirical Analysis of Airport Service Levels

Our analysis focuses on quarterly changes in domestic service at the 195 largest U.S. airports over the 1984 through 2001 period.[4] Airport service levels change frequently and substantially, as airlines reoptimize their networks in response to altered demand, cost, and competitive conditions. In our sample, the median absolute value of quarterly changes in airports' total nonstop domestic flights is greater than 4%. Fortunately, the rich structure of airline markets and airline data provide substantial power in distinguishing the effect of a carrier's bankruptcy from other determinants of aggregate service. Bankruptcy decisions are made at the carrier level at a given point in time. Panel data on airports provides variation over time in bankruptcy activity, as well as variation over airports in their exposure to potential bankruptcy disruptions at a point in time, generated by network heterogeneity across carriers.

The data construction and empirical model of airport service are described below. We detail first our measures of service at an airport, then the variables that capture the effect of bankruptcy, and finally, controls for demand and cost variations that might induce changes otherwise attributed to airline financial distress.

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[3] Firms may be homogeneous *ex ante*, but investments in capital and skills may still make them more heterogeneous over time.

[4] These are the top 200 domestic airports excluding five that are in U.S. territories (*e.g.,* Guam). We focus on domestic service because the number of international flights and their operators remain heavily regulated by bilateral treaties. We include an airport-quarter in the dataset only if the airport recorded at least 500 nonstop flights in both the current and previous quarter, an average of just under 3 round-trip flights per day.

*Service:* Aggregate airline service for an airport-quarter is captured by two measures: total nonstop domestic flights to and from the airport, and the number of domestic destinations that can be reached by nonstop flights from the airport.[5] These variables seem most consistent with the current policy focus on the impact of airline bankruptcies on available air travel options. Results from alternative measures, including the number of seat-departures (flights multiplied by capacity of each plane) and seat-mile-departures (seat-departures multiplied by the nonstop distance of each flight), are quite similar to those reported below for flights. The estimated first-differenced models use changes in the natural logs of these service measures from the previous quarter as the dependent variables, dln(FLIGHTS) and dln(DESTINATIONS).

*Bankruptcy:* Airport-quarters vary substantially in their exposure to possible bankruptcy effects. In most quarters, there is no bankruptcy activity. When a carrier files for bankruptcy protection, only the airports in its network are at risk from the filing. Measuring the exposure of a given airport-quarter to bankruptcy thus requires two components: the date a carrier files for Chapter 11 protection, and the share of operations at that airport accounted for by a filing carrier. We identify 17 significant airline Chapter 11 bankruptcy filings over our sample period, shown in Table 1. Eight, marked with an asterisk, involved a large domestic carrier, defined as a carrier operating more than 25,000 domestic flights per quarter prior to bankruptcy.[6] We report results based on these eight bankruptcies as well as a set of results for the full panel of 17 filings. Neither set of results is materially affected by excluding the Eastern Airlines bankruptcy from the analysis.[7]

For each bankruptcy filing $i$, we construct a one quarter-long interval centered on the filing date, $FILED_i$. $QTRFILED_{it}$ is equal to the fraction of quarter $t$ that overlaps with $FILED_i$. Thus, for a filing that occurs mid-quarter, $QTRFILED_{it}$ is one for the filing quarter, 0 for all other quarters. For filings earlier in the quarter, $QTRFILED_{it}$ will be positive for the quarter before and the quarter of filing, with the values in these two quarters summing to 1; a similar construction applies for filings later than mid-quarter.

At each airport $j$, we construct $BANKRUPT\ SHARE_{ijt} = QTRFILED_{it} \cdot$

[5] These are constructed from the U.S. Department of Transportation's T-100 dataset, as processed and distributed by Database Products, Inc.

[6] In half of these, the restructured carrier emerged from Chapter 11 protection, though only Continental and America West continue as major carriers today.

[7] Eastern's filing followed by less than a week a strike that forced the airline to greatly reduce flights. This is surely not unrelated to the bankruptcy, but one might be concerned that it is an outlier. Our analysis and conclusions, however, do not change substantially if we exclude Eastern's bankruptcy.

