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Gordon M. Phillips
Giorgo Sertsios

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ABSTRACT

We analyze the interaction of firm product quality and pricing decisions with financial distress and bankruptcy in the airline industry. We consider an airline's choices of quality and price as dynamic decisions that trade off current cash flows for future revenue. We examine how airline mishandled baggage, on-time performance and pricing are related to financial distress and bankruptcy, controlling for the endogeneity of financial distress and bankruptcy. We find that an airline's quality decisions are differentially affected by financial distress and bankruptcy. Product quality decreases when airlines are in financial distress, consistent with financial distress reducing a firm's incentive to invest in quality. In contrast, in bankruptcy product quality increases relative to financial distress. In addition, we find that firms price more aggressively when in financial distress consistent with firms trying to increase short-term market share and revenues.

Gordon M. Phillips
R.H. Smith School of Management
Van Munching Hall
University of Maryland
College Park, MD 20742
and NBER
gphillips@rhsmith.umd.edu

Giorgo Sertsios
Bauer College of Business
University of Houston
Houston, TX
Sertsios@econ.umd.edu

1 Introduction

Financial distress is frequently cited as influencing firm value by causing firms to take actions that would be suboptimal in normal times in order to reduce their chance of entering bankruptcy and potentially being liquidated.[1] Potential costs of financial distress and bankruptcy are commonly given as a reason for firms to have less debt than they would have otherwise chosen given the potential tax advantages of debt. The potential costs of financial distress and bankruptcy include the possibility that customers and suppliers may not wish to do business with a firm that is likely to fail as they may lose value if the firm is liquidated (Titman 1984). Additionally, in financial distress, the firm may produce a lower quality product and attempt to sell this product as higher quality in order to stave off bankruptcy as modeled by Maksimovic and Titman (1991). Empirically, the importance of these effects is unknown.

We examine how product quality and pricing decisions vary with financial distress and bankruptcy in the airline industry. We analyze whether managers reduce product market quality and prices in periods of financial distress before the firm actually defaults, as well as quality and pricing decisions in bankruptcy. Our measure of financial distress is a firm's probability of default, calculated using Merton's distance to default measure. Changes in the probability of default may reduce a firm's incentives to produce a high quality product since a reduction in quality may increase current cash flows at the expense of bondholders who may receive less in the future. Similarly, the firm may also have incentives to lower prices to increase market share and current cash flow even if this triggers a price war in the future. Bankruptcy, however, can have a different effect. In bankruptcy, the time horizon of firm managers may be longer, as debtholders and other fixed claimants are closer to becoming future owners of the firm and management may also wish to be involved in the firm post-bankruptcy.[2] In addition, firm claimants' incentives to invest in customer retention may increase under bankruptcy, as they need to demonstrate to the bankruptcy judge that the firm is

[1] See for example, the Wall Street Journal, Dec 17, 2008, p B1. Also see Asquith, Gertner and Scharfstein (1994) for firm-specific actions taken by a sample of junk-bond issuers to avoid bankruptcy.

[2] Hotchkiss (1995) examines firms post-bankruptcy and finds that the management of many bankrupt firms does not change after emerging from Chapter 11 and finds evidence of inefficient continuation of firms post-bankruptcy. Strömberg (2000) documents that conflicts of interest in bankruptcy auctions can lead to inefficient continuation decisions.

viable as a going concern. Thus the firm managers and claimants to the firm may have incentives to increase quality in bankruptcy relative to periods of financial distress to keep existing customers.

We examine how two different components of product quality in the airline industry, mishandled baggage and on-time performance, and airline pricing, are related to financial distress and bankruptcy. Econometrically, we estimate a simultaneous system of equations for price, quantity and quality, along with financial distress and bankruptcy.

We find that airlines' quality and pricing decisions are affected by financial distress and bankruptcy. Financial distress reduces a firm's incentive to invest in quality. In addition, firms price more aggressively when in financial distress, consistent with them trying to increase short-term market share and revenues. Interestingly, the negative effects of financial distress on product quality are not present during bankruptcy. In bankruptcy, product quality *increases* relative to the pre-bankruptcy financial distress period, consistent with airlines investing in customer retention and reputation through product quality. Regarding prices, we find that firms further reduce prices in bankruptcy relative to periods of financial distress. These results are robust to using route-level analysis with firm-route fixed effects for the only quality measure available at that level of aggregation (on-time performance).

We add to the previous literature on bankruptcy and financial distress by focusing on identifying real effects on quality. Hoshi, Kashap, and Scharfstein (1990), Asquith, Gertner, and Scharfstein (1994), Sharpe (1994) and Hotchkiss (1995) find that financially distressed firms have a greater tendency to cut investment, sell assets, and reduce employment than their non-leveraged counterparts. Campello (2003) shows that sales growth of leveraged high debt firms drops more in recessions. However, Andrade and Kaplan (1998) and Khanna and Poulsen (1995) find no differences in actions by financially distressed firms versus benchmarked competitors. Maksimovic and Phillips (1998) find that industry conditions are a primary determinant of bankruptcy outcomes and that firms make efficient liquidation decisions. Khanna and Tice (2005) show that high debt firms are more likely to exit low price cities and are more likely to be efficient. Benmelech and Bergman (2010) examine the effect of bankruptcy on competitors through the decreased value of collateralizable assets in the industry.

Previous research on financial distress in airlines by Pulvino (1998) has documented that asset sales by distressed airline firms are associated with a significant price discount. Additional articles have examined the effect of financial conditions on airline accident rates. Rose (1990) examines airline accidents and finds that accident rates decrease with an airline's operating margin – a measure of financial health of an airline. Dionne et al. (1997) criticizes Rose's approach arguing that operating margin is not the right measure of financial health because underinvestment in airline safety can increase operating margin in absence of accidents. They propose leverage as a measure of financial condition and obtain mixed results for the effect of financial condition on airline safety. Noronha and Singal (2004) use bond ratings to capture the financial health of an airline and find that better bond ratings are related to lower accident rates. However, they only examine cross-sectional variation between firms. It is likely that better-run airlines could have caused both lower accident rates and higher bond ratings creating an omitted variable bias.

Several papers examine pricing decisions in the airline industry. Busse (2002) examines how financially distressed firms price in the airline industry and finds prices are cut when leverage is high or interest coverage is low. Borenstein and Rose (1995) show that prices decline pre-bankruptcy but then remain constant in bankruptcy. They conclude that firms change their prices due to financial distress and not due to bankruptcy because consumers believe that financially distressed firms offer lower quality, which in turn lowers demand and optimally lowers firm price. While this is a possible interpretation there is no evidence in that paper that financially distressed firms actually offer lower quality or that the reduction in price is due to a reduction in demand. Our article documents the direct effect of financial conditions on product quality showing that there is an additional cost of financial distress in the form of reduced quality of service for the airline's customers and examines the differences between the effects of financial distress and bankruptcy.

Lastly, a series of papers examines bankruptcy and not financial distress. Borenstein and Rose (2003) examine the effect of the share of airport capacity operated by airlines in bankruptcy on the number of flights and destinations from a given airport. They find that the number of flights from a given airport decreases for bankrupt airlines. However it is hard to interpret this finding given that bankruptcy is an endogenous outcome. Two recent papers by Ciliberto and Schenone (2010a, 2010b) focus just on bankruptcy and examine the impact of bankruptcy on airline pricing, product variety and on-time performance. They do not examine financial distress as they exclude two quarters of data prior to the firm declaring bankruptcy and they also do not compute any probability of bankruptcy for non-bankrupt periods and non-bankrupt airlines. They thus compare bankruptcy to non-distress periods for airlines that declare bankruptcy and do not control for the endogeneity of bankruptcy.[3] Lastly Benmelech and Bergman (2010) examine how bankruptcy of one firm imposes negative externalities on non-bankrupt industry competitors by driving down the collateral value of assets used in the industry. They show that the cost of debt financing increases for industry firms.

Our finding that prices fall with measures of default probability also indicates that default is involuntary in our setting and that firms adopt strategies that may allow them to recover. In contrast, previous work on voluntary increases in financial leverage by Chevalier (1995) and Phillips (1995) shows that prices increase with voluntary leverage buyouts (LBOs) and management buyouts (MBOs) in most industries. Phillips (1995) does show that in the gypsum industry there were price cuts following the large increases in leverage. However, in this industry there was entry by a Canadian firm and gypsum firms that undertook leveraged buyouts ended up in involuntary financial distress followed by bankruptcy.

Our paper contributes on multiple dimensions to our understanding of how financial distress and bankruptcy affect firm quality *and* pricing decisions. First, our paper examines the effect of both financial distress and bankruptcy on product quality and pricing. We show that firms' quality decisions are substantially different in financial distress and bankruptcy versus non-bankrupt periods. Our paper is the first to show econometrically that firms reduce quality when faced with financial distress in order to increase their probability of near term survival. In contrast to financial distress, we find that firms increase quality in bankruptcy relative to periods of financial distress. Second, we simultaneously estimate equations for the firm's pricing, quantity, quality decisions and its financial condition, explicitly controlling for the endogeneity of financial condition using the tangibility of the firm's assets as instrument. Without controlling for the endogeneity of financial conditions, the estimated effects of financial condition on quality and prices might be biased, because lower firm quality or prices may be the cause of financial distress and bankruptcy in the first place. Lastly, we have a more precise measure of a firm's financial distress than the previous literature as we use Merton's probability of default, which is a continuous and more accurate measure of financial distress.

Our paper proceeds as follows. In Section 2 we give the theoretical background and also present our econometric model. In Section 3, we describe our data. Section 4 presents the results for financial distress and bankruptcy. Section 5 concludes.

[3] Financial distress might start earlier than just 2 periods before bankruptcy. In that scenario, they compare distressed and not distressed periods with bankruptcy.

2 Quality and pricing in financial distress and bankruptcy

In this section we describe how financial distress and bankruptcy may affect a firm's quality and pricing decisions. In section 2.1 we describe the theoretical background and also describe the implications we test from the prior theoretical literature. In section 2.2 we present the econometric model we estimate.

2.1 Theoretical background

We draw on the theoretical article by Maksimovic and Titman (1991) in formulating the hypotheses we test. Consider a firm with some degree of market power, to the extent it can choose price and quality. Assume also that the good sold by the firm is an experience good so the quality is not known beforehand. In periods of financial distress, firm managers and equity holders may have incentives to lower the quality of the product they sell if they can earn higher profits until the lower quality is observed. Firms can cut quality and given that quality provision is costly, this will lower the marginal cost of production. Until consumers realize the good sold is of lower quality, firms will earn higher profits. Once the lower quality is observed, firms will face reduced demand. If the claimants do not bear the full cost of this reduced demand or face a very high discount rate, they may have incentives to shift profits into nearby periods. These features fit well the airline industry. In the airline industry, firm's provision of quality is to some extent unobserved at the time an airline ticket is sold. Consumers can observe lagged measures of quality, but quality at the actual time the flight is taken may be quite different than past quality. Firms may also face a very high demand for current profits and may be willing to trade future profits for current profits.

Debt, financial distress and bankruptcy play a role just as in the Maksimovic and Titman model, as financial distress and *expected* bankruptcy can increase the incentives of firms to lower quality. The intuition for financial distress to play a role is simple and follows directly from their model. If the firm defaults on its debt, debtholders rather than equityholders bear the loss of the future market share. If a firm faces a significant chance of defaulting on its debt, it may choose to cut quality today in order to survive in the hopes that there is a positive demand shock before consumers discover the lower quality. The positive demand shock may enable survival, despite the demand reduction that comes as a consequence of lower past quality. Afterwards, the firm can rebuild its reputation.

Put differently, the probability of default enters in the airline's supply of quality decision. The firm's supply of quality will be affected by a higher probability of default because the future benefits of quality diminish, given that there is a higher probability that the firm will enter into bankruptcy (equivalent to a higher discount rate). To the extent that not all consumers are aware of this present cut in quality, the firm optimally reduces quality taking an involuntary loan from consumers. This might help the firm, in the short run, to avoid bankruptcy.

Airline pricing can also be affected by financial distress. Morrison and Winston (1996) and Busse (2002) have found evidence that the prices in the airline industry are characterized by alternating periods of tacit collusive agreements and price wars. Price wars can be triggered as a firm reduces prices and deviates from the tacit collusive agreement prices in order to gain market share in the short run. As a higher default probability is equivalent to a higher discount rate a firm in financial distress will be more prone to reduce prices even if this triggers a price war in the future, given that bondholders might be the ones who receive less in the future if this happens. This logic holds only if there is no immediate detection of the price deviation. While the reduction in prices can be observed, airlines can modify the average price of their tickets by changing the composition of seats sold without changing their posted prices and this action may go unnoticed by other airlines for a significant period, giving scope for a non immediate detection from competitors.[4] This logic differs from Borenstein and Rose (1995) interpretation of pre-bankruptcy price reduction. They argue that prices go down because demand is lower for a distressed firm. Our hypothesis is that even after controlling for demand changes there is still an incentive to reduce prices as a firm's financial distress increases.

We thus test the following central implication:

Hypothesis 1: Firms cut product quality and price as the probability of default increases.

Our main focus is on financial distress but we extend our analysis to Chapter 11 bankruptcy. We also consider the effect of operating in Chapter 11 bankruptcy on firms' decisions. Chapter 11 bankruptcy is a state in which the firm continues to operate while it is attempting to reorganize.

[4] It is well known that airlines charge different prices even within economy class. Each airline decides how many seats to offer at each price using an optimization package (e.g: PROS). The cheapest seats are sold first and as time passes the more expensive ones start to sell as well. If an airline decides to sell all the economy seats at the cheapest price the average price of that airline will be reduced, yet the posted price might not have changed. This makes the detection of price deviations difficult because other firms will find out only after observing that their bookings are not behaving as expected.

