# Bankruptcy in international vs domestic markets: Evidence from the airline industry

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# Abstract

We study the effects of Chapter 11 bankruptcy protection on competitive product pricing in both domestic and international markets using data from the airline industry. We find a decline of about 5% in domestic markets and an even more significant drop in international markets. Further, in international markets the competing carriers respond by dropping their prices as well, whereas they slightly increase them domestically. By contrast, existing literature considers only domestic markets finding a more moderate fare drop of about 3% in domestic markets by the bankrupt carrier, with mixed results on the fare drop by competitors.

**JEL classifications:** G33; L13; L93; K2

**Keywords:** Airline industry; Bankruptcy; Chapter 11

# Introduction

Bankruptcy protection under Chapter 11 of the United States Bankruptcy Law is a mechanism that allows firms to organize and restructure. This process has been employed by numerous firms from literally every segment of the US economy, such as the banking and financial sector (Conseco in 2002, Lehman Brothers and Washington Mutual in 2008), the automotive sector (GM and Chrysler in 2009), and the telecommunications sector (WorldCom in 2002). Bankruptcy protection has been criticized as it facilitates reorganization of potentially inefficient firms (Hotchkiss, 1995), and that this reorganization may result with chronic inefficiencies (Jensen, 1991), which can lead to recurring filings for bankruptcy protection, as is the case with the US airline industry—this process has been employed by all major US network carriers in the past.

The prevalence of Chapter 11 and the access to this process has raised concerns that Chapter 11 can be perceived as a form of a subsidy which ultimately distorts the level playing fieldin international markets. This concern has been clearly voiced by the European Union in December 2011, when its delegation to the US-EU Joint Committee—a consensus body that oversees the implementation of the EU-US open skies agreement—expressed its concerns about the competition distorting effects of Chapter 11 in regard to flights under the EU-US open skies agreement. Specifically, they asked whether Chapter 11 had an influence on airline pricing strategies and competition in international markets (European Commission and United States DOT, 2010).[[1]](#footnote-1) Similar, in the debate on the “level playing field”, Emirates responded to the accusations of Delta Air Lines, United Airlines, and American Airlines by claiming that the US carriers were subsidised via the operation of Chapter 11 (Emirates, 2015). The present paper focuses on the pricing behaviour of bankrupt carriers protected under Chapter 11 and their competitors. The broader question if whether Chapter 11 does involve a subsidy, and if so, does it distort competition, is a matter for further research (see Bock et al., 2018).

While existing literature considers markets where all firms are subject to the same legal framework namely, they all have access to the bankruptcy protection process—quite surprisingly, little is known about the effect in international markets where firms might have varying degrees of access to bankruptcy protection. Hence, it is instructive to understand whether bankruptcy protection results with a pricing behaviour in international markets that is different than the outcomes that have been observed in US domestic markets, as in the latter all competing firms have access to the rather lenient process of Chapter 11, whereas in the former only US firms can take advantage of this option.

Existing studies (Borenstein and Rose, 1995; Barla and Koo, 1999; Ciliberto and Schenone, 2012a) reveal that carriers decrease their prices by about 2%-3% upon entering bankruptcy protection. The reactions by the competing carriers are less clear. According to Borenstein and Rose (1995), competing carriers first respond by dropping their fares by 2%, but this is offset over time as their fares ultimately increase by 1% above the pre-bankruptcy level. Barla and Koo (1999) find that competing carriers drop prices by about 4%, whereas Ciliberto and Schenone (2012a) do not find any evidence for a fare response by competitors. It shall be noted that the aggressive pricing may start even before the firm enters bankruptcy protection. Phillips and Sertsios (2013) show that firms’ decisions under financial distress might differ than those under bankruptcy. Accordingly, firms might start their aggressive pricing already under financial distress in order to gain market share, although this may spark a price war in the future. The impact of bankruptcy protection lingers also in the post-bankruptcy period. Zhang (2010) finds that when firms emerge from bankruptcy protection, this had a negative impact on their competitors, who then suffer from worsening financial performance and exhibit negative post-emergence long-term equity returns. Hence, there is ample evidence that the bankruptcy protection process influences the entire industry during bankruptcy protection as well as once the bankrupt firm emerges from protection.