$SHARE_{ij}$, where $SHARE_{ij}$ is the share of total nonstop flights to and from airport $j$ accounted for by filing carrier $i$. The share is based on flights four quarters before the carrier's Chapter 11 filing, to avoid the influence of any schedule changes in the quarters immediately preceding the filing. The sum of $BANKRUPT\ SHARE_{ijt}$ across all eight bankruptcy filings generates $BANKRUPT\ SHARE_{jt}$, the variable used in the empirical analysis. Two leads and lags of $BANKRUPT\ SHARE_{jt}$ are included to capture changes in service over the six months leading up to and following the bankruptcy filing quarter.

*Seasonal and Time-Period Fixed-Effects:* The model includes a full set of airport-seasonal effects ($\phi_{jq}$, $q = 1,...,4$) to control for systematic changes in service levels at a given airport over the year. These pick up differences in seasonal demand patterns across airports as well as any systematic growth or decline in an airport's service over the sample period (captured in the mean of the airport-seasonal effects for each airport). For example, service to and from many Florida airports systematically increases in the first quarter and decreases in the third quarter of the year. We also include a full set of time-period effects ($\delta_t$, $t =$ 1984:4,...,2001:2) to control for aggregate macroeconomic fluctuations, system-wide airline cost changes, and other shocks common to all airports in a given quarter.[8]

*Regional Economic Conditions:* Fluctuations in local demand conditions may lead to service changes at an airport not captured by the aggregate time-period or airport-seasonal fixed effects. We control for regional variation in economic conditions with changes in log of state-level employment and income. Employment is based on total nonagricultural employment; income is aggregate personal income.[9] To allow these variables to function as leading or lagging indicators of air travel demand, we include in the model two lags and leads as well as contemporaneous log income and log employment, all in first-differenced form.[10]

This yields the following first-differenced empirical specification:[11]

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[8] The time-period effects will also pick up any indirect bankruptcy effects that are common to all airports, independent of the filing carrier's presence or activity.

[9] Total nonagricultural employment is from http://data.bls.gov/cgi-bin/surveymost?sa. Aggregate personal income is from http://www.bea.doc.gov/bea/regional/sqpi/. Both measures are seasonally adjusted; personal income is available only as a seasonally adjusted series.

[10] There is a potential endogeneity of the macroeconomic variables, because an airline's reduction in employment that may be caused by entering bankruptcy would affect local employment and income. This effect, however, is likely to be quite small, particularly since the macroeconomic variables are measured at the state level.

[11] The data exhibit no serial correlation in the residuals for dln(FLIGHTS). Reported standard er-

$$dln(S_{jt}) = \sum_{n=-2}^{2} \beta_n \cdot BANKRUPT\ SHARE_{j,t+n}$$
$$+ \sum_{n=-2}^{2} \gamma_n \cdot dln(EMPLOYMENT_{j,t+n}) + \sum_{n=-2}^{2} \alpha_n \cdot dln(INCOME_{j,t+n})$$
$$+\delta_t + \sum_{q=1}^{4} \phi_{jq} \cdot I_{qt} + \epsilon_{jt}$$

where $S_{jt}$ is the service level measured as either nonstop flights ($FLIGHTS$) or number of destinations served nonstop from the airport ($DESTINATIONS$), $I_{qt}$ is equal to one if quarter $t$ is the $q$th quarter of the year, otherwise zero. After generating all needed leads and lags, the dataset contains a total of 12,805 observations from 1984q4 to 2001q2. Table 2 presents summary statistics.

**III. Results**

We first explore average bankruptcy effects pooling across all airports in our sample. Estimated bankruptcy coefficients for each measure of airport service levels are reported in table 3. As noted above, the model includes (unreported) airport-seasonal effects, time-period fixed effects and regional macroeconomic controls, each set of which is jointly significant at the 1% level in all regressions.[12] The results in column 1 suggest substantial filing quarter effects of bankruptcies on total flights at an airport. The coefficient of -0.232 (standard error, 0.069) on $BANKRUPT\ SHARE_t$ implies, for instance, that if a carrier has 20% of the flights at a certain airport, then in the quarter it files for Chapter 11 bankruptcy protection, the total number of flights at the airports declines by about 4.5%. The cumulative effect beginning two quarters prior to bankruptcy filing and ending two quarters after the filing, measured by the sum of the five $BANKRUPT\ SHARE$ variables, is estimated at -0.106 (standard error, 0.099) and cannot be statistically distinguished from zero.