There are several key provisions of Chapter 11 bankruptcy that are relevant to our analysis: the *automatic stay* provision, the *voting procedure* in Chapter 11, the *feasibility test,* and *debtor-in-possession financing.* These provisions are described fully in Gertner and Scharfstein (1991), who theoretically show how they affect firm investment and emergence from Chapter 11.

During Chapter 11, under the automatic stay provision payments to creditors are deferred while the firm reorganizes.[5] Firm management has the right to propose a reorganization plan to emerge from Chapter 11 to the bankruptcy judge. The plan is then voted upon by claimants to the firm, with each class approving the plan if one-half by number and two thirds of the aggregate face value agree to the plan. The plan involves offering new securities to existing claimants under which they exchange their old debt securities for less senior and covenant free securities like equity. This exchange offer is also called the exit consent provision. Management's right to propose a plan legally exists for the first hundred and twenty days, but extensions are generally automatically granted by the bankruptcy judge. In addition the bankruptcy judge can approve additional debt securities, called debtor in possession financing, that are senior to existing debt issued before Chapter 11. The additional debt securities allow the firm to have funds to invest and continue to operate, reducing the debt overhang problem.

This bankruptcy reorganization plan also has to pass a *feasibility* test – specifically management has to demonstrate to the judge that the firm is viable as a going concern under the new plan. This plan can include a request to the bankruptcy judge that past union contracts be changed and a new wage structure imposed on the firm's employees. In addition, the firm can ask the bankruptcy judge to turn over past union pensions to the government pension fund, the Pension Benefit Guarantee Corporation (PBGC). The value of the pension paid by the PBGC is typically much lower than previous commitments under past labor agreements.

We hypothesize that Chapter 11 bankruptcy affects the incentives of managers differently than the probability of distress. Given that management wishes to emerge from bankruptcy, it has a much longer term perspective than during financial distress. We hypothesize that it now has incentives to treat existing customers well and to increase quality and thus invest in its long run reputation. The effect on price is less clear. There are three conflicting incentives. Two of them imply that prices do not increase with respect to the distress period and one of them implies that they increase. First, the management does not have to make interest and principal payments and as such has more

[5] Aircraft financing is exempt from automatic stay provision (section 1110 of chapter 11 bankruptcy).

flexibility to reduce price[6]. Second, airlines need to convince consumers to fly with them in spite of potential recent quality cuts and the consumer's potential belief that the firm may be liquidated. Therefore, prices should not increase. However, an airline also has to demonstrate feasibility to the bankruptcy judge and thus, controlling for demand, it must demonstrate that it can make profits on a per customer basis, which may give an incentive to raise prices. Given the ambiguity in the effect of bankruptcy on prices, we are only able to state our second central hypothesis in terms of product quality:

Hypothesis 2: In bankruptcy, firms increase product quality relative to pre-bankruptcy financial distress periods.

2.2 Empirical strategy and econometric model

Our empirical strategy analyzes the effects of financial distress, measured as default probability, and bankruptcy on a firm's supply decisions (product-quality and price). We analyze financial distress separately from bankruptcy as a firm's default probability is not defined when a firm is in bankruptcy. Our measure of default probability is based on stock prices and when firms go into bankruptcy, specifically Chapter 11, are not traded in the market, so there is no information about their stock price. Following the analysis of the impact of financial distress on a firm's supply decision we analyze the differential effect of bankruptcy relative to periods of high financial distress.

Analyzing the periods of financial distress is the primary focus of our paper. Analyzing financial distress separately from bankruptcy has the advantage of not imposing any value on the default probability when it is not defined (during bankruptcy). This is important since we hypothesize that before bankruptcy the default probability plays the role of a higher discount rate, shortening the firm's horizon; but while in bankruptcy a higher financial distress does not have any direct implication regarding a firm's horizon. Initially, we thus analyze distress excluding bankruptcy periods and then separately analyze bankruptcy compared to pre-bankruptcy financial distress periods. The cost of analyzing distress separately from bankruptcy is that we do not use the whole sample in both estimations. Thus initially, we use only non-bankruptcy firm-quarter observations in analyzing the effect of financial distress and we use only distressed and bankrupt firm-quarters to analyze the differential effects of bankruptcy and financial distress.

[6] Additionally, airlines can renegotiate pension benefits, reducing their costs (section 1113, chapter 11).

Following our analysis of financial distress and bankruptcy separately, we use the whole sample to estimate simultaneously a system that contains both financial distress and bankruptcy. We end up finding similar results using this approach as when we estimate financial distress and bankruptcy in separate estimations. Thus in the interest of space, this method and the associated results are presented in the appendix. The benefit of this approach is that we can analyze the effects of default probability and bankruptcy on the firm's supply decisions at the same time. However, there are some limitations to this combined analysis. The main limitation is that we cannot estimate the probability of financial distress when the firm is in bankruptcy. Thus in this case, we set the financial distress variable to be undefined with a value of zero when the firm is in bankruptcy and let a "predicted" bankruptcy dummy pick up the full effect of distress and bankruptcy. Note that we are not explicitly saying the firm is not distressed when in bankruptcy, but econometrically we are letting the bankruptcy variable to pick up the different degrees of financial distress that a firm might face when the firm is actually in bankruptcy.[7]

We now present the econometric approach that we use to analyze financial distress and bankruptcy. We first present the econometric model we use to analyze financial distress and then follow with the model for bankruptcy.

2.2.1 Financial distress

In this analysis of financial distress, we initially drop firm-quarter observations where the firm is in bankruptcy as financial distress is not defined in bankruptcy. We use a simultaneous equation approach to estimate the impact of the probability of default on supply decisions. Specifically, we jointly examine a firm's supply decisions of quality (S) and price (P) with its quantity demanded (Q) and the probability of default (Pr_def).

The following 4 simultaneous equations describe the airline economic environment:

1a. $S_{it}=h(P_{it}, Q_{it}, Pr\_def_{it}, Y_{it})$

2a. $P_{it}=g(S_{it}, Q_{it}, Pr\_def_{it}, X_{it})$

3a. $Q_{it}=f(Pr\_def_{it}, P_{it}, S_{it}, W_{it})$

4a. $Pr\_def_{it}=j(Q_{it}, P_{it}, S_{it}, Z_{it})$

[7] With this approach we can think of the firm as operating under 3 different regimes: non-distressed and not bankrupt; distressed but not bankrupt, and bankrupt.

In the above equations, S are the two measures of quality, either the mishandled bags rate or on time departures, P is our measure of price which following the airline industry convention is calculated as a yield or average price per mile, Q is the total quantity of total enplaned passengers (TEP), and Pr_def is the default probability. Equations (1a) and (2a) can be obtained from the optimization problem of a firm that maximizes profits, $\Pi(P(.),S(.),Q(.),Pr\_def(.))$, with respect to S and P. Equations (3a) and (4a) are the demand and default probability equations. Both of them can be affected by the firm's pricing and quality decisions.

In order to choose the simplest setting to generate these first order conditions, we assume linear demand and assume that the marginal cost of transporting a passenger and the marginal cost of providing quality are independent. In this simpler setting, which we adopt for the remaining equations we present, the marginal effect of quality on price and vice-versa are independent and we can drop P from equation (1a) and S from equation (2a). However, the results we obtain are invariant to their inclusion.

Y, X, W and Z are exogenous variables that affect quality, price, quantity and default probability, respectively. Variables in Y that affect the supply of quality are airport decongestion. The variables in X that affect pricing are oil fuel cost, average miles per flight, oil efficiency and airport decongestion. The variables in W that affect quantity demand are competition, income, unemployment and airport decongestion and the variable in Z is the percentage of liquidable assets. We will discuss these variables in the data section.

Equations (1a)-(4a) imply that the quantity demanded, Q, affects the pricing strategy, as usual, but might also affect the quality supply decision because when there are high numbers of passengers providing higher quality might be more costly. Additionally, Q affects the default probability, because lower demand presumably increases the default probability. Given that pricing and quality decisions might affect the default probability they are included in equation (4a) as well. Finally, Q is affected by the default probability because consumers might anticipate the incentives of the airlines to under-provide quality while in financial distress.

We take into account the endogeneity of price (P), quantity (Q), quality (S), and Pr_def using a simultaneous instrumental variable (IV) approach. Our instruments for price (P) are the elements of X that are excluded from the other 3 equations. Similarly, the instruments of quality (S), quantity (Q) and Pr_def are the excluded components of Y, W and Z. We instrument Price or yield (P) with average miles per flight, oil fuel cost and oil efficiency; we instrument total enplaned passengers (Q) with local income, competition and local unemployment and we instrument the default probability with the percentage of liquidable assets. We discuss these instruments and our identification strategy further below in Section 3.5. For now, we just limit ourselves to give a brief intuition of why they satisfy the exclusion restriction. Oil prices, local area income and unemployment are exogenous to firm's decisions. The percentage of liquidable assets is likely to satisfy the exclusion restriction as it is unlikely that having more valuable assets in case of liquidation will affect directly the quality of a firm's product or its prices. What can be argued is that this measure of tangibility has a relation with performance, because better performance can lead a firm to acquire more fixed assets, which increase the percentage of liquidable assets. In that case, our instrument could directly affect the firms' real outcomes, because it might be capturing unmeasured productivity to the extent that our controls are not perfect. Nevertheless, this is unlikely, because we observe that higher percentage of liquidable assets is positively related with high financial distress and bankruptcy, states in which productivity is unlikely to be high.

We do not have any variable that belongs to the set Y and is excluded from the other three equations. As a consequence, we are unable to instrument S directly, thus we replace quality in equations (3a) and (4a), and estimate:

1a'. $S_{it}=h(Q_{it}, Pr\_def_{it}, Y_{it})$

2a'. $P_{it}=g(Q_{it}, Pr\_def_{it}, X_{it})$

3a'. $Q_{it}=f(Pr\_def_{it}, P_{it}, Y_{it}, W_{it})$

4a'. $Pr\_def_{it}=j(Q_{it}, P_{it}, Y_{it}, Z_{it})$

We estimate this system using 3 stage least squares (3SLS) to take advantage of the potential error correlation structure between the equations. In this specification, we are able to analyze the effect of financial distress on the price and quality supply decisions. We also use firm and time fixed effects.

2.2.2 Bankruptcy

After considering the effect of financial distress, we examine the impact of bankruptcy. We hypothesize that Chapter 11 bankruptcy may affect a firm's quality positively relative to financial distress given that a firm wishes to keep customers as it attempts to emerge from bankruptcy. We do not have a clear prediction for prices. The firm has more flexibility to lower prices in bankruptcy as it does not has to pay principal and interests on its debt; it also may want to lower prices to attract reluctant customers that may have observed lower quality during the period of financial distress; but the firm also may want to raise prices relative to those in financial distress to raise cash to demonstrate to the bankruptcy judge that it can successfully emerge from bankruptcy.

In our analysis of bankruptcy, we examine all firm-quarters in bankruptcy and compare them to observations in which firms are in high financial distress but is not in bankruptcy. We thus drop firm-quarters where the firms have low probability of default. This sample does include firms that have a high probability of default that do not enter bankruptcy. Econometrically, we estimate a similar set of equations as for the financial distress case, but examining the impact of bankruptcy (a dummy variable) instead of default probability:

5a'. S_{it}=h(Q_{it}, $Bankrupt_{it}$, Y_{it})

6a'. P_{it}=g(Q_{it}, $Bankrupt_{it}$, X_{it})

7a'. Q_{it}=f($Bankrupt_{it}$, P_{it}, Y_{it}, W_{it})

8a'. $Bankrupt_{it}$=j(Q_{it},P_{it},Y_{it},Z_{it})

3 Data and summary statistics

3.1 Airline data

Our data consists of an unbalanced quarterly panel of 21 airlines from the first quarter of 1997 to the fourth quarter of 2008. The data was constructed using information from *Transtats*, a site managed by the Bureau of Transportation Services (BTS); *Air Travel Consumer Reports (ATCR)* also from the BTS; Compustat; the Center for Research in Security Prices (CRSP); and the Bureau of Economic Analysis (BEA).

Our final sample is limited to firms included in all data sets. Airlines must have annual operating revenues of at least US$20 million to be included in Transtats; they have to have a domestic revenue market share greater than 1% to appear in *ATCR* and they must be publicly traded to have their financial information included in Compustat and CRSP. Given that we have an unbalanced panel with some firms entering and exiting the panel, our final sample contains 647 firm-quarter observations for the 21 airlines in our sample.[8] Table 1 summarizes the names of the carriers, the number of quarters they appear in the sample and whether each of these carriers had a bankruptcy episode during those quarters. Of the 21 carriers, 13 never entered into bankruptcy in our sample, 7 had one bankruptcy episode and only 1 firm, US Airways, had two bankruptcy episodes.

Insert Table 1 here

From Transtats we obtain each airline's domestic operating passenger revenue (DOPR), domestic passenger revenue miles (DPRM) and domestic total enplaned passengers (TEP) by segment.[9] TEP represents our measure of quantity, measured in millions of passengers; dividing DORP by DRPM we obtain the "yield", which is our measure of price. Yield is a common price indicator in the airline industry, measuring the average price per mile a passenger is paying. Yield is measured in $US cents following common industry practice. Prices are measured at the time tickets are purchased, not when they are used.

We study two measures of quality: on time performance from Transtats and mishandled bags per 1,000 customers from ATCR. We do not consider accidents as these are rare events and because Rhoades and Waguespack (2000) find safety and service quality to be highly correlated. We also considered including the number of customer complaints but the Department of Transportation (DOT) reports that it has not determined the validity of the complaints - thus our measures are more objective.[10] The BTS classifies a flight as late if it is 15 or more minutes late from the scheduled arrival time. Nevertheless, constructing a dummy variable that takes a value of 1 if the flight is late and zero otherwise may hide information on how late are flights.[11]

[8] Our unit of analysis is firm-quarters as there is no information at the route level for mishandled baggage.