Since all earlier contributions that study the effect Chapter 11 on pricing are carried out in the context of US domestic markets only, the insights and conclusions cannot be immediately applied to international markets. As stated above, international markets differ from domestic markets in several different dimensions (e.g., in regard to access to Chapter 11, the regulatory framework and the competitive situation). Accordingly, this work extends the scope to analyse the influence of Chapter 11 on prices in the European-US aviation markets as well, thereby revealing potential differences in pricing between these two market types: US domestic flights vs transatlantic flights.

To carry out the empirical analysis, we use monthly airfare data obtained from a global distribution system covering US domestic flights and European-US flights between 2009 and 2015. Our econometric approach is similar to that of Barla and Koo (1999) and Ciliberto and Schenone (2012a). A log-linear fixed-effects model is used to assess bankruptcy and post-bankruptcy effects of Chapter 11 on prices of the bankrupt carrier and its competitors.

In line with earlier literature, our results indicate that in US domestic markets the bankrupt carrier decreases prices during the bankruptcy period by about 5% and by additional 2-3% upon emerging from the bankruptcy protection, as compared to the pre-bankruptcy level. By contrast, in European-US markets there is a dramatic fare reduction of about 50% by the bankrupt carrier during the bankruptcy period, followed by a price correction in the post-bankruptcy period, completing a fare reduction of 30%. This is a rather surprising result, as—from the cost argument—one would expect domestic markets to exhibit a more substantial drop than international markets. When US carriers set up operations in Europe, they are subject to local law and regulations. Hence, the cost reduction benefits that come with Chapter 11 do not fully apply to their international operations. The main intuition for this result is the risk faced by passengers that drives fares lower in international markets. In domestic markets, passengers can easily substitute a flight from a bankrupt carrier to another rival carrier (or with other travel modes, when available). Further, with the slot-constrained European airports and due to different training procedures, longer planning, scheduling processes and generally higher load factors in intercontinental flights, competing carriers cannot easily pick up the slack in international markets. Also related is the behaviour of consumers when purchasing flights for trans-Atlantic vs domestic travel. Since travel planning and reservations in trans-Atlantic markets occur much earlier than in domestic markets, passengers demand a larger discount on the fares to compensate for the risk of flying with a carrier under bankruptcy protection. This is an important consideration. Potentially, news relating to the carrier’s financial distressed state start emerging prior to the bankruptcy filing itself whereby the risk associated with the financially distressed carrier increases inducing the carrier to initiate a price war (Busse 2002). Hence, this fare drop in international markets is a process that spans over several months.[[2]](#footnote-2)

Additionally, we find that competitors of bankrupt carriers slightly increase their prices by about 2% in US domestic markets during the bankruptcy period and remain stable thereafter. Interestingly, in the European-US markets, competitors decrease prices during the bankruptcy protection period by 1%, and by about 3% in the post-bankruptcy period as compared to the pre-bankruptcy level. This fare decrease in international markets suggests that competing carriers respond to the price drop of the carrier under bankruptcy protection.

Overall, our results are significant as they clearly quantify the difference in the dynamics between international markets and domestic markets. Namely, they show that the impact of bankruptcy protection is amplified in European-US markets as compared with US domestic markets.

Bankruptcy protection is a process that is not limited to US domestic markets. In Japan, firms under financial stress can apply for court protection from creditors under the Corporation Reorganization Law or under the Civil Rehabilitation Law (Nakata, 2009). Japan Airlines (JAL) has applied for protection on 19 January 2010, in a process that is similar to that available in the US. JAL’s restructuring included shedding off of close to 16,000 positions, retiring of older and less fuel-efficient aircraft, and the elimination of JAP Cargo. These were agreed upon in exchange for ¥300 billion cash injection via the government-backed Enterprise Turnaround Initiative Corporation of Japan.

Our paper also studies the implications of both AA’s and JAL’s bankruptcies in the US-Japan aviation market. The prevailing results reveal consistent qualitative insights. While our data does not include fares in Japanese domestic markets, we still observe and find evidence that in international markets prices drop significantly more than in US domestic markets. Still, the behaviour of prices in US-Japan markets differ than in US-European markets.