The second column of Table 3 reports results measuring service by the total number of nonstop destinations from an airport. The current quarter and cumulative 5-quarter

rors have not been corrected for the modest (-0.25) negative serial correlation in the residuals for dln(DESTINATIONS), and hence may overstate true standard errors.

[12] The individual leads and lags of the two regional macro controls tend to be imprecisely estimated, and some point estimates are negative. The aggregate effects, however, are positive and jointly significant in all regressions.

effects of bankruptcy on destinations are all quite imprecisely estimated, though the point estimate of the cumulative effect is roughly the same order of magnitude as for flights.

We next explore whether bankruptcy effects differ by airport size, which varies substantially across our sample. Political concerns about airline bankruptcies have in some cases focused on the largest airports and metropolitan areas, while in other cases more concern has attached to service to smaller communities. We therefore divide sample airports into three groups. The 26 "large" airports are those averaging more than 400 flight operations per day during our 18-year sample, and include all large hubs. The 51 "medium" airports average between 100 and 400 flights per day and include smaller hubs (*e.g.,* Memphis, Dayton, Washington Dulles), secondary airports in large cities (*e.g.,* Oakland, Midway, Houston Hobby) and primary airports in midsize cities (*e.g.,* New Orleans, Indianapolis, Reno). The remaining 118 "small" airports average between 8 and 100 flights per day.[13]

Table 4 reports results for dlnFLIGHTS regressions that allow bankruptcy effects to vary across these three airport size categories while maintaining common time-specific and regional macroeconomic effects. The estimates suggest substantial heterogeneity in service responses to carrier bankruptcies. The top panel reports bankruptcy coefficients by airport size for our base sample of 8 major carrier bankruptcies. The bottom panel reports results using all 17 bankruptcies identified in Table 1. As the two sets of results are quite similar, the detailed discussion focuses on the first panel. Large airports exhibit much smaller filing-quarter effects than does the pooled sample, and these cannot be statistically distinguished from zero. In contrast, medium and small airports experience substantial declines in flights during the quarter of bankruptcy filing. If a carrier had a 20% share of flights at a medium-sized airport, for instance, the estimate implies that total service at the airport would decline by 5.0% in the quarter it filed for Chapter 11 bankruptcy. At a small airport, the same example would yield a 5.3% reduction in total service.

The aggregate 5-quarter effect for large airports is estimated to be -0.132 (standard error, 0.089). The estimate implies that if a carrier had a 20% share of flights at an airport prior to its bankruptcy, total service at the airports would decline by about 2.6% after it filed, but the 95% confidence interval (-26%,+4%) fails to reject no bankruptcy effect. For medium-sized airports, the estimated aggregate effect is much larger, a 9.3bankrupt. While the confidence interval is quite broad, it is bounded away from zero. At small airports, the decline in flights during the filing quarter appears largely offset by increases in subsequent

[13] The data do not allow us to further distinguishing hub from nonhub airport bankruptcy effects.

quarters, leading to an estimate of virtually no change over the 5-quarter window. Once again, however, the imprecision of the estimates leads to a large confidence band.

Table 5 reports corresponding results using dlnDESTINATIONS as the service measure. Results for large airports (column 1) and small airports (column 3) are essentially unaffected by the selection of bankruptcy events. The point estimates for medium airports (column 2) sometimes differs across the two bankruptcy samples, though their confidence intervals exhibit considerable overlap. The 5-quarter bankruptcy impacts on DESTINATIONS follow a similar pattern to the FLIGHTS results. At large airports, the 5-quarter estimates imply that the number of destinations served declines by about 3.7% if a carrier with 20% of the flights at an airport files for Chapter 11 protection. For medium-sized airports, the decline is estimated to be 8.3%. The confidence intervals for these estimates are broad, and just reject no effect at the 5% level. For small airports, the estimated cumulative bankruptcy effect is small and statistically indistinguishable from zero.