[9] We measure TEP on a segment basis; measuring TEP on a leg basis leads to similar results. The difference between legs and segments is best understood by an example. Suppose an airlline flies from A to B, and from B to C. A passenger flying from A to B or B to C would be counted as one segment and one leg. A passenger flying from A to C, with a setpover in B, would be counted as one passenger in terms of segments, but two passengers in terms of legs.

[10] We do not consider other measures of service quality, such as the flight cancellation rate, not because we think they are not important, but because they do not satisfy the Maksimovic and Titman (1991) framework in which quality cuts increase short term profits. There is no short-term benefit of cancelling a flight since passengers have to be relocated in other flights in the short run. The determinants of flight cancellation can be better explained at the route level (See Rupp and Holmes, 2003).

[11] Airlines sometimes are able to manipulate arrival times for flights that are on the border of being on time. Our measure does not suffer as significantly from this potential manipulation.

Our variable “Late” is constructed as the average delay of late flights times the percentage of late flights. For instance, if a firm in a quarter has 20% of its flights arriving late and their late flights are on average 50 minutes late, the variable “Late” takes a value of 50*0.2=10. To get higher quality as an increasing function, we define "On Time Performance" as the inverse of Late.

From ATCR we obtain the mishandled baggage rate per 1,000 passengers. According to the DOT, the definition of mishandled baggage is “lost, damaged, delayed or pilfered baggage”. Note that airlines, and not airports, control important aspects of baggage handling given that airlines have to relabel baggage when there is a change in schedule. Also airlines can decide whether to invest in a better monitoring technology in terms of bar-coding and decide how many personnel to assign to the monitoring of bags. Again, to get higher quality as an increasing function, we define our variable as the inverse of the mishandled baggage rate, so the higher this rate is, less baggage is lost. Our sample starts in the first quarter on 1997 because there is no previous information about mishandled baggage.

Figures 1A through 1C present some initial summary statistics for firms in the quarters preceding and following bankruptcy. Figure 1A presents on-time performance, Figure 1B presents the inverse of mishandled bags and Figure 1C presents airline pricing or yield. All data is quarterly, with quarter zero representing the first quarter a firm is in bankruptcy.

Insert Figure 1 here

The figures show that quality and price measures decrease in the quarters prior to bankruptcy. Additionally, figures 1A and 1B show that quality increases after bankruptcy is declared.

Table 2 presents similar summary statistics. However, in this table we report detrended data, where we detrend the quality and price variables by regressing the raw measures on time dummies and firm dummies. Thus we use the residuals of these equations to construct Table 2. This table includes data only for firms that go into bankruptcy at some point in the sample and splits the data into observations more than four quarters before bankruptcy, the four quarters right before bankruptcy and the period the firm is in bankruptcy itself. The omitted default category is post-bankruptcy.

Insert Table 2 here

Table 2 shows several striking patterns. First, both measures of quality decrease sharply in the four quarters prior to bankruptcy - a period of time we label as the "distress" period. Yield (our measure of price) also decreases sharply during the distress period. The differences in the medians of the residuals of the quality and price measures, between the pre-distress and distress periods are statistically different from zero at the 5% level of significance using a one-sided Fisher test for a non-parametric two sample comparison. Second, during bankruptcy both measures of quality and price increase relative to the distress period. However, only the differences in the medians of the quality measures for the bankruptcy and distress periods are significantly different from zero.

This initial evidence is interesting, but it does not consider firms with a high probability of default that do not enter into bankruptcy nor does it control for the endogeneity of distress or bankruptcy. These simple differences may thus be driven by other exogenous changes and merely related to firm bankruptcy. We now turn to the task of disentangling whether bankruptcy and financial distress affect firms' decisions after controlling for other exogenous demand and supply changes and the endogeneity of a firm's financial condition itself.

3.2 Probability of default and bankruptcy

In our analysis of default probability we examine both firms that manage to avoid bankruptcy and to those that do not. We construct a direct measure of the probability of default and use this to examine firm quality and pricing decisions. In addition our analysis takes into account that this probability of default might be endogenous. The probability of default is based on the Bharath and Shumway (2008) probability of default measure which, in turn, is based on the Merton (1974) model.[12] The idea is to compare the firm to a bond using the standard deviation of its equity

[12]Merton (1974) derives that a firm's probability of default follows the following formula: $\pi_{Merton} = \left(-\frac{\ln\left(\frac{V}{D}\right)\ +(\mu-0.5\sigma_V)T}{\sigma_V\sqrt{T}}\right)$, where V is the economic value of the firm, D is the economic value of the firm's debt and T is the forecasting horizon. This model uses a system of nonlinear equations to numerically infer the economic value of the firm and its standard deviation from the value of equity. Bharath and Shumway (2008) show that a naïve version of this default probability performs better in hazard models and in out-of-sample forecasts than the one that uses the numerical solution to obtain the economic value of the firm and its standard deviation. They proxy the economic value of debt, D, to its face value F; they proxy the standard deviation of debt value with $\sigma_D = 0.05 + 0.25\sigma_E$, they proxy the economic value of the firm V as the sum of the face value of the debt plus the value of equity, E, implying that the standard deviation of the firm value can be derived as $\sigma_V = \frac{E}{E+F}\sigma_E + \frac{F}{E+F}\sigma_D$. They also replace the expected return, μ , with the last period return, r_{it-1}. Thus, the naïve Merton's default probability, for a one period forward forecast, can be expressed as $\pi_{Merton-naive} = \left(-\frac{\ln\left(\frac{E+F}{F}\right)\ +\left(r_{it-1}-0.5(\frac{E}{E+F}\sigma_E+\frac{F}{E+F}(0.05+0.25\sigma_E))\right)}{\frac{E}{E+F}\sigma_E+\frac{F}{E+F}(0.05+0.25\sigma_E)}\right)$. This expression is based on stock price and debt value information only.

and the value of its debt to construct its probability of default. Daily stock price information was obtained from CRSP and short and long term debt were obtained from quarterly Compustat. At least 25 stock price observations were required to construct the standard deviation of equity.

Our measure of default probability differs slightly from Bharath and Shumway (2008) in two ways. First, we construct the default probability quarterly rather than annually. Second, we incorporate as an additional component of long run debt the underfunding of pension liabilities[13] given their importance in airline default.[14] A default probability of, say, 50% is interpreted as implying that the firm has a 50% of chance of entering bankruptcy in the next quarter.

We impute the probability of default when a corporation owns more than one airline in the sample, as is the case of AMR, which owns American Airlines and American Eagle Airlines. In this case, the probability of default was calculated for AMR and used for both companies. A similar situation occurs in the case of mergers. When one airline buys another, the subsequent probability of default for both is constructed using the information of the consolidated firm after the merger takes place.

We choose Merton's default probability over other traditional distress measure, like Altman's Z, because the latter is not robust to changes in industry financial structure, such as the increasing trend in operational leases (see Gavazza 2010). Altman's Z is constructed using Multi Discriminant Analysis (MDA), a technique similar to econometric regressions that selects the financial ratios with the best ability to discriminate between distressed and not distressed firms. Using MDA for the airline industry, Chow, Gritta and Leung (1991) found that interest coverage, revenue to shareholders' equity and equity to total assets were the most important factors among the financial ratios examined for predicting airlines' default.[15] The final computation of the distress indicator assigned each of the three ratios a weight equivalent to a reduced-form parameter in the regression analysis. Nevertheless, changing trends in the financing of aircraft makes all of the parameters, especially the interest coverage, quite unstable.

[13] 'Pension net liabilities' was constructed from BTS as 'pension liabilities' minus 'special funds'. If this was less than zero it was replaced by zero because the plan is overfunded. 'Pension liabilities' are the liabilities that a carrier has due to its defined benefit pension plan. 'Special funds' contain pension assets and other minor assets. Nevertheless, in the data it can be seen that airlines that do not have a defined benefit plan almost invariably have special funds equal to zero, so 'special funds' is a good approximation of pension assets.

[14] Not incorporating pension liabilities or even the long run debt in the default probability does not affect the results of the paper.

[15] Interest coverage was the single most relevant financial ratio in their estimation.

We use Merton's default probability because it is a more structural measure of default probability, given that it is theoretically derived and depends on basic elements of a firm's risk like its debt and the standard deviation of its equity. In addition, in preliminary regressions, Merton's default probability predicted the bankruptcy episodes in our sample far better than Altman's Z in our sample. Finally, the advantages of Merton's default probability over Altman's Z apply to any other financial ratio given that Altman's Z is composed of multiple financial ratios.[16]

In our analysis of bankruptcy, we examine all firm-quarters for firm that are in bankruptcy and compare them to observations in which firms are in high financial distress but not in bankruptcy. These high distress firm quarters include firms that eventually enter bankruptcy but also firms that do not enter bankruptcy. Bankruptcy takes value 1 when a firm declares itself (or is declared) in Chapter 11 and zero otherwise. There are 59 firm-quarter observations where the firm is in Chapter 11 bankruptcy in our sample, but there are no Chapter 7 episodes.[17]

For the non-bankruptcy sample that we compare to the bankrupt sample, we use firm years in which the firms are highly distressed. Some of the distressed firms enter into bankruptcy; others remain distressed in this subsample. Given that we are using firm fixed effects we are estimating a difference-in-difference where the treatment is being bankrupt and the control state is financial distress.

The criterion for selecting distressed firms is that our measure of default probability exceeds 10%. We select this criterion balancing not dropping too many non-bankrupt observations while ensuring that the included are, on average, quite distressed, with an average default probability of 60%. Nevertheless, relaxing this criterion does not change the results.[18] We get a final sample of 192 observations: 59 bankrupt firm-quarters and 133 distressed firm-quarters.

[16] Merton's default probability is also potentially more accurate than bond ratings given that bonds rating barely vary over time, and are frequently adjusted downward after a default.

[17] Independence Air did enter Chapter 7 but shrank to a small size before actually entering Chapter 7 so they could not be included given that they do not satisfy the 1% market share requirement of the ATCR.

[18] All the results hold if we drop observations with default probability lower than 5%, 15% and 20%, or even higher. However, results do get weaker if we do not drop any observations. This is to be expected because when dropping observations with default probability lower than 5%, 10%, 15% and 20% the average default probability of the non-bankrupt firms in the sample is 54%, 60%, 67% and 71% respectively. Comparing those observations with the bankrupt firm quarters is correctly comparing distressed firms with bankrupt firms. However, when we do not drop any observations the average default probability of the non-bankrupt firm quarters is 14%, which implies that these firm-quarters are not that distressed and thus are not good candidates to be compared with bankrupt firm quarters.

3.3 Demand and supply variables

To identify any effect of distress or default on firm quality it is critically important to control for demand and supply shocks. To construct demand shift variables (denoted W above), we use the average income and unemployment rate per state-quarter from the BEA.[19] We use these state level variables in the following way for each airline. For each airline, we compute the total number of passengers originating from each state for each quarter, and divide them by the total number of passengers that the firm carried in that quarter. This gives us the percentage of origin passengers that each state represents for each airline. These percentages are lagged one period, to avoid potential endogeneity problems, and are multiplied by the average income and unemployment of each state in each quarter, yielding weighted average income and unemployment at origin for each airline. We do the same for destinations. To minimize the collinearity between weighted unemployment and weighted income we use average income weighted at the origin state and the average unemployment rate weighted at the destination state.[20] We call these variables local income and local unemployment.

Another variable that shifts the demand of a firm is the competition it faces. Our measure of competition is the weighted average number of competitors that an airline faces by route. We do the computation in a similar way as the one for weighted income and unemployment. We sort the data by route and see how many airlines operate on a given route, measured as a pair of cities.[21] Then, we weight routes using lagged passengers to obtain our measure of competition.

Our supply variables, denoted as X in the previous equations, are based on cost items that vary over time. The two most important supply variables are oil prices and the efficiency with which each airline uses fuel. "Oil Fuel Cost" is constructed as the actual price per gallon that an airline pays in a quarter. This is obtained by dividing the total fuel cost of an airline by the number of gallons it used in that quarter. This price measure has two advantages over the oil spot price per gallon. First, it incorporates airlines' fuel hedging strategies as this price incorporates future or forward contracts the airlines signed. Second, it is not perfectly collinear with the time fixed effects. Thus, the overall economic conditions are captured by time fixed effects while the specifics conditions on

[19] Average income is in thousands of dollars. Income and yield are in 2009 dollars (cents).

[20] Including both variables at the origin or destination states does not affect the results.

[21] We exclude airlines that transport less than 100 passengers in a route-quarter, because they represent irrelevant competition.

an airline's oil price are captured by this variable. Efficiency, on the other hand, is defined as the number of ASM (available seat miles) an airline produces for each gallon of fuel they use. The more efficiently airlines use oil, due to new aircraft technology, the lower the costs of the firm.

Another variable that influences supply, through cost, is average distance of flights. The longer the distance that an airplane flies the lower the cost of the flight per mile, because the take-off and landing use more fuel, and thus firms with shorter flights will look less efficient all other things equal. This variable can be obtained by dividing Domestic Revenue passenger miles (which is the product of passengers and miles) by total enplaned passengers.[22]

Finally, we consider a variable that might affect both demand and supply conditions: "Congestion", which measures how congested the markets in which an airline operates are on average. Given that we are measuring positive characteristics as increasing variables, we will construct a measure of decongestion rather than congestion. To construct this measure we take the average percentage of on time flights (arriving within 15 minutes of the scheduled arrival time) of each airport, for each firm, excluding the firm's own flights. Then, we weight each airport by the lagged number of passengers for each firm. With this variable we can control for airport quality independent of the firm itself.

Congestion might affect the firms' pricing decision, because operating in congested markets is similar to facing capacity constraints in that the firm cannot increase supply as much as it would want to. Since operating under capacity constraints makes competition softer, we expect that (de)congestion should increase (decrease) prices. Congestion might affect demand as well, because congestion might reflect high consumer valuation for those markets. Finally, congestion can also affect our measures of quality, because it is easier to improve on-time performance and decrease the rate of mishandled baggage in less congested markets. Thus by controlling for congestion we will not penalize a firm because it operates a large proportion of its flights in congested airports like JFK or La Guardia. Given that the only quality supply shift variable is decongestion, which also affects supply and demand, we cannot instrument quality.