This work contributes to a more comprehensive understanding of how Chapter 11 influences pricing strategies in international markets, which have a different competitive environment than US domestic markets. This is especially important from a policy perspective in ensuring a level playing field under open skies agreements between the EU and the US, as under such agreements only the US carriers have access to Chapter 11.

# Chapter 11 and the airline industry

Chapter 11 bankruptcy protection of the United States Bankruptcy Law is a mechanism that allows firms to organize and restructure. It is only available to US firms. Under Chapter 11 protection, the bankrupt firm can implement cost reduction strategies. Filing a Chapter 11 petition also automatically facilitates a stay to recover a claim or to enforce a judgement against the debtor. This procedure prevents creditors from recovering claims against the debtor. The core options available to the debtor include: Renegotiation on prepetition debts; Rejection of executory contracts; Rejection of equipment leases; Modification of the Collective Bargaining Agreements (CBAs); Termination of pension plans; and Modification of retiree benefits. These options can result in significant annual cost savings providing the debtor with a competitive advantage over competitors.

In recent history (since 2000), almost every major network carrier in the US has gone through the Chapter 11 bankruptcy protection process. Each of these carriers had a presence in international markets and hence could have affected the competitive environments in those markets. In each of the cases where the US carriers has filed for Chapter 11, this was done voluntarily, and it can be noticed that no conversion to Chapter 7—where the trustee liquidates the debtor’s assets to pay creditors as the company ends its operations— has ever occurred in those cases.

Possibly, a Chapter 11 filing by one firm has initiated a domino effect that ultimately has affected the entire airline industry in the US. Evidently, once a firm enters bankruptcy protection, it enjoys some advantages not available to other firms in the industry, while facing a detrimental risk of moving into Chapter 7. These influence the ways in which firm, as well as its competitors, behave and set prices. Specifically, the following aspects have been identified by the literature (Borenstein and Rose, 1995; Barla and Koo, 1999; Ciliberto and Schenone, 2012a) as key in affecting pricing decisions by airline carriers during and post bankruptcy protection: (1) The possible cost reductions the airline under Chapter 11 can achieve; (2) A decline in demand for the products of the bankrupt airline due to the negative impact of bankruptcy on the public image of the firm; (3) A focus on short term profit maximization of the bankrupt firm in order to raise cash quickly and avoid liquidation; and (4) Predation strategies by competitors which want to drive the financially weak company under Chapter 11 out of the market. We elaborate on each of these aspects.

Cost reductions: Chapter 11 basically provides bankrupt carriers with six core possibilities to reduce cost during reorganization: renegotiation on prepetition debts, rejection of executory contracts, rejection of aircraft leases, modification of CBA, termination of pension plans and modification of retiree benefits. Cost savings and consequently decreasing marginal costs might lead to lower prices being charged by the bankrupt carrier.

Declining demand: Carriers under Chapter 11 may face a declining demand for their products because of the negative impact the bankruptcy has on the public image of the company. Customers may fear that the bankrupt carrier might not be able to survive and accordingly they switch their loyalty to another carrier. Further, a major concern of many loyal customers is their earned benefits. Indeed, upon filing for Chapter 11 on November 29, 2011, American Airlines published a statement (on *The Wall Street Journal*) assuring its customers that the frequent flyer program will be fully maintained and all miles and elite status earned are secure. This highlights the fact that that bankrupt airlines are aware of the fact that consumers are worried about their frequent flyer benefits in the case of an airline bankruptcy. The possibly of declining demand might lead to significant price cuts of bankrupt carriers in order to achieve required load factors and avoid losing market share.

Short term focus: The fear of a possible liquidation might lead to a focus of the bankrupt carrier on short term profit maximization in order to raise cash (as crises reduce the likelihood of the carrier generating any earning in the future). This change in pricing policy might be different for different competitive situations. With respect to aviation markets, this effect might be influenced by the presence of airline alliances. In this respect, domestic and international markets differ. The North Atlantic market, for example, is dominated by three major airline alliances. The presence of these alliances gives rise to potential tacit collusion, and revenue sharing, which lessens competitive rivalry, is permitted in some international markets, though not US domestic markets. Tacit collusion exists if firms accomplish collusion indirectly, as they learn from experience how competitors will behave in the market. If firms which charge lower prices than the average market price are punished by competitors by even stronger price cuts tacit collusion is the likely outcome (Baye, 2010). If the financial distress is severe or demand declines massively, a focus on short term profit maximization might lead the respective carrier to the conclusion that deviating from the collusive status-quo by charging lower prices is favourable even in regard to the future punishment which is likely to follow.