Taken together, these results suggest that the greatest impact of bankruptcy on service occurs at mid-sized airports. Although the break points we use to define large, medium, and small airports are somewhat arbitrary, the pattern of results are robust to a wide range of alternative choices: small airports exhibit no significant effect over the 5-quarter window, medium airports experience the greatest bankruptcy-induced declines, and the estimated magnitude of both large and medium airport effects increases as we use a cut that moves more airports from the "medium" to "large" category.

It it is useful to put these results into context by comparing bankruptcy-induced changes to the "typical" quarterly variation in service that occurs at airports as a consequence of seasonal demand variation, macroeconomic fluctuations, and other factors. Table 6 reports the distribution of changes in service that occur in airport-quarters with no significant bankruptcy impact.[14] Consider, for example, the bankruptcy of a carrier with a 30% share of flights at an airport. Our results suggest this would reduce total flights by 4.0% at a large airport. A change of this magnitude wouldn't be particularly unusual, occurring in nearly one in five large-airport-quarters absent bankruptcy. The corresponding 13.6% change implied by our results for a medium airport would be more unusual, falling in the third percentile of the no-bankruptcy distribution. For a carrier with a 10% share of flights at an airport, the total change in flights is estimated to be 1.4% at a large airport and 4.8% at a medium airport, neither of which would be likely to stand out among the normal fluctuations in service at such airports.

[14] This excludes any airport-quarter at which a carrier in bankruptcy operated during the 5-quarter window around its bankruptcy.

## III. Conclusion

We find that airline bankruptcies reduce service at some airports. At large airports, the effect is weakly significant, and the magnitude is not large in comparison to the normal fluctuations in service. The estimated effect is greatest at midsize airports where bankruptcy of a carrier with a significant share of flights may reduce service by amounts that would stand out from the typical quarter-to-quarter variation. At small airports, a brief decline in service appears to be quickly offset in the following quarters, with the net impact over five quarters being small and statistically insignificant. These findings suggest that bankruptcy has direct causal effects on some airline operations. These effects merit further exploration and investigation. Our ongoing work attempts to decompose bankruptcy effects into filing-carrier and rival carrier responses, in an effort to discern how much service is replaced by rivals', and what are the key determinants of the replacement decision.

The larger question – what are the social implications of the observed net service declines? – is much more difficult to address. The theoretical literature is ambiguous, and the current state of empirical methods makes it unlikely that one could construct reliable estimates of the welfare costs of alternative network configurations. Weiss and Wruck's (1998) case study of the Eastern Airlines bankruptcy may provide a cautionary note on assessing the welfare effects of possible bankruptcy constraints, and potentially, the implications for current efforts to mitigate or avoid airline bankruptcies. They argue that the prolonged operation of Eastern Airlines following its chapter 11 filing was facilitated by "asset-stripping" that reduced the value of the firm by $2 billion, and that the tendency toward such value-destruction may not be an aberration. "The temptation to use liquid assets to prolong the firm's survival, even if doing so destroys value, can prove irresistible. In addition, such actions are easily rationalized; because they postpone the fallout of painful outcomes, they appear to be the socially responsible thing to do. The avoidance of painful decisions is more likely to arise when massive downsizing or shutdown is required." (Weiss and Wruck, 1998, p. 84).

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Table 1: U.S. Air Carrier Bankruptcies, 1984-2001

| Airline | Date of Chapter 11 Filing |
|---|---|
| Air Florida | 3/7/84 |
| Frontier* | 8/28/86 |
| Eastern* | 3/9/89 |
| Braniff | 9/28/89 |
| Continental* | 12/3/90 |
| Pan Am | 1/8/91 |
| Midway* | 3/30/91 |
| America West* | 6/27/91 |
| TWA* | 1/23/92 |
| Hawaiin Airline | 9/21/93 |
| TWA* | 6/30/95 |
| Kiwi Intl | 9/30/96 |
| Western Pacific | 10/5/97 |
| Pan Am | 2/26/98 |
| Kiwi Intl | 3/23/99 |
| TWA* | 1/10/01 |
| Midway | 8/13/01 |

* indicates large domestic carrier, defined as a carrier averaging 25,000 or more flights in the quarter prior to bankruptcy.