[22] Controlling for this variable is important because Low Cost Carriers (LCC) typically have similar yields to major carriers in the data, but after adjusting for the average miles per flight, which are lower for LCCs, we find that their yield is actually lower.

3.4 Variable summary statistics

Table 3 presents summary statistics for all our variables for the full sample of firms. Table 3 shows the 10th percentile, mean, 90th percentile, standard deviation and number of observations for the variables shown in the left column. The data consists of an unbalanced panel of 21 airlines for 48 quarters (1st quarter of 1997 to 4th quarter of 2008).

Insert Table 3 here

The main message that Table 3 conveys is that there is high variation in our measures of quality and default probability over the sample. Note that the statistics on default probability do not include the quarters the firm is actually in bankruptcy, as we cannot calculate Merton's default probability for companies without publicly traded stock. Despite not covering these quarters, the default probability goes from 0% at the 10th percentile to 69.2% at the 90th percentile. The maximum for this variable is close to 1.

3.5 Financial condition and identification

One of the central problems that researchers face when attributing effects to financial variables like the probability of default or bankruptcy is that these variables are endogenous and potentially related to firm quality and prices. Thus we face a typical identification problem. Having low quality might have driven the airline into distress or bankruptcy in the first place. A similar argument can be made for high or low prices. Using airline fixed effects and time fixed effects partially mitigates this problem but clearly does not solve it.

We solve the identification problem using instrumental variables. To solve the problem, we need an instrument that affect the probability of default, but does not affect prices, quantity or quality. This also needs to hold for bankruptcy. We use the percentage of liquidable assets as instrument for both financial conditions. In our first analysis as default probability and bankruptcy are analyzed separately only one instrument is needed for identification.

The percentage of liquidable assets proxies for the tangibility of assets and follows Berger et. al. (1996) formulation. Berger et al. used data from Lexis/Nexis on the proceeds from discontinued operations reported by a sample of COMPUSTAT firms from 1984 to 1993 to compute how much the firm's assets were worth in case of liquidation. They found that a dollar of book value yields 72 cents in liquidation value for accounts receivables, 55 cents in liquidation value for inventory and 54 cents in liquidation value for their fixed assets. Our variable percentage of liquidable assets is the expected amount that can be recovered in case of liquidation, using those parameters, divided by the book value of assets.

The percentage of liquidable assets captures what proportion of a firm's assets creditors can recover in case the firm is liquidated. The more creditors can obtain in case of liquidation, the more they are willing to lend to the firm. Thus a higher percentage of liquidable assets is likely to be related with higher leverage and also with a higher probability of default and bankruptcy.

We are not the first to use the percentage of liquidable assets as an instrument for a financial variable. Campello (2006) uses the percentage of liquidable assets, following Berger et al. specification, to instrument leverage when analyzing the effect of leverage on firms' sales growth. We just go one step ahead and use it to instrument default probability and bankruptcy directly.

Conceptually, the percentage of liquidable assets is likely to satisfy the exclusion restriction. It is unlikely that having more valuable assets in case of liquidation will affect directly the quality of a firm's product or its prices. What can be argued is that this measure of tangibility has a relation with performance, because better performance can lead a firm to acquire more fixed assets, which increase the percentage of liquidable assets. In that case, our instrument could directly affect the firms' real outcomes, because it might be capturing unmeasured productivity to the extent that our controls are not perfect. Nevertheless, this is unlikely, because we observe that higher percentage of liquidable assets is positively related with high financial distress and bankruptcy, states in which productivity is unlikely to be high. Moreover, Almeida and Campello(2007), and Campello (2007) (see Table 3 of Campello (2007)) demonstrate that a firm's pledgable assets are independent of its financial constraints and that there is no direct relationship between a firm's percentage of liquidable assets and a firm's performance. Campello (2007) shows that the only relationship between these two variables is through the financing channel. Thus, the firm's percentage of liquidable assets is a good instrument for financial conditions as is unrelated to a firm's performance. In addition, any story that tries to directly relate the percentage of liquidable assets with product quality in one direction faces the hurdle that using the same instrument product quality is shown to have opposite effects in financial distress and bankruptcy.

Specifically, in the airline industry, our measure of percentage of liquidable assets captures not only an increase in debt capacity of the firm, but also the increase in fixed assets that occurs when firms acquire aircraft using secured debt. According to Benmelech and Bergman (2009) *"... secured debt has become the primary source of external finance of aircraft by airlines in the US."* Simply put, secured financing implies that an airline issue securities to buy aircraft and back up those securities using the aircraft bought as collateral. Thus, when a firm acquires new aircraft the fixed assets of the firm increases and so does our measure of percentage of liquidable assets.[23] The debt of the firm and the default probability are likely to be higher as well. Thus, through this channel, a firm with higher percentage of liquidable assets is also a firm that is more likely to default in the future given its incremental level of debt.

The exclusion restriction of the percentage of liquidable assets can also be justified when the secured debt channel is at work. According to Gavazza (2010) a firm does not continuously buy or sell aircraft to adjust its capacity. The decision of buying or selling aircraft has wide inaction ranges due to the high transaction costs involved with it. According to his model, a firm acquires an aircraft only if it has a high enough productivity shock such that it is worth it to adjust its capacity in the long run (rather than adjusting it on the short run using operational leases). One consequence of his model is that getting rid of aircraft is difficult when the firm needs to downsize its fleet. Thus, a firm that acquired aircraft in the past is more vulnerable to adverse shocks because it might be highly indebted and cannot sell their aircraft to adapt its capacity quickly. Yet, in this story, the initial factors that might have lead a firm to the purchase an aircraft are not contemporaneously related with the factors driving the firm into financial distress, which occurs ex post. They cannot be contemporaneous because a firm facing a negative shock (which is the most likely scenario in financial distress) will not be likely to acquire any aircraft. Therefore, the positive relationship that the percentage of liquidable assets and default probability display in our data is likely to be due to the fact that the percentage of liquidable assets was high from a period previous to financial distress and remains high thereafter.

The "buying first with potential distress later" story is consistent with the persistence patterns of the percentage of liquidable assets and default probability that we find in our data. When

[23] When aircrafts are acquired or there is a financial lease contract which implies that by the end of the lease the aircraft will be possessed by the airline, then the aircrafts appear in the airlines' balance sheets. When an airline signs an operational lease, that transaction is off the balance sheet (see Morrell 2007). Therefore, our measure of percentage of liquidable assets is not affected by operational leases which are not generally acknowledged as a cause of financial distress.

running a regression between the percentage of liquidable assets on its lag using firm and time fixed effects as controls, we find that the coefficient of the lag is 0.78, while when doing the same analysis for default probability is just 0.21 (both are statistically significant at the 1%). This implies that the percentage of liquidable assets evolves slowly through time, consistent with Gavazza's research showing inaction bands and with the fact that the distress is much less predictable.[24,25]

While we argue that the percentage of liquidable assets is a good instrument, we conduct an additional set of tests to further allay concerns. In additional tests we substitute out for quantity (total enplaned passengers) in the financial condition equation, and vice versa, and thus "borrow" additional instruments - local income and unemployment and competition - from our demand equation to the financial condition equation. In other words, rather than estimating the financial condition and demand *equations*, we estimate the impact that percentage of liquidable assets, competition, local income and unemployment have, *in equilibrium*, on the firm's financial condition and total enplaned passengers, and these instrumented versions are used in the system of equations. The advantage of this approach is that we can use instruments from an overidentified equation (the demand equation, which has 3 instruments) to increase the number of instruments on other equations (the financial condition equations, which are exactly identified). The drawback of this approach is that we cannot estimate the true equations that describe the demand and financial conditions, but only the impact of exogenous variables on their equilibrium values. As estimating the demand and financial condition equation is not our goal, we do not consider this a major drawback in designing this additional set of tests. [26] Local income is shown to be an additional strong instrument –and predictor- for the default probability and bankruptcy. The main results of the paper are robust to this alternative approach.

[24] This argument does not contradict Eisenfelt and Rampini (2008) who argue that firms in financial distress are the ones that lease more and buy less. Our argument is about how a firm enters into distress. They analyze what happens when the firm is already distressed.

[25] A less obvious channel that could potentially violate the exclusion restriction is the following. An airline could acquire more assets to expand faster to other markets. In this scenario, the percentage of liquidable assets may be correlated with faster market expansion. To the extent that expanding faster reduces the airline's ability to provide high quality it can be argued that the percentage of liquidable assets may have a direct effect on quality. We test for this potential effect and find that even after controlling for revenue growth in the quality and price equations, the effects of instrumented financial distress and bankruptcy on quality and prices were unaltered.

[26] In a simple setting of supply and demand our approach is analogous to run the price and a quantity equations on both supply and demand shifters rather than estimating the demand and supply equations.

4 Results: Multivariate Evidence

Before estimating our simultaneous equation system, we first present some simple regression statistics for quality and pricing. We regress quality and price on quarterly time and firm fixed effects and then examine the residuals of this simple regression for different percentiles of default probability (which is of course not included in the regression). The idea is to see if quality and price exhibit trends that are associated with financial distress after removing quarterly time and firm fixed effects.

Insert Table 4 here

Examining the results in Table 4 we can see that price per mile declines sharply and monotonically with a firm's default probability by quartile. There is an increase in price (yield) in bankruptcy relative to quartile 4, but not back to the levels of the other quartiles. The results for quality show that the inverse of mishandled bags decreases in quartiles 3 and 4 and sharply increases in bankruptcy. On-time performance also shows a sharp increase in bankruptcy relative to previous quartiles. Thus the most striking fact that we find in this table is the sharp *increase* in quality when firms move into bankruptcy. Quality is the highest when firms are in bankruptcy, consistent with firms increasing quality as they try to retain customers and emerge from Chapter 11.

Of course as we noted earlier, financial distress and bankruptcy are endogenous states and are correlated with other exogenous factors. Thus we now turn to examining quality and pricing when controlling for the endogeneity of financial distress and bankruptcy through simultaneous equations regressions. We analyze separately the effect of financial distress and bankruptcy on product quality and prices to avoid imposing any value on the default probability when a firm is in bankruptcy. These results are presented in sections 4.1 and 4.2. In section 4.3, we analyze the different effects of financial distress and bankruptcy at the route level for the only quality measure available at that level of aggregation (on-time performance). Finally, in the appendix, we show the results when a value of zero is imposed on the default probability when the firm is in bankruptcy (a value of 1 when the firm is in bankruptcy would indistinguishable from bankruptcy itself) and the impact of financial distress and bankruptcy are estimated simultaneously on the firm's decision variables.

Before proceeding with the analysis, a subtle distinction needs to be made in the interpretation of the default probability and bankruptcy when they are instrumented. When instrumented, the default probability has to be interpreted as the predicted probability that a firm enters into bankruptcy the next period, while bankruptcy, when instrumented, has to be interpreted as the predicted probability of being in bankruptcy rather than entering into bankruptcy.

4.1 Financial distress

We now examine in a multivariate setup how distress affects firm's quality and pricing (yield) decisions. For quality we examine two different quality supply decisions: mishandled baggage (the inverse of mishandled bags per 1000 customers) and on-time performance. The key variable we use to examine financial distress is Bharath and Shumway naïve probability of default. Table 5 presents results from estimating equations (1a') to (4a').

We estimate the system using three stage least squares (3SLS) to take advantage of the potential error correlation between the sets of equations. We use firm fixed effects to isolate firms' within variation in their pricing and quality strategies. We also use time fixed effects to absorb time-varying shocks that affect all firms' quality and prices and that might be correlated with firm's financial distress. We are able to identify temporary shocks from financial distress because financial distress affects different firms at different points in time. Lastly, we express our constructed variables in logarithms, whenever possible, to be able to interpret our results as elasticities. We use logarithms of price (yield), oil fuel cost price, efficiency and income.[27]

Econometrically we identify the direct effect of financial distress on price and quality by instrumenting price, quantity and the default probability. The instruments that satisfy the exclusion restriction for the price equation are average miles per flight, oil fuel cost and efficiency; for the quantity equation are competition, income and unemployment; and for the default probability is the percentage of liquidable assets. Our tests show that all the instruments but unemployment are strong.

Table 5: The Effect of Distress on Firm Pricing and Firm Quality

Table 5 shows that firms' price and quality are negatively affected by their financial distress as

[27] Some variables like average miles per flight, competition, percentage of liquidable assets, unemployment and decongestion have a straight forward interpretation, so we do not express them in logarithms. We do not express Quantity in logarithms because the within difference in passengers through time is close to zero in logarithms. For instance, the difference between 2 million and 2.01 million passengers is almost zero in logarithms. Finally, our quality measures are already in ratios, so the logarithmic transformation does not provide any further insight.

captured by the default probability. These results are consistent the conflict of interest between equity holders and debt holders that arises in financial distress. These results as a whole are inconsistent with a cash constrained firm being unable to invest in quality as a firm does not need cash to cut prices.

To understand the economic impact of these results we compare the quality and price decisions of a firm with zero default probability with itself when it is highly distressed, with a 60% of default probability. Thus the parameter of default probability has to be multiplied by 0.6 for its interpretation. We select this number because it will allow us to compare our results for financial distress with the later results on bankruptcy, for which sample firms have on average a 60% default probability when they are not in bankruptcy.