Predation strategies: The presence of a bankrupt airline in a market might also lead to predation by competitors. Predation is only economically rational if the future profits without the respective competitor offset the initial losses. If predation plays a role in regard to market competition and Chapter 11 bankruptcy is present, significant price drops by competitors of the bankrupt firm will be observable.

Another possible point that could affect pricing behaviour under Chapter 11 is addressed by Ciliberto and Schenone (2012b), who point out that Chapter 11 or financial distress in general could be linked to the product quality of an airline (cancellations, delays and average aircraft age). They find that Chapter 11 does not lead to decreased product quality in the airline industry and therefore changes in product quality put no additional downward pressure on prices of the bankrupt carrier. Borenstein and Rose (1995) consider another possible link between financial distress and pricing behaviour. They state that bankruptcy could alter the strategic position of the bankrupt carrier by lifting or introducing company internal constraints through changing managerial decisions committing a carrier to more, or less, aggressive competition.

In this paper, due to limitation of data availability (see Section 3), we consider primarily the bankruptcy protection of American Airline, henceforth AA, as it operates both domestic markets as well as international markets. AA filed for Chapter 11 on November 29, 2011, and emerged after 741 days in December, 2013, after merging with US Airways Group (McGrath, 2013). Our data also include two domestic bankruptcies: Pinnacle Airlines and Mesa Air. The duration of AA’s bankruptcy protection is in line with previously observed bankruptcies in the US airline industry which ranged between five months to more than three years. AA was evidently aware of the perils that entering a Chapter 11 entails, as the firm has clearly declared less than two months before entering bankruptcy protection that it is “certainly not our goal or preference”.

While every other major legacy carrier in the US had already filed for Chapter 11 at least once since 2001 (following 9/11), AA was presumably at a disadvantage in the late 2000s as its major competitors had reduced their debts and renegotiated labour related contracts during bankruptcy, leaving them with a lower cost base. Indeed, AA’s Turnaround Plan in 2003-2007 resulted with the industry’s largest non-labour cost reductions (estimated to $4 billion of annual savings), along with a negotiated $1.8 billion voluntary labour cost savings during this period. In spite of this, AA’s competitors have achieved higher labour cost savings via Chapter 11, which essentially leaves AA with a labour cost disadvantage (Aviation Economics, 2008).

The point was echoed by the CEO of AA in 2012, as he was announcing the firm’s plan to save $2 billion annually, including $1.25 billion in labour costs (Carey & Nicas, 2012). This plan resulted with $1.1 billion labour cost saving annually, through new CBAs and freezing of pension plans, along with $450 million of annual savings due to renegotiated leasing contracts for aircrafts and executory contracts.

On December 9, 2013, AA emerged from bankruptcy after merging with US Airways. Prior to the merger, the two airlines had only a dozen overlapping routes out of the combined 900 routes (Mouawad, 2013), with none of these 12 overlaps occurring in international markets. US Airways shareholders received 28% of the shares of the new airline whereas the parent company of American Airlines received 72%. The merged airline was better positioned to compete with the other two network carriers, United Airlines and Delta Air Lines, both of which have gone through bankruptcies and mergers in the previous decade (ibid.). All creditors experienced a 100% recovery rate (partly in equity of the new company), and equity holders even earned profits (Lynagh et al., 2013). For further discussion of the merger and its approval by the Justice Department, see DePamphilis (2015).

In our robustness analysis we also include Japan Airline’s bankruptcy. While similar to the process in the US, there are still differences between the two countries. For example, in Japan the government can inject money to support the reorganization (through the Enterprise Turnaround Initiative Corporation of Japan) and even provide load guarantees. Yet, despite the differences, it is valuable to highlight how two bankruptcies influence pricing behaviour in the international markets. This is carried out later in §‎6.4.