Table 2: Summary Statistics (N= 12,805)

| Variable | Mean | Std Dev | Minimum | Maximum |
|---|---|---|---|---|
| *Flights* | 16541 | 26875 | 503 | 202423 |
| *Destinations* | 16.59 | 21.69 | 1 | 136 |
| *Bankrupt Share* (*large carriers*) | 0.0039 | 0.00249 | 0.0000 | 0.8000 |
| *Bankrupt Share* (*all carriers*) | 0.0043 | 0.0262 | 0.0000 | 0.8000 |
| *Employment* (millions) | 3982 | 3506 | 182 | 14721 |
| *Income* ($millions) | 208359 | 216208 | 6559 | 1131361 |
| | | | | |
| $\Delta log(Flights)$ | 0.0045 | 0.1437 | -1.3721 | 1.4182 |
| $\Delta log(Destinations)$ | 0.0012 | 1.1990 | -1.6094 | 1.3862 |
| $\Delta log(Employment)$ | 0.0051 | 0.0055 | -0.0399 | 0.0344 |
| $\Delta log(Income)$ | 0.0141 | 0.0117 | -0.1093 | 0.2293 |

NOTE: Includes 12,805 observations on 195 airports for 1984q4-2001q2, omitting observations in which airport had fewer than 500 flights during the observed quarter or previous quarter.

Table 3: Estimation Using All Airports

| Dependent Variable | dln(FLIGHTS) | dln(DESTINATIONS) |
|---|---|---|
| $Bankrupt\ Share_{t+2}$ | -0.024 | -0.177** |
| | (0.048) | (0.073) |
| $Bankrupt\ Share_{t+1}$ | 0.014 | 0.088 |
| | (0.045) | (0.092) |
| $Bankrupt\ Share_{t}$ | -0.228** | -0.088 |
| | (0.068) | (0.100) |
| $Bankrupt\ Share_{t-1}$ | 0.042 | 0.054 |
| | (0.078) | (0.116) |
| $Bankrupt\ Share_{t-2}$ | 0.088 | 0.011 |
| | (0.058) | (0.088) |
| Five-Quarter Aggregate | -0.107 | -0.112 |
| *Bankrupt Share* effect | (0.099) | (0.164) |

NOTES: Observations=12,805. Regional macroeconomic variables (employment and income), airport-seasonal fixed effects (4 per airport), and time-period fixed effects (one per quarter) not reported. Robust standard errors in parentheses. * = significant at 10% level. ** = significant at 5% level.

Table 4: Estimation of Bankruptcy Effect on FLIGHTS By Airport Size

Dependent Variable: dln(FLIGHTS)

*Using the 8 Large-Carrier Bankruptcies in Table 1*

| Aiport Size | Large | Medium | Small |
|---|---|---|---|
| $Bankrupt\ Share_{t+2}$ | 0.015 | 0.045 | -0.040 |
| | (0.044) | (0.106) | (0.063) |
| $Bankrupt\ Share_{t+1}$ | -0.050 | -0.131 | 0.047 |
| | (0.035) | (0.114) | (0.059) |
| $Bankrupt\ Share_{t}$ | -0.066 | -0.255** | -0.273** |
| | (0.051) | (0.111) | (0.095) |
| $Bankrupt\ Share_{t-1}$ | -0.093 | 0.040 | 0.092 |
| | (0.057) | (0.131) | (0.105) |
| $Bankrupt\ Share_{t-2}$ | 0.058 | -0.187 | 0.147** |
| | (0.062) | (0.218) | (0.069) |
| Five-Quarter Aggregate *Bankrupt Share* effect | -0.136 | -0.488** | -0.027 |
| | (0.088) | (0.216) | (0.136) |

*Using All 17 Airline Bankruptcies in Table 1*

| Aiport Size | Large | Medium | Small |
|---|---|---|---|
| $Bankrupt\ Share_{t+2}$ | -0.058 | -0.000 | -0.022 |
| | (0.049) | (0.083) | (0.068) |
| $Bankrupt\ Share_{t+1}$ | -0.006 | -0.035 | 0.069 |
| | (0.044) | (0.085) | (0.072) |
| $Bankrupt\ Share_{t}$ | -0.072 | -0.283** | -0.237** |
| | (0.050) | (0.101) | (0.088) |
| $Bankrupt\ Share_{t-1}$ | -0.083 | 0.081 | 0.116 |
| | (0.056) | (0.124) | (0.096) |
| $Bankrupt\ Share_{t-2}$ | 0.059 | -0.143 | 0.145** |
| | (0.060) | (0.177) | (0.065) |
| Five-Quarter Aggregate *Bankrupt Share* effect | -0.121 | -0.381** | 0.070 |
| | (0.085) | (0.169) | (0.135) |