According to the estimates reported in Table 5, a firm that has a probability of 60% of going bankrupt next period charges 28.3% less than a healthy firm with zero default probability. The effect on quality is also large. A firm with a 60% probability of defaulting next period decreases the inverse of bags mishandled by 0.058, which represents 0.7 standard deviations, with respect to a firm with zero default probability. Thus financial distress represents a change from the sample mean of 5.8 mishandled bags per 1000 passengers to 7.7 mishandled bags per 1000 passengers. Similarly, a firm with a 60% probability of defaulting next quarter decreases its on-time performance by 0.034 which represents 0.55 standard deviations, with respect to a firm with zero default probability. Assuming that the overall percentage of late flights remains at its sample mean, financial distress represents a change from late flights arriving 52 minutes late, at the sample mean, to 65 minutes late.

The results for our control variables also make economic sense. In the pricing equation, prices are higher when quantity increases, when oil prices are higher and are lower the less congested are the airports in which they operate. Prices also decrease with average miles per flight and with fuel efficiency. Lastly, both measures of quality increase when airports are less congested, but only the effect on baggage handling rate is statistically significant.

In non-reported regressions the estimated coefficient of default probability on price is -4.5 percent when default probability is treated as exogenous. Though this result is statistically significant it is an order of magnitude smaller than the estimated effect when default probability is instrumented.[28]

[28] Lee (2010), treating financial distress as exogenous, found a similar decrease of between 3 to 5% in airline prices in the pre-bankruptcy periods. Her result is in agreement with our non instrumented result.

Not instrumenting financial distress leads to a downward biased coefficients in the estimation of firm product quality. When financial distress is not instrumented its effect on both quality measures is smaller, in absolute value, and looses statistical significance.

Table 6: The Effect of Distress with additional instruments

Table 6 presents the results of additional tests that demonstrate that our previous results are robust to choices of instruments. Table 6 substitutes out for quantity (total enplaned passengers) in the default probability equation thus "borrowing" the additional instruments - local income and unemployment and competition - from our quantity demanded equation. We also substitute out for default probability in the quantity equation. In other words, we are replacing equation (3a') into (4a') and vice versa. Local income in particular is shown to be an additional strong instrument for the default probability and is exogenous to firm-level quality and prices.

We find very similar results to those in Table 5. In columns 1 and 2 of Table 6, we can see that the effect on an increase in default probability is associated with a decrease in firm quality - more bags are mishandled and on-time performance decreases. Column 3 also shows prices also decrease in financial distress.

4.1.1 Financial distress and market share

In this section we explore the effect of financial distress on a firm's market share. If rival firms can perfectly observe the firm's price, and are willing to match the firm's prices for all quantities, then there may be no gain to cutting price for the financially distressed firm even in the short run. However, while prices can be observed, rivals cannot observe the quantity of seats sold at any given price as discussed earlier. Table 7 thus adds a market share equation as an additional equation to the previous system estimated in Table 5. Market share is measured in terms of domestic operating passenger revenue. This market share equation was run in the same system as in Table 5 but presented separately in order to provide the intuition of why prices go down when there is distress: firms increase their market share by cutting their prices.

Table 7: Financial Distress and Market Share

Table 7 shows that prices affect firm market shares negatively. Thus, it is consistent with distressed firms gaining market share in the short run by cutting their prices. In addition the coefficient on default probability is positive and statistically significant at the one-percent level, which means that firms in financial distress gain market share for reasons other than price reductions which may include giving away extra frequent flyer miles, a practice United used while it was in financial troubles, when it gave away triple the regular flight miles.

4.2 Bankruptcy

We now examine the impact on price and quality of Chapter 11 bankruptcy. We compare bankrupt firm-quarters with highly distressed firm-quarters - including both firms that enter bankruptcy, their bankrupt periods and their high distress quarters, and also firms that are highly distressed but do not enter bankruptcy. We estimate a similar set of equations as for the financial distress case, but now we use a bankruptcy indicator rather than the probability of default as the relevant financial condition. Thus we estimate equations (5a') to (8a') using three stages least squares. The results of are presented in Table 8.

Table 8: Quality, Firm Pricing and Endogenous Bankruptcy

Table 8 shows that both of our measures of quality, the inverse of bags mishandled and the on-time performance, increase in bankruptcy relative to the distressed firm-quarters examined (which have a 60% default probability on average). Prices continue to fall in bankruptcy relative to financial distress. Low prices during bankruptcy are consistent with lower short-term cost pressures as interest is deferred via the automatic stay provision when the firm is in bankruptcy.

The percentage of liquidable assets is a strong and significant predictor of bankruptcy even in this small subsample (192 firm-quarter observations). The rationale behind this pattern is the following. Firms on their way to bankruptcy reduce both fixed assets and short term assets. However, firms with a higher proportion of fixed assets find it more difficult to avoid bankruptcy as they cannot generate immediate cash from those assets. Thus, the higher the percentage of fixed, non-liquidable assets a firm has, the lower its chances of avoiding bankruptcy when facing a negative shock.

The effect of instrumented bankruptcy on both quality measures is positive and strongly significant. When a firm goes from financial distress into bankruptcy, it increases the inverse of bags mishandled by 0.082 which represents a one standard deviation increase. Thus bankruptcy represents a change from the estimated 7.7 mishandled bags per 1000 passengers in financial distress to 5.3 mishandled bags per 1000 passengers. Similarly, a firm in bankruptcy increases its on-time performance by 0.037 which represents 0.6 standard deviations, with respect to when it was financially distressed. Thus bankruptcy represents a change from late flights arriving 65 minutes late in financial distress to just 43 minutes late. In sum, firms in bankruptcy actually increase their quality slightly with respect to when they are financially healthy. The intuition is that firms during bankruptcy are trying hard to regain the confidence of consumers and convince the bankruptcy judge that they are viable in the long run. The increased quality is also consistent with the firm investing in its reputation for the future.

We conduct an additional analysis where we explore whether our results are robust to choices of instruments. As in Table 6, we substitute out for quantity (total enplaned passengers) in the bankruptcy equation and we substitute the bankruptcy equation in the quantity equation. This is equivalent to replace equation (7a') into (8a') and vice versa. These results are reported in Table 9.

Table 9: The Effect of Bankruptcy with additional instruments

The results in Table 9 are very similar to those in Table 8. In columns 1 and 2 of Table 9, we can see that bankruptcy is associated with an increase in firm quality.

Overall these results on quality in bankruptcy as compared to quality in financial distress are unique. We show that quality increases in bankruptcy relative to financial distress. Our results that prices fall with financial distress are robust and agree with Borenstein and Rose (1995) and Busse (2002), although our findings suggest a different mechanism by which prices are lower in financial distress than the arguments proposed earlier. Borenstein and Rose (1995) argue that consumers might anticipate the firm's incentive to reduce quality and thus lower their demand, implying a reduction in prices. In our setting even after controlling for firm demand we find that firms reduce price in the presence of financial distress. This mechanism is consistent with firms in financial distress having a higher discount rate which gives firm managers incentives to cut prices in the short run in order to generate cash by stealing market shares from its competitors. This proposed mechanism is similar to Busse (2002) as she also argues that firms in distress cut prices in order to get higher profits in the short run even if this triggers a price war in the future. The difference is that she attributes the short run gains to gaining ticket sales at the expense of future sales while we show they are compatible with stealing market share from competitors.

4.3 Route Level Analysis

Our previous results are conducted at the airline level as this is the level where bankruptcy and financial distress affect firms. Another alternative is to estimate the effects on individual firm routes. The route level analysis has been used recently by Ciliberto and Schenone (2010b) (CS) to analyze bankruptcy. This approach has advantages and disadvantages relative to analysis at the firm level. One advantage of the route-level analysis is that more closely matched bankrupt and non-bankrupt pairs can be obtained. As more data is used in the estimation the precision of the estimates can improve. A second advantage is that at the route level it may be possible to detect how firms alter their product quality in response to financial conditions. For instance, we can explore whether firms that improve product quality in bankruptcy shed problematic routes, improve the quality on the existing routes, or do both.

The route-level analysis, however, has several shortcomings. One disadvantage is that out of the three decision variables that we analyze at the firm level (i.e: quality of mishandled bags, quality of on-time performance and prices) only on-time performance can be analyzed properly at the route level. The BTS does not provide information on mishandled bags at the route level. Additionally, the only information about prices at the route level that the BTS provides comes from a sample of tickets (Databank 1A). This sample is collected at the time the ticket is used, not at the time it is purchased. Thus for a flight operated during financial distress the ticket prices are likely to reflect a combination of distress and pre-distress pricing strategies. Similarly, for a flight operated in bankruptcy the ticket prices are likely to be capturing both distress and bankruptcy pricing strategies. Therefore, there is not a good way of isolating non-distress from distress, and distress from bankruptcy, on prices at the route level.

An additional disadvantage, which is related to the first one, is that by analyzing a single firm decision (on-time performance) we lose statistical power. We lose the benefit of estimating more equations in a system that captures macro-economic shocks which can help in estimating the standard errors more accurately when there is error correlation among the equations.

Most importantly, the advantage of having more data at the route-level may not be relevant for most of our analysis as financial distress and bankruptcy are firm-level phenomena. The errors from the route-level analysis are unlikely to be independent - implying that the advantage of using more observations might disappear when properly clustering standard errors at the firm level.

With the above caveats in mind, we still explore the effects of financial distress and bankruptcy on on-time performance at the route level. The results are presented in Table 10. Panel A of Table 10 presents the results for financial distress and Panel B presents the results for bankruptcy. Columns 1 to 4 use as dependent variable our measure of on time performance at the route level. These columns try to replicate, at the route level, our previous analysis at the firm level. The independent variables are the instrumented financial condition (i.e: default probability or bankruptcy) at the firm level and the instrumented total enplaned passengers at the route level. The instruments are percentage of liquidable assets, oil prices, efficiency, competition, income and unemployment.[29] The estimation procedure is two-stage least squares. In the regressions, we weight observations inversely corresponding to the number of routes each carrier operates in a quarter, in order not to over-represent carriers that operate a large number of routes given bankruptcy and financial distress are firm-level phenomena. Columns 1 and 2 use firm-route fixed effects, so they capture the variation within routes for the same carriers. Columns 3 and 4 use firm-fixed effects, allowing for variation across routes, for the same carrier, on top of the variation across time for each route-carrier. Columns 1 and 3 do not cluster standard errors at the firm level. Columns 2 and 4 cluster the standard errors at the firm level.

The main implications from Panels A and B, column 1, are that our results at the firm level are confirmed at the firm-route level: quality goes down with financial distress, but it goes up in bankruptcy. However, the standard errors increase significantly when errors are corrected by clustering at the firm level (column 2). Financial distress loses statistical significance and bankruptcy is statistically significant only at the 10% level.

The impact of financial distress and bankruptcy on quality are larger, in absolute terms, in column 1 when the estimations capture within route variation for the same firms than in column 3 when the estimations capture within firm variation. This result implies that most of the quality variation that financial conditions explain is attributable to changes in quality within the same routes rather than to variations in quality across routes.[30]

[29] Average miles per flight is not useful to estimate a route-level phenomenon. In addition, decongestion was not included as an independent variable as total emplaned passengers at the route level captures how congested a route is. In addition, this measure did not show any explanatory power on on-time performance at the firm level. Its inclusion does not change the results.

[30] Variation of quality across routes can be due to an airline's introduction or withdrawn of routes that have different quality than the existing ones.

For robustness, we also explore a different variant of on-time performance that was used recently by CS (2010b). In both Panels, columns 5 and 6, we change our dependent variable from on-time performance to the total number of late flights. We also include the total number of flights as explanatory variable just as in CS (2010b). Column 5 replicates CS (2010b), but using our empirical design rather than theirs (i.e: we compare healthy to distressed firms and distress to bankrupt firms, rather than dropping 2 quarters before bankruptcy and just analyzing bankruptcy and we use instruments).[31] Column 6 replicates column 5, but clusters the standard errors by firms.

Column 5 confirms the results from column 1: flights arriving late increase in financial distress, but decrease in bankruptcy. Column 6 shows that at the route level, statistical significance is lost if we cluster at the firm level.

Two conclusions arise from the route-level analysis. First, regardless of the methodology, the route level analysis looses statistical significance when standard errors are not properly clustered at the firm level. Therefore, there it is not an advantage to analyze financial distress and bankruptcy at the route level, given financial distress and bankruptcy are firm-level problems. The additional observations at the route level analysis provides are not independent and identically distributed (i.i.d.). Once this clustering is taken into account the results are not more precise. The more important limitation of using the route level analysis is that at the route level we are unable to use the full system of equations and take advantage of the error correlation between the firm's decision variables.

Second and most importantly, using our methodology (i.e: performing separate analysis for financial distress and bankruptcy, and using instruments), the qualitative conclusions hold at the route level. We are able to confirm our conclusion that firms cut quality in financial distress and increase quality in bankruptcy relative to financial distress. The route-level results for on-time performance confirm our more extensive firm-level analysis that firms cut quality in financial distress and increase quality in bankruptcy relative to financial distress. The results are consistent with firm managers having a short-term focus in financial distress and taking actions (cutting quality and price) that increase their chances of short-term survival at the expense of longer term gains.

[31] Ciliberto and Schenone (2010b) also include the effect on rivals' bankruptcy as explanatory variable. We do not include this variable as it is not the focus of our paper.

5 Conclusions

Our paper examines the impact of financial distress and bankruptcy on airlines' quality and pricing decisions. We show that firms reduce quality and price when faced with financial distress. These findings are consistent with firms facing incentives to take advantage of other stakeholders such as customers when faced with financial distress, as in the model of Maksimovic and Titman (1991). We find different results in bankruptcy. We document that firms *increase* quality relative to pre-bankruptcy financial distress. These findings are consistent with managerial incentives changing in bankruptcy and with firms in Chapter 11 trying to retain customers and invest in reputation in order to emerge as a viable company.