# Data description

To empirically estimate the effects of Chapter 11 on market competition in the Europe-US market Global Distribution System (GDS) data obtained from a major provider (Sabre AirVision) were used. GDSs facilitate transactions between providers of travel services (airlines) and travel agencies. GDSs can provide extensive information on travel itineraries. The data obtained are for an on-leg basis for US domestic flights as well as flights between North America and Europe. The data include information on average fares and airline passenger share on the respective routes on a monthly basis, and the great circle distance between the origin and destination airports. Data obtained were for the 2009-2015 period. Accordingly, the unit of observation is a carrier-route-year-month combination. In the scope of this work a route is defined as a non-stop airport-to-airport trip.

Thin markets could have a distortive effect on the analysis because of different competitive situations in contrast to larger markets. Therefore, the analysis includes only the densest routes which cover 50% of the total traffic based on passenger numbers in 2012 in domestic and international markets, respectively. To test for the robustness of the results, 25% and 75% cut-offs are discussed in §‎‎6.1, and in the appendix we consider a threshold based on passenger volume, rather than percentage-based.

AA operated in 34 of the 86 Europe-US routes during bankruptcy, and in 32 after emerging from Chapter 11. In US domestic markets AA operated during bankruptcy in 165 of the 688 routes in the sample, and in 180 after emerging from Chapter 11 protection.[[3]](#footnote-3)

Apart from AA’s bankruptcy, our data contains additional bankruptcies. Specifically, Pinnacle Airlines which was under bankruptcy protection between April 2012 and May 2013, and operated in 41 of the 688 domestic routes in the sample during bankruptcy and in 24 after emerging from Chapter 11. Furthermore, Mesa Air that was under such protection between January 2010 and March 2011, operated in 52 of the 688 domestic routes in the bankruptcy period and in 46 after emerging. We also obtained data that covers the Japan Airlines bankruptcy (January 2010 – March 2011), as a robustness check (§‎6.4). Japan Airlines operated in 12 of the 14 US-Japan routes during bankruptcy and in 11 after emerging from bankruptcy protection. However, as we only have the US-Japan data without the Japanese domestic data we are unable to compare the change in fares in the international market to that in the domestic Japanese market. Hence, we include this analysis only in the robustness checks.

Carriers that do not provide service on a specific route on a regular basis could distort the results of the analysis. Nevertheless, they could appear in the dataset because of, e.g., rerouting (airport closure, weather situations, etc.). Therefore, airlines with a passenger share of less than 5% on a specific route within the corresponding month are excluded from the analysis. Barla and Koo (1999) use a similar cleaning and drop observations for airlines with a market share of less than 3%. Ciliberto and Schenone (2012a) use a different cleaning method according to which they drop observations for airlines with less than one departure every week in one direction.

The GDS fares obtained are weighted monthly averages. This means that the average fares were calculated by taking into account the different fare classes and the number of tickets available in the respective class. Hence, the average fares may reflect not only in the levels of fares at the different fare classes, but also a change in the allocation of seats to the various fare classes.

Fares were normalized by dividing with the respective route distance to take into account possible distorting effects of different leg distances within either domestic or international markets. For the US domestic data and the Europe-US international data, respectively, observations with fares in the bottom and top 5 percentile in their month were dropped to control for outliers. Ciliberto and Schenone (2012a) also exclude observations with fares in the bottom and top 5 percentile, however related to a yearly interval.

# General Effects of Chapter 11 on Prices

The following specification is used to estimate the overall effects of a Chapter 11 filing on airlines’ prices. This estimation implicitly assumes that the effects in domestic and international markets are identical. We isolate the effects on the bankrupt airline’s prices from the competing airlines’ prices and we further differentiate the effect during the bankruptcy protection from that after the bankruptcy protection.