NOTES: Observations=12,805. Regional macroeconomic variables (employment and income), airport-seasonal fixed effects (4 per airport), and time-period fixed effects (one per quarter) not reported. Robust standard errors in parentheses. * = significant at 10% level. ** = significant at 5% level.

Table 5: Estimation of Bankruptcy Effect on DESTINATIONS By Airport Size

Dependent Variable: dln(DESTINATIONS)

*Using the 8 Large-Carrier Bankruptcies in Table 1*

| Aiport Size | Large | Medium | Small |
|---|---|---|---|
| $Bankrupt\ Share_{t+2}$ | -0.058 | -0.130 | -0.217** |
| | (0.049) | (0.123) | (0.100) |
| $Bankrupt\ Share_{t+1}$ | -0.006 | -0.103 | 0.141 |
| | (0.044) | (0.136) | (0.126) |
| $Bankrupt\ Share_{t}$ | -0.071 | -0.099 | -0.084 |
| | (0.052) | (0.162) | (0.137) |
| $Bankrupt\ Share_{t-1}$ | 0.013 | 0.081 | 0.069 |
| | (0.053) | (0.133) | (0.162) |
| $Bankrupt\ Share_{t-2}$ | -0.069 | -0.183 | 0.068 |
| | (0.054) | (0.141) | (0.122) |
| Five-Quarter Aggregate | -0.191** | -0.434** | -0.024 |
| *Bankrupt Share* effect | (0.093) | (0.214) | (0.235) |

*Using All 17 Airline Bankruptcies in Table 1*

| Aiport Size | Large | Medium | Small |
|---|---|---|---|
| $Bankrupt\ Share_{t+2}$ | -0.050 | -0.145 | -0.116 |
| | (0.049) | (0.094) | (0.099) |
| $Bankrupt\ Share_{t+1}$ | 0.001 | 0.125 | 0.074 |
| | (0.043) | (0.126) | (0.123) |
| $Bankrupt\ Share_{t}$ | -0.075 | -0.267* | -0.071 |
| | (0.052) | (0.150) | (0.130) |
| $Bankrupt\ Share_{t-1}$ | 0.021 | 0.065 | 0.109 |
| | (0.052) | (0.143) | (0.147) |
| $Bankrupt\ Share_{t-2}$ | -0.064 | -0.026 | 0.095 |
| | (0.053) | (0.136) | (0.113) |
| Five-Quarter Aggregate | -0.165* | -0.248 | 0.092 |
| *Bankrupt Share* effect | (0.092) | (0.204) | (0.217) |

NOTES: Observations=12,805. Regional macroeconomic variables (employment and income), airport-seasonal fixed effects (4 per airport), and time-period fixed effects (one per quarter) not reported. Robust standard errors in parentheses. * = significant at 10% level. ** = significant at 5% level.

Table 6: Distribution of Percentage Change in FLIGHTS at Airports with No Bankruptcy Effect

| | All Airports | Large Airports | Medium Airports | Small Airports |
|---|---|---|---|---|
| 1st Percentile | -36.1% | -13.1% | -24.5% | -40.5% |
| 3rd Percentile | -23.5% | -9.8% | -13.4% | -27.5% |
| 5th Percentile | -17.2% | -8.0% | -10.1% | -20.6% |
| 10th Percentile | -10.5% | -5.6% | -6.7% | -12.8% |
| 15th Percentile | -7.4% | -4.4% | -5.2% | -9.1% |
| 20th Percentile | -5.6% | -3.6% | -4.0% | -6.9% |
| 25th Percentile | -4.2% | -2.6% | -3.2% | -5.1% |
| Median | +0.1% | +0.4% | +0.5% | +0.1% |
| 75th Percentile | +4.9% | +3.9% | +4.4% | +5.4% |