Our results that prices fall with financial distress agree with Borenstein and Rose (1995) and Busse (2002), although our findings suggest a different mechanism by which prices are lower in financial distress than the arguments proposed earlier. Borenstein and Rose (1995) argue that consumers might anticipate the firm's incentive to reduce quality and thus lower their demand, implying a reduction in prices. In our setting even after controlling for firms demand we find that firms reduce price in the presence of financial distress in order to gain market share from competitors. This mechanism is consistent with firms in financial distress having a higher discount rate which gives firm managers incentives to cut prices in the short run in order to generate cash by stealing market shares from its competitors, even though this might imply lower profits in the future due to a potential price war.

The fact that prices fall with measures of default probability also indicates that default is involuntary in our setting and that firms adopt strategies that may allow them to recover. In contrast, previous work on voluntary increases in financial leverage by Chevalier (1995) and Phillips (1995) shows that prices increase with voluntary leverage buyouts (LBOs) and management buyouts (MBOs) in most industries. Phillips (1995) does show that in the gypsum industry there were price cuts following the large increases in leverage. However, in this industry there was entry by a Canadian firm and gypsum firms that undertook leveraged buyouts ended up in involuntary financial distress followed by bankruptcy. Our paper is unique relative to these papers as we focus on product quality and compare supply decisions in both distressed and bankruptcy periods.

Overall our paper shows an important dimension of how a firm's financial condition impacts its real product market decisions and impacts its customers. Our analysis can be extended in several directions. Currently, we do not make a distinction between healthy firms that came out of bankruptcy and firms that never have gone into bankruptcy. Their product market behavior might differ given more apprehension from customers or creditors about the firm's reputation for product quality. Additionally, it would be interesting to extend the analysis to see if there is any interaction between the duration of bankruptcy and a firm's product market behavior. We leave these extensions for future research.

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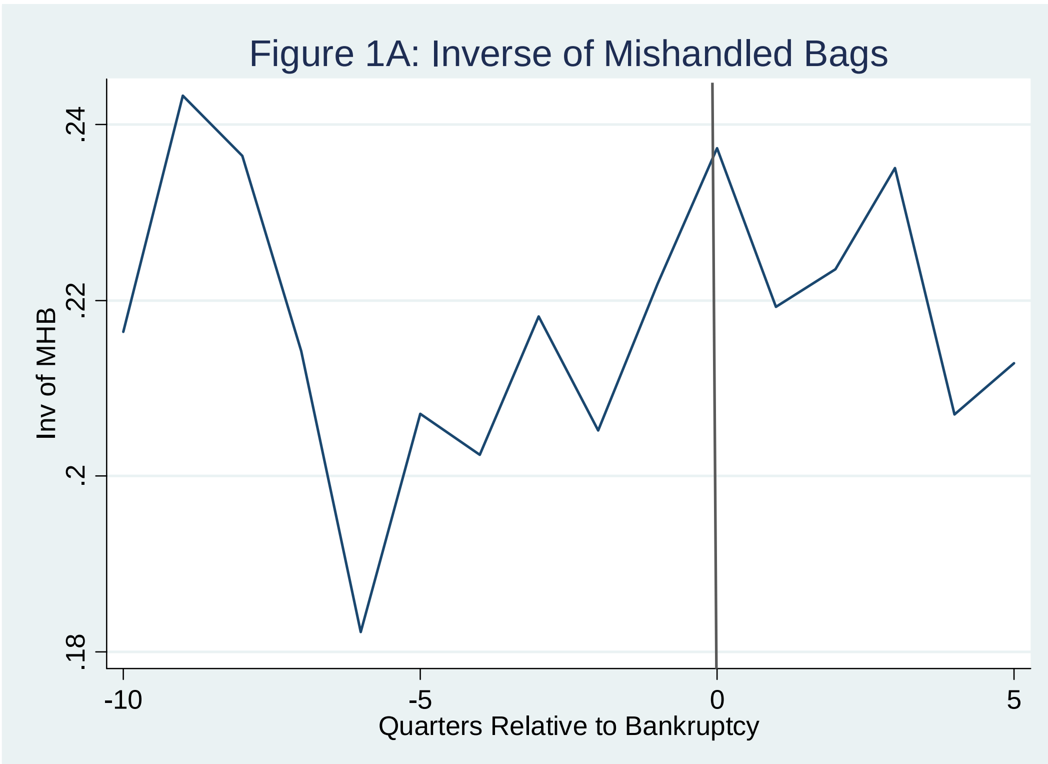
Figures 1A – 1.C

Evolution of Quality and Prices Relative to Bankruptcy

"Quarters relative to Bankruptcy" are the number of quarters before and after a firm enters into bankruptcy. Quarter zero is defined as the quarter when firms enter into bankruptcy, if they do. The mean quality, in terms of inverse of mishandled baggage and on-time performance, and the mean price are plotted for each quarter relative to bankruptcy, for firms that entered into bankruptcy. Figure 1A shows the evolution of the inverse of mishandled bags, figure 1B shows the evolution of on-time performance and figure 1C shows the evolution of prices.



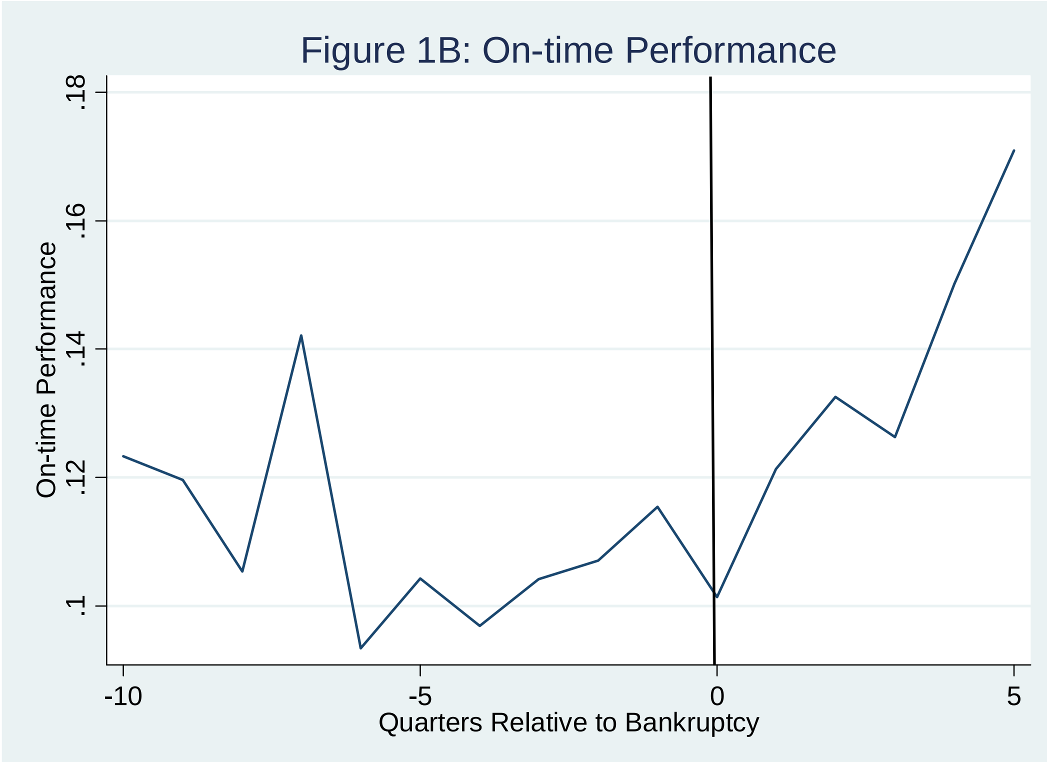


Figure 1B: On-time Performance
On-time Performance
.1
.12
.14
.16
.18
-10
-5
0
5
Quarters Relative to Bankruptcy

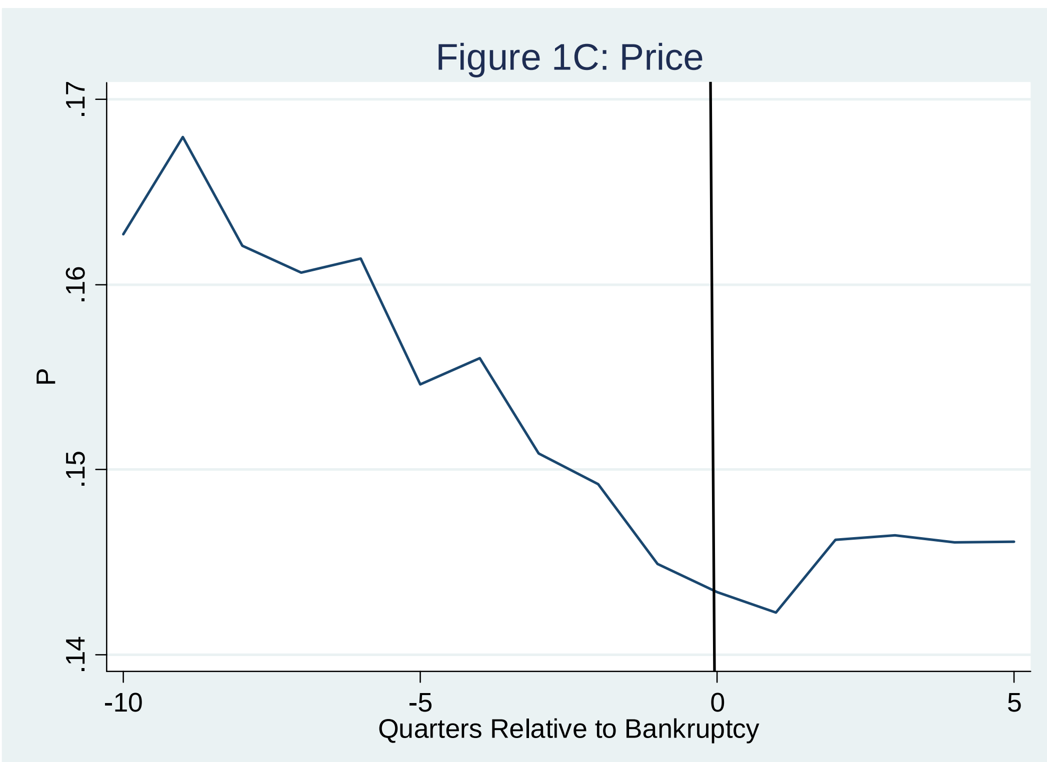


Figure 1C: Price
P
.14
.15
.16
.17
-10
-5
0
5
Quarters Relative to Bankruptcy

Table 1
Carriers and Bankruptcies

The left column of this table presents the names of the 21 carriers that had annual operating revenue greater than US$20 million, had a domestic revenue market share greater than 1% and were publicly traded, for any quarter between the first quarter of 1997 and the fourth quarter of 2008. The middle column shows how many quarters each firm appears in the sample. All 21 firms appear in consecutive quarters. The right hand side column shows how many bankruptcy episodes each carrier has in the sample.

Carrier	**Quarters in the sample**	**Bankruptcy episodes**
ATA Airlines	15	1
Air Tran Airways	23	0
Alaska Airlines	36	0
America West Airlines	36	0
American Airlines	48	0
American Eagle Airlines	31	0
Atlantic Southeast Airlines	23	0
Comair	19	1
Continental Airlines	48	0
Delta Air Lines	48	1
ExpressJet Airlines	22	0
Frontier Airlines	14	1
Hawaiian Airlines	20	1
JetBlue Airways	23	0
Mesa Airlines	11	0
Northwest Airlines	48	1
SkyWest Airlines	23	0
Southwest	48	0
Trans World Airways*	15	0
United Airlines	48	1
US Airways	48	2
Total Airlines: 21	Total firm-quarters: 647	Bankruptcy episodes: 9

*TWA went bankrupt in 2002, but was acquired by American Airlines before that bankruptcy episode.

Table 2
Quality, Price and Firm Financial Situation

This table presents detrended summary statistics surrounding bankruptcy for price (yield) and two measures of quality: Inverse of Mishandled Baggage and On Time Performance. All measures are detrended by regressing each measure against quarterly time and firm fixed effects - thus all statistics omit the each firm's own average and the average for that quarter. The measures below are the resulting residuals of those regressions, scaled by 10,000. The table presents the median, standard deviation and number of observations of these detrended measures are presented according to the different financial situation of the firm-quarter. Only firms that went bankrupt are included in this table. The omitted default category is post-bankruptcy. The inverse of Mishandled Baggage is defined as one divided by the rate of mishandled baggage per 1,000 customers. On time Performance is defined as one divided by "Late", where "Late" is the average flight delay by airlines of their late flights times the percentage of late flights. A flight is considered late it is arrives 15 minutes or later after its schedule arrival time. Price (yield) is defined as Domestic Operating Passenger Revenue divided by Domestic Revenue Passenger Miles, expressed in 2009 US cents. Firms that went bankrupt are categorized according to time periods in reference with their bankruptcy episode(s). The pre-distress period contains all the firm-quarter observations of firms that went bankrupt 5 quarters or more before they filed into bankruptcy. The Distress period contains all the firm-quarter observations of firms that went bankrupt in the 4 quarters before they filed for bankruptcy. Bankruptcy includes the 59 firm-quarter bankruptcy episodes in the sample. In our sample period, only US Airways went bankrupt twice. Significance level (p-value): *<0.1, **<0.05, ***<0.01.