Following Ciliberto and Schenone (2012a), while adding controls for competition intensity and differentiating between domestic and international markets, we have

|  |  |
| --- | --- |
|  | (1) |

where is the average fare per kilometre for a flight of carrier c on route r at time t; is a dummy variable that indicates whether the airline is bankrupt or not. Specifically, it equals to 1 if the carrier is bankrupt and operates on route r at time t; similarly, is a dummy variable for a competitor which is serving the same market as the bankrupt airline. Specifically, it equals to 1 if a competitor is bankrupt and operates on route r at time t. Thus, the coefficient measures the current effect of a Chapter 11 filing on the bankrupt carrier’s price charged on route r at time t, whereas the current effect of bankruptcy on the competitors’ prices is measured by ; in a similar fashion, and , are post-bankruptcy dummy variables and their coefficients, and , measure the post-bankruptcy effects (within the defined post-bankruptcy period of one year after the official emergence from Chapter 11) on the bankrupt carrier and on its competitors.

The variable represents the Herfindahl-Hirschman index(HHI) on route r at time t. It is defined as the sum of the squared (passenger-based) market shares and can range from 0 to 1. As the value increase and approaches 1 it indicates a higher degree of concentration on the respective route, with 1 essentially reflecting a monopoly. The coefficient therefore measures the effect of concentration on .[[4]](#footnote-4)

Although we do not distinguish, at this stage, between the effects of bankruptcy in domestic and international markets, we still account for potential inherent differences between these two types of markets. We let the dummy variable equal to 1 if the respective observation is an international flight between the Europe and the US, and 0 otherwise (i.e., if it is a US domestic flight). Thus, captures fundamental differences between international and domestic flights as reflected in the normalized fares levels.[[5]](#footnote-5)

is a route-carrier fixed effect measuring unobserved heterogeneity. Ciliberto and Schenone (2012a) argue that including route-carrier fixed effects instead of just carrier and route fixed effects is important in regard to empirical analysis in the airline industry. They state, among others, the following example to support their argumentation: “[…] a carrier flying on a certain time schedule might benefit business travel in some markets but not in others, affecting the price behaviour of that carrier in those markets, but not in others”. Furthermore, Gerardi and Shapiro (2007) made similar conclusions.

Seasonal demand changes and [exogenous](http://www.dict.cc/englisch-deutsch/exogenous.html) system-wide effects (e.g., changes in fuel prices), year-month fixed effects are captured by the variable . The variable is an idiosyncratic error and assumed to be uncorrelated with the explanatory variables.

Another important point to consider in regard to the empirical analysis is the pre-bankruptcy performance of bankrupt firms’ prices and competitors’ prices. Firms filing for Chapter 11 have been usually already operating under financial distress for a certain time period. During this time period the financially distressed company might try, by all means, to avoid bankruptcy and, therefore, focus on short term profit maximization, for example, by cutting prices in order to steal market share from competitors. At the same time, competitors might establish predation strategies even before the financial troubled carrier files for Chapter 11 in order to weaken the distressed carrier even further. These points could lead to significant price drops prior to the actual filing for Chapter 11. Hence, comparing the average prices during bankruptcy to the pre-bankruptcy values, might distort the results, if the pre-bankruptcy prices are artificial low. To address this issue, we also test estimations where we eliminate from the analysis the observations from the three months prior to the Chapter 11 filing date.

Another important point is the possible endogeneity of the Chapter 11 process itself. Decreasing prices in the pre-bankruptcy period might have caused the Chapter 11 filing. Therefore, reversed causality might be a factor concerning the pre-bankruptcy performance of bankrupt airlines. While filing for bankruptcy protection is potentially endogenous, in their study of seven Chapter 11 filings, Ciliberto and Schenone (2012a) suggest that this does not seem to be significant in practice and hence they conclude that the estimated coefficients are not biased.

The estimation results of Equation (1) are provided in Table 1, including fixed effects and mixed effects models. The mixed effects models enable estimation of the coefficient of INT, which is invariant over time. The results are robust across the four different models and indicate that the prices of the bankrupt carrier are lower both during the bankruptcy protection as well as after emerging from bankruptcy as compared to the pre-bankruptcy period. The prices of the competitors are slightly higher during and after the bankruptcy. Further, as expected, the coefficient of the HHI, , is positive and indicates that more concentrated markets have higher prices per kilometre than less concentrated markets, whereas the negative coefficient of the INT variable, , confirms that prices per kilometre are lower in international markets than in domestic markets (Holloway, 2008).