	Pre-distress	Distress	Bankruptcy
Detrended Within Variation			
Quality: Inv. of Mishandled Baggage	29.02	-105.72***	165.53***
	(41.29)	(46.87)	(56.36)
Quality: On time Performance	3.92	-66.069**	16.25
	(24.66)	(30.20)	(58.06)
Price (Yield)	-7.51	-50.873***	-15.07
	(14.38)	(14.62)	(13.89)
N	103	32	59

Table 3

Summary Statistics

This table reports sample statistics for the full sample of all airlines in our sample. We present the 10th percentile, mean, 90th percentile, standard deviation and number of observations for the variables shown in the left column. The data consists of an unbalanced panel of 21 airlines for 48 quarters (1st quarter of 1997 to 4th quarter of 2008). Price (yield) is defined as Domestic Operating Passenger Revenue divided by Domestic Revenue Passenger Miles, expressed in 2009 US cents. Inverse of Mishandled Baggage is defined as one divided by the rate of mishandled baggage per 1,000 customers. On time Performance is defined as one divided by "Late", where "Late" is the average flight delay by airlines of their late flights times the percentage of late flights. A flight is considered late it is arrives 15 minutes or later after its schedule arrival time. Total Enplaned Passengers is the Domestic Total Passenger by segment each airline transports, expressed in millions. Decongestion is average on-time performance by airport excluding the airline's own flights, weighted by the airline's lagged share of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered, expressed in 2009 US dollars. Competition represents the weighted average number of competitors an airline faces across its markets. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. The Default Probability is computed following Bharath and Schumway (2008). The information used to construct this variable comes from Compustat and CRSP. From the 647 observations, 59 of them are bankruptcy firm-quarters, thus we should have 588 Default Probability observations. However, for 9 firm-bankruptcy episodes it was possible to construct the Default Probability measure, as there was enough pre-bankruptcy information within those quarters. Additionally, there was no enough information to construct this measure for 11 non-bankruptcy quarters. Thus, the total number of Default Probability observations is 586. % Liquidable Assets is the fraction of the face value of assets a firm can recover in case of liquidation, constructed following Berger et al (1996).

Variables	**10th Pctile**	**Mean**	**90th Pctile**	**Std. Dev.**	**N**
Quality: Inv. of Mishandled Baggage	0.102	0.209	0.313	0.080	647
Quality: On time Performance	0.062	0.106	0.154	0.061	647
Price (Yield)	106.5	143.5	206.9	45.8	647
Total Enplaned Passengers	2.532	9.501	19.284	6.787	647
Default Probability	0.000	0.138	0.692	0.293	586
Bankruptcy	0.000	0.091	0.000	0.288	647
Decongestion	0.718	0.766	0.815	0.038	647
Average Miles per Flight	487.4	886.5	1225.9	276.4	647
Oil Fuel Cost	70.54	153.31	258.30	81.01	647
Competition	1.224	2.013	2.977	0.693	647
Efficiency	0.411	0.578	0.705	0.115	647
% liquidable assets	0.228	0.34	0.429	0.091	647
Income	72547	79197	85261	4968	647
Unemployment	0.041	0.051	0.062	0.085	647
Market Share	0.014	0.066	0.150	0.050	647

Table 4

Quality and Price Variation with Firm Default Probability

This table examines how quality and price (yield) vary with firm default probability and with bankruptcy. We present mean detrended measures of quality and price for quartiles of Merton's default probability. To detrend the measures, we follow the procedure used in Table II and run separate regressions of Price, Inverse of Mishandled Baggage and On Time Performance on quarterly time and firm fixed effects. The detrended measures are the residuals from these regressions, scaled by 10,000. These measures thus represent the detrended within-firm variation of yield and the 2 measures of quality. The mean, standard deviation and number of observations of these measures are presented by quartile of default probability, for the non-bankrupt firm quarters, and separately for the bankrupt firm-quarters. The total number of observations sums to 636 rather than 647 because there are 11 missing observations of default probability for non-bankrupt firms. Significance level (p-value): *<0.1, **<0.05, ***<0.01.

Quartile of Default Probability	Q 1	Q2	Q3	Q4	Bankrupt
Detrended Within Variation					
Quality: Inv. of Mishandled Baggage	22.07	-5.53	-26.00	-13.74	125.5***
	(29.14)	(34.21)	(27.87)	(29.32)	(56.36)
Quality: On time Performance	4.10	-16.71	18.45	-7.11	57.77
	(20.38)	(26.63)	(23.18)	(21.39)	(58.06)
Price (Yield)	8.92	5.56	1.46	-25.841*	-11.60
	(10.75)	(15.30)	(14.32)	(17.10)	(13.88)
N	147	146	147	137	59

Table 5

Quality and Price with Endogenous Default Probability

This table reports estimated relationships between quality, price (measured by yield) and financial status using three-stages least squares. The five dependent variables: quality: mishandled baggage, quality: on time performance, price, total enplaned passengers and default probability are in columns 1 to 5. Total enplaned passengers, default probability and price are used as right-hand-side variables as well. Decongestion measures the average on-time performance by airport, excluding an airline's own flights, weighted by the airline's lagged share of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Income and unemployment are quarterly for each state and weighted by the airline's share of passengers in that state, lagged one quarter. Competition represents the weighted average number of competitors an airline faces across its markets. % Liquidable Assets is the fraction of the total value of assets a firm can recover in case of liquidation, following Berger et al (1996). Data are quarterly from the first quarter of 1997 to the fourth quarter of 2008. Only non bankrupt observations are considered. All regressions include firm and time fixed effects. Standard errors are in parenthesis. Significance level (p-value): *<0.1, **<0.05, ***<0.01.

Variables	(1) **Quality:Inv. of Mishandled Baggage**	(2) **Quality: On time Performance**	(3) **ln(Price)**	(4) **Total Enplaned Passengers**	(5) **Default Probability**
Default Probability	-0.0979***	-0.0562**	-0.4717***	9.6066***	
	(0.0330)	(0.0259)	(0.0667)	(1.7962)	
Total Enplaned	0.0033*	-0.0018	0.0147***		0.0189**
Passengers	(0.0019)	(0.0015)	(0.0049)		(0.0089)
ln(Price)				-2.3552	-0.4044**
				(2.1830)	(0.1650)
Decongestion	0.4303***	0.0656	-0.6494***	10.9724**	-0.8305*
	(0.0903)	(0.0706)	(0.1917)	(4.9263)	(0.4451)
Average Miles per Flight			-0.0005***		
			(0.0001)		
ln(Oil Fuel Cost)			0.1786***		
			(0.0335)		
ln(Efficiency)			-0.1788***		
			(0.0328)		
Competition				-2.3256***	
				(0.3121)	
ln(Income)				42.7624***	
				(9.6782)	
Unemployment				-7.6814	
				(32.0400)	
% Liquidable Assets					0.3626**
					(0.1579)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
"R-squared"	0.7692	0.7046	0.8717	0.8831	0.5818
N	577	577	577	577	577

Table 6
Endogenous Default Probability with Additional Instruments

This table reports estimated relationships between quality, price (yield) and financial status using three-stages least squares. The five dependent variables: quality: mishandled baggage, quality: on time performance, price, total enplaned passengers and default probability are in columns 1 to 5. In this table, we substitute out for quantity (total enplaned passengers) in the default probability equation in column 5 and thus "borrow" the additional instruments - local income and unemployment and competition - from our quantity demanded equation. We also substitute out for default probability in the quantity regression presented in column 4. Total enplaned passengers, default probability and price are used as right-hand-side variables as well. Decongestion measures the average on-time performance by airport, excluding an airline's own flights, weighted by the airline's lagged share of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Income and unemployment are quarterly for each state and weighted by the airline's share of passengers in that state, lagged one quarter. Competition represents the weighted average number of competitors an airline faces across its markets. % Liquidable Assets is the fraction of the total value of assets a firm can recover in case of liquidation, following Berger et al (1996). Data are quarterly from the first quarter of 1997 to the fourth quarter of 2008. Only non bankrupt observations are considered. All regressions include firm and time fixed effects. Standard errors are in parenthesis. Significance level (p-value): *<0.1, **<0.05, ***<0.01.

	(1)	(2)	(3)	(4)	(5)
Variables	**Quality:Inv. of Mishandled Baggage**	**Quality: On time Performance**	**ln(Price)**	**Total Enplaned Passengers**	**Default Probability**
Default Probability	-0.0673**	-0.0484*	-0.3565***		
	(0.0332)	(0.0260)	(0.0724)		
Total Enplaned	0.0020	-0.0028*	0.0104*		
Passengers	(0.0019)	(0.0015)	(0.0054)		
ln(Price)				-6.9205***	-0.0173
				(1.9002)	(0.1985)
Decongestion	0.4486***	0.0752	-0.5585***	4.8955	-0.7031
	(0.0903)	(0.0706)	(0.1933)	(4.0174)	(0.4403)
Average Miles per Flight			-0.0005***		
			(0.0001)		
ln(Oil Fuel Cost)			0.2268***		
			(0.0355)		
ln(Efficiency)			-0.1801***		
			(0.0349)		
Competition				-2.6487***	0.0128
				(0.2900)	(0.0294)
ln(Income)				46.8060***	-2.5584***
				(9.0505)	(0.8451)
Unemployment				-15.5707	-4.8830*
				(33.1731)	(2.9170)
% Liquidable Assets				1.7292	0.8095***
				(1.7471)	(0.1826)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
"R-squared"	0.7328	0.7281	0.9045	0.972	0.6651
N	577	577	577	577	577

Table 7

Market Share, Default Probability and Prices

This table reports the estimated relationship between market share, default probability and price. The dependent variable is market share, measured as the airline's proportion of Domestic Operating Passenger Revenues in the US market. This equation was estimated in conjunction with the set of equations shown in Table 5 using three stages least squares. Price (yield) is instrumented with Oil Fuel Cost, Efficiency, and Average Miles per Flight and Default Probability is instrumented with the % Liquidable Assets. Decongestion measures the average on-time performance by airport, excluding an airline's own flights, weighted by the airline's lagged share of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Income and unemployment are quarterly for each state and weighted by the airline's share of passengers in that state, lagged one quarter. Competition represents the weighted average number of competitors an airline faces across its markets. % Liquidable Assets is the fraction of the total value of assets a firm can recover in case of liquidation, following Berger et al (1996). Data are quarterly from the first quarter of 1997 to the fourth quarter of 2008. Only non bankrupt observations are considered. All regressions include firm and time fixed effects. Standard errors are in parenthesis. Significance level (p-value): *<0.1, **<0.05, ***<0.01.

Variables	(1) **Market Share**
Default Probability	0.0721***
	(0.0139)
ln(Price)	-0.0276*
	(0.0169)
Decongestion	0.0931**
	(0.0385)
Competition	-0.0132***
	(0.0024)
ln(Income)	0.2593***
	(0.0712)
Unemployment	-0.2258
	(0.2329)
Firm fixed effects	Yes
Time fixed effects	Yes
"R-squared"	0.8746
N	577

Table 8

Quality, Price and Endogenous Bankruptcy

This table reports estimated relationships between quality, price (measured by yield) and financial status three-stages least squares. The five dependent variables: quality: mishandled baggage, quality: on time performance, price, total enplaned passengers and bankruptcy are in columns 1 to 5. Total enplaned passengers, bankruptcy and price are used as right-hand-side variables as well. Decongestion measures the average on-time performance by airport, excluding an airline's own flights, weighted by the airline's lagged share of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Income and unemployment are quarterly for each state and weighted by the airline's share of passengers in that state, lagged one quarter. Competition represents the weighted average number of competitors an airline faces across its markets. % Liquidable Assets is the fraction of the total value of assets a firm can recover in case of liquidation, following Berger et al (1996). Data are quarterly from the first quarter of 1997 to the fourth quarter of 2008. The default state is financial distress without bankruptcy. The sample only considers firm-quarters with a default probability higher than 10% or in bankruptcy. We include firm and time fixed effects in all estimations. Standard errors are in parenthesis. Significance level (p-value): *<0.1, **<0.05, ***<0.01.

Variables	(1) **Quality: Inv. o** **Mishandled** **Baggage**	(2) **Quality:** **On time** **Performance**	(3) **ln(Price)**	(4) **Total** **Enplaned** **Passengers**	(5) **Bankruptcy**
Bankruptcy	0.0819***	0.0370**	-0.0936*	1.0179*	
	(0.0156)	(0.0180)	(0.0492)	(0.5334)	
Total Enplaned	0.0135	-0.0449***	0.0497		-0.0528
Passengers	(0.0102)	(0.0101)	(0.0465)		(0.0862)
ln(Price)				2.0911	-0.4281
				(1.7583)	(0.4567)
Decongestion	0.7451***	0.2921	-1.3564***	12.1019**	-6.3854***
	(0.1793)	(0.2024)	(0.5031)	(5.3737)	(1.2091)
Average Miles per Flight			-0.0003**		
			(0.0001)		
ln(Oil Fuel Cost)			0.2701*		
			(0.1416)		
ln(Efficiency)			-0.6255***		
			(0.2254)		
Competition				0.1133	
				(0.2277)	
ln(Income)				12.6800*	
				(7.5168)	
Unemployment				-24.3447	
				(31.3112)	
% Liquidable Assets					2.0380***
					(0.3219)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
"R-squared"	0.8275	0.4307	0.9246	0.9686	0.7212

Table 9
Endogenous Bankruptcy with Additional Instruments

This table reports estimated relationships between quality, price (measured by yield) and financial status using three-stages least squares. The five dependent variables: quality: mishandled baggage, quality: on time performance, price, total enplaned passengers and bankruptcy are in columns 1 to 5. In this table, we substitute out for quantity (total enplaned passengers) in the bankruptcy equation in column 5 and thus "borrow" the additional instruments - local income and unemployment and competition - from our quantity demanded equation. We also substitute out for bankruptcy in the quantity regression presented in column 4. Total enplaned passengers, default probability and price are used as right-hand-side variables as well. Decongestion measures the average on-time performance by airport, excluding an airline's own flights, weighted by the airline's lagged share of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Income and unemployment are quarterly for each state and weighted by the airline's share of passengers in that state, lagged one quarter. Competition represents the weighted average number of competitors an airline faces across its markets. % Liquidable Assets is the fraction of the total value of assets a firm can recover in case of liquidation, following Berger et al (1996). Data are quarterly from the first quarter of 1997 to the fourth quarter of 2008. Only non bankrupt observations are considered. All regressions include firm and time fixed effects. Standard errors are in parenthesis. Significance level (p-value): *<0.1, **<0.05, ***<0.01.

Variables	(1) Quality: Inv. of Mishandled Baggage	(2) Quality: On time Performance	(3) ln(Price)	(4) Total Enplaned Passengers	(5) Bankruptcy
Bankruptcy	0.0787***	0.0350**	-0.1031**		
	(0.0154)	(0.0168)	(0.0519)		
Total Enplaned	0.0132	-0.0432***	0.0538		
Passengers	(0.0097)	(0.0102)	(0.0511)		
ln(Price)				1.6997	-0.3288
				(1.7063)	(0.5165)
Decongestion	0.7298***	0.2732	-1.3845***	5.3416	-6.4558***
	(0.1771)	(0.1980)	(0.5251)	(4.5393)	(1.1747)
Average Miles per Flight			-0.0004***		
			(0.0002)		
ln(Oil Fuel Cost)			0.3253**		
			(0.1545)		
ln(Efficiency)			-0.5382**		
			(0.2461)		
Competition				-0.0625	-0.1320**
				(0.2162)	(0.0617)
ln(Income)				9.9055	-3.7997*
				(7.5390)	(2.1326)
Unemployment				2.2526	13.6847
				(30.7903)	(8.6361)
% Liquidable Assets				1.5714	1.5593***
				(1.1260)	(0.3052)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
"R-squared"	0.8316	0.4621	0.9182	0.9734	0.7156

Table 10

Route Level Analysis

This table reports estimated relationships between on-time performance and financial status using two-stages least squares. Observations are at the firm-route level. Panel A presents the results for financial distress and Panel B for bankruptcy. Columns 1 to 4 use as dependent variable our previous measure of on-time performance: 1/Late, where Late is the percentage of late flights a route has on a quarter times the average lateness of the late flights. Columns 5 and 6 use as dependent variable the logarithm of total late flights per quarter.. The main independent variable of Panel A is Merton's naïve default probability as constructed by Bharath and Shumway (2008). The main independent variable of Panel B is the bankruptcy dummy. Columns 1 to 6 use total enplaned passengers (TEP) at the route level as an additional explanatory variable. TEP is measured in millions of passengers. Columns 5 and 6 also use the logarithm of total enplaned flights as control variable. Financial conditions and TEP are instrumented by the percentage of liquidable assets, oil prices, efficiency, competition, income and unemployment.

Panel A: Financial distress at the route level.

Variables	(1) On_time	(2) On_time	(3) On_time	(4) On_time	(5) Log(Late Flights)	(6) Log(Late Flights)
Default Probability	-0.0433***	-0.0433	-0.0424***	-0.0424	0.0357***	0.0357
	(0.0110)	(0.0745)	(0.0127)	(0.0792)	(0.0058)	(0.0846)
TEP	5.986***	5.986***	5.339***	5.339***	-1.0739***	-1.0739
	(0.2131)	(1.4601)	(0.1701)	(1.0574)	(0.1129)	(0.7936)
Log(Total Flights)					1.013***	1.013***
					(0.0024)	(0.0107)
Firm Fixed Effects	No	No	Yes	Yes	No	No
Firm-Route Fixed Effects	Yes	Yes	No	No	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Cluster	No	Yes	No	Yes	No	Yes
Route Weights	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.0239	0.0239	0.1333	0.1333	0.5282	0.5282
N	202,233	201,741	202,233	202,233	202,233	201,741

Panel B: Bankruptcy at the route level.

Variables	(1) On_time	(2) On_time	(3) On_time	(4) On_time	(5) Log(Late Flights)	(6) Log(Late Flights)
Bankruptcy	0.0360***	0.0360*	0.0253***	0.0253**	-0.0158***	-0.0158
	(0.0056)	(0.0198)	(0.0059)	(0.0121)	(0.0048)	(0.0243)
TEP	3.146***	3.146	3.956***	3.956**	0.3912	0.3912
	(0.3159)	(2.6392)	(0.2646)	(1.7995)	(0.2741)	(1.1444)
Log(Total Flights)					1.006***	1.006***
					(0.0042)	(0.0150)
Firm Fixed Effects	No	No	Yes	Yes	No	No
Firm-Route Fixed Effects	Yes	Yes	No	No	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Cluster	No	Yes	No	Yes	No	Yes
Route Weights	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.0660	0.0660	0.1966	0.1966	0.6511	0.6511
N	62,259	603,16	62,259	62,259	62,259	60,316

Appendix

Simultaneous Estimation of Financial Distress and Bankruptcy

We analyze the effects of financial distress and bankruptcy simultaneously on firm supply decisions at the firm level. This analysis has efficiency gains, relative to the separate analyses, but it also has two drawbacks. First, we have to impose a value of zero on the default probability when it is not defined. Second, we are no longer able to identify the demand equation since we need to borrow instruments from the demand to identify the separate effects of default probability and bankruptcy.

The probability of default is not defined when the firm is in bankruptcy. Therefore, we set it equal to zero for bankrupt observations. Note we are not explicitly asserting that the firm is not distressed when in bankruptcy, but rather we let the bankruptcy indicator variable probability pick up the full effect of financial distress when the firm is actually in bankruptcy. Ideally, we would use a dummy variable that takes value of 1 when the default probability has a missing value and zero otherwise, rather than just imposing a zero. However, this variable will be perfectly collinear with bankruptcy because when a firm is in bankruptcy its default probability is not defined. The cost of imposing a zero on the default probability when it is undefined -during bankruptcy- will be explained when we present the results.

The system of equations we would like to estimate is the following:

1b. S_{it}=h(Q_{it}, Pr_def$_{it}$, Bankrupt$_{it}$, Y_{it})

2b. P_{it}=g(Q_{it}, Pr_def$_{it}$, Bankrupt$_{it}$, X_{it})

3b. Q_{it}=f(Pr_def$_{it}$, Bankrupt$_{it}$, P_{it}, S_{it}, W_{it})

4b. Pr_def$_{it}$=j(Q_{it}, P_{it}, S_{it}, Z_{it})

5b. Bankrupt$_{it}$=k(Q_{it}, P_{it}, S_{it}, Z_{it})

However, as we only have one instrument in Z, the percentage of liquidable assets, to instrument both financial conditions we have to use instruments from other equations to instrument bankruptcy and default probability. We replace equation (1b) in equations (3b) to (5b) as in the previous analysis, but now we also replace equations (2b) and (3b) into equations (4b) and (5b), equations (4b) and (5b) into equation (3b) and equation (2b) into equation (3b), obtaining the following system:

1b'. S_{it}=h(Q_{it}, Pr_def$_{it}$, Bankrupt$_{it}$, Y_{it})

2b'. P_{it}=g(Q_{it}, Pr_def$_{it}$, Bankrupt$_{it}$, X_{it})

The following three equations for quantity and two financial condition are estimated in terms of exogenous instruments.

3b'. Q_{it}=f(Y_{it}, X_{it}, W_{it}, Z_{it})

4b'. Pr_def$_{it}$=j(Y_{it}, X_{it}, W_{it}, Z_{it})

5b'. Bankrupt$_{it}$=k(Y_{it}, X_{it}, W_{it}, Z_{it})

We have 4 instruments to instrument Q, Pr_def and Bankrupt in the price equation: the percentage of liquidable assets, competition, income and unemployment and we have seven instruments, these same four instruments plus the oil fuel cost, average flights per mile and oil efficiency, to instrument Q, Pr_def and Bankrupt in the quality equation. The cost of this approach is that now we do not estimate the demand and financial condition equations, but only how exogenous variables affect them in equilibrium. This is not an important issue as the estimation of demand and financial condition is not our main goal.

In A1, we present first stage regressions for the three endogenous variables that we use as explicative variables in the supply equations: Total enplaned passengers (quantity), default probability and bankruptcy. The estimated equations correspond to equations (3b'), (4b') and (5b'). Note that in Table A2 below we use the fitted values of these equations, replacing the predicted default probability with a zero when the firms are bankrupt, to estimate the effect of financial distress and bankruptcy on quality and price.

Table A1 goes here

The results in the first column of Table A1 are sensible, showing that quantity increases with income and decreases with unemployment and competition. In column 2, we see that the default probability increases with the percentage of liquidable assets and decreases with income. What may look surprising is that default probability decreases with fuel cost; however, this is due to the subsequent, simultaneous effect that feeds through prices, as prices increase with a firm's fuel cost. Lastly, we see similar effects in column 3 for bankruptcy.

Table A2 presents our second stage regressions for quality and price. These equations correspond to equations (1b') for both measures of quality and (2b') for prices. To incorporate the potential error correlation structure we estimate the three equations simultaneously using seemingly unrelated equations (SURE). To get consistent standard errors we use 50 bootstrap repetitions given that the first and second stage were estimated separately.

Table A2 goes here

The results in Table A2 show that financial distress, as reflected in an increase in the firm's default probability, decreases the provision of quality. This result reinforces the previous result in Table 5. The estimated coefficient on bankruptcy now has to be interpreted relative to a healthy firm. We see firms in bankruptcy increase the quality of their baggage handling and on time performance, but this effect is only statistically significant for baggage handling. The equality of the coefficients of financial distress and bankruptcy is rejected using a t-test at the 5% level of significance. Thus, the results of this estimation method are in agreement with our previous findings: quality decreases with financial distress and increases in bankruptcy relative to financial distress. In addition, we find that quality of baggage handling is higher in bankruptcy than in the pre-distress period, which was also the case in our previous set of results. We cannot asses that on-time performance is higher in bankruptcy than in the pre-distress situation, but at least we can assure it is not lower. This is also consistent with our previous results where the increase in on-time performance quality in bankruptcy relative to the pre-distress situation was modest.

Imposing a zero value for the predicted default probability when the firm is bankrupt is innocuous if we expect a change in supply behavior before and after bankruptcy. But, if the supply behavior of a bankrupt firm follows the same trend it showed during financial distress this procedure is somewhat problematic, as in the case of prices. The predicted default probability and the predicted bankruptcy are highly collinear when there is no value imposition. So, if we expect prices to go down in bankruptcy relative to a distress situation, by setting the default probability equal to zero this method assigns the price reduction to bankruptcy even if it is due to financial distress. Now bankruptcy is the variable that matches best the inverse behavior of prices as predicted bankruptcy stays high in bankruptcy while prices stay low. Default probability, on the other hand does not stay high while in bankruptcy: it is set equal to zero. This explains why in Table A2 we observe that prices are unaffected by default probability while they are negatively affected by bankruptcy.

Table A1

First Stage Regressions for TEP, Default Probability and Bankruptcy

This table reports the first stage regressions of Total Enplaned Passengers (TEP), Default Probability and Bankruptcy on all the exogenous variables available. Decongestion measures the average on-time performance by airport, excluding an airline's own flights, weighted by the airline's lagged share of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Income and unemployment are quarterly for each state and weighted by the airline's share of passengers in that state, lagged one quarter. Competition represents the weighted average number of competitors an airline faces across its markets. % Liquidable Assets is the fraction of the total value of assets a firm can recover in case of liquidation, following Berger et al (1996). Data are quarterly from the first quarter of 1997 to the fourth quarter of 2008. We include firm and time fixed effects in all estimations. Standard errors are in parenthesis. Significance level (p-value): *<0.1, **<0.05, ***<0.01.

	(1)	(2)	(3)
Variables	**Total Enplaned Passengers**	**Deafult Probability**	**Bankruptcy**
Decongestion	4.1140	-0.7845	-2.3065***
	(3.4055)	(0.4796)	(0.5061)
Average Miles per Flight	-0.0035**	-0.0003	-0.0002
	(0.0016)	(0.0002)	(0.0002)
ln(Oil Fuel Cost)	-3.9059***	-0.1821**	-0.0455
	(0.6288)	(0.0774)	(0.0934)
ln(Efficiency)	1.8311**	-0.0731	0.0492
	(0.8777)	(0.1124)	(0.1304)
Competition	-1.9412***	0.0589	0.0530
	(0.2635)	(0.0365)	(0.0392)
ln(Income)	24.6908***	-2.0843**	-2.4048**
	(7.7126)	(1.0325)	(1.1463)
Unemployment	-62.7373**	-5.1595	2.8508
	(31.9349)	(4.2027)	(4.7463)
% Liquidable Assets	0.8212	1.0972***	1.5883***
	(1.3155)	(0.1914)	(0.1955)
Firm fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
R-squared within	0.3273	0.573	0.268
N	647	586	647

Table A2

Second Stage on Quality and Prices

This table estimates a SURE using inverse of mishandled baggage, on-time performance and price (yield) as dependent variables. The variables Total Enplaned Passengers, default probability and bankruptcy are instrumented values obtained from Table VIII. These equations correspond to equations (1b') and (2b') from the text. Decongestion is average on-time performance by airport excluding an airline's own flights, weighted by the airline's lagged number of customers. Oil Fuel Cost is the actual fuel cost per gallon after hedging contracts are considered. Efficiency is defined as ASM (available seats miles) divided by gallons of fuel utilized. Data are quarterly from the first quarter of 1997 to the fourth quarter of 2008. We include firm and time fixed effects in all estimations. Standard errors are in parenthesis. Significance level (p-value): *<0.1, **<0.05, ***<0.01.

Variables	(1) Quality: Inv. of Mishandled Baggage	(2) Quality: On time Performance	(3) ln(Price)
Default Probability	-0.0507***	-0.0341*	0.0132
	(0.0190)	(0.0198)	(0.0309)
Bankruptcy	0.0453***	0.0014	-0.1690***
	(0.0168)	(0.0141)	(0.0459)
Total Enplaned	0.0030**	-0.0015	0.0082*
Passengers	(0.0015)	(0.0019)	(0.0050)
Decongestion	0.4903***	0.0508	-0.5874***
	(0.1072)	(0.1679)	(0.1619)
Average Miles per Flight			-0.0005***
			(0.0001)
ln(Oil Fuel Cost)			0.2155***
			(0.0624)
ln(Efficiency)			-0.2080***
			(0.0435)
Firm fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
"R-squared"	0.8401	0.7707	0.9516
N	647	647	647