Table 1: Effects of Chapter 11 filings on prices (dependent variable ln ), routes covering 50% of total traffic, pooled US and Europe-US markets

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | -0.060\*\*\* | -0.058\*\*\* | -0.074\*\*\* | -0.056\*\*\* | -0.060\*\*\* |
|  | (0.003) | (0.002) | (0.003) | (0.003) | (0.003) |
|  | 0.017\*\*\* | 0.014\*\*\* | 0.015\*\*\* | 0.017\*\*\* | 0.018\*\*\* |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
|  | -0.080\*\*\* | -0.076\*\*\* | -0.093\*\*\* | -0.066\*\*\* | -0.080\*\*\* |
|  | (0.003) | (0.003) | (0.004) | (0.003) | (0.003) |
|  | 0.006\*\*\* | 0.003\* | 0.010\*\*\* | 0.016\*\*\* | 0.006\*\*\* |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
|  | 0.157\*\*\* | 0.156\*\*\* | 0.136\*\*\* | 0.167\*\*\* | 0.151\*\*\* |
|  | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
|  |  |  |  |  | -0.227\*\*\* |
|  |  |  |  |  | (0.02) |
| Observations | 128,146 | 132,867 | 128,350 | 128,146 | 128,357 |
| Route-carrier FE | YES | YES | NO | YES | YES |
| Route and carrier FE | NO | NO | YES | NO | NO |
| Year-month FE† (84 FE) | YES | YES | YES | NO | YES |
| Year and month FE | NO | NO | NO | YES | NO |
| 3 month prior excluded | YES | NO | YES | YES | YES |
| Within R-squared/LL | 0.0168 | 0.0159 | 0.0147 | 0.0144 | 80554 |

Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

† Note, when the 3 months prior to bankruptcy are excluded (resp., included) there are 81 (resp., 84) year-month fixed effects. LL stands for Log Likelihood.

Estimation (1) includes route-carrier and year-month fixed effects and furthermore excludes observations three months prior to the Chapter 11 filing to address the issue of possible price reductions in the pre-bankruptcy period by the bankrupt carrier. The coefficient indicates a 5.8% price drop of the bankrupt carrier while being under Chapter 11 protection.[[6]](#footnote-6) Estimation (2) does not exclude observations three month prior to the Chapter 11 filing. In the three months prior to entering bankruptcy protection, prices might decrease and, hence, including these observations could lead to a less pronounced price decrease during the bankruptcy period. However, we do not find evidence for that as the coefficient indicates a similar drop in prices by the bankrupt carrier. Estimations (3) and (4) consider further variations—replacing the route-carrier fixed effects with separate route and carrier fixed effects (estimation 3) and replacing the year-month fixed effects with separate year and month fixed effects. Estimation (5) provides an example of a mixed effects regression that allows us to estimate the value of INT.

Quite consistently, we find that during Chapter 11 protection the bankrupt carrier lowers its prices by about 6-7% across all estimations. In the post-bankruptcy period the prices of the bankrupt carrier drop by an additional 1-2 percentage points compared to the in-bankruptcy period.

Competitors increase their prices by about 1.5-2% in all estimations. However, in the post-bankruptcy period competitors’ prices return to their pre-bankruptcy levels, overall reflecting an increase of up to 1% compared to the pre-bankruptcy period.

These results are partially in line with the findings of Ciliberto and Schenone (2012a), who investigated Chapter 11 bankruptcies in US domestic markets between 1992 and 2007. Specifically, they find that bankrupt airlines drop prices by 3% while under bankruptcy protection, which is in line with the estimated 6-7% drop we depict in Table 1. This difference could be driven by the fact that we integrate international markets. To that end, in the next section we differentiate between domestic and international markets. Further, they notice an increase by 4% in prices by the bankrupt carriers after emerging from Chapter 11 compared to the pre-bankruptcy period. By contrast, our results suggest a further price drop in the post-bankruptcy period of 1-2%. Hence, with regard to pricing of bankrupt carriers, despite the fact that both analyses were conducted over different time spans and including different markets (domestic versus domestic and international) the results are rather consistent. However, with respect to competing carriers, their results show no evidence of significant price changes by the bankrupt airline’s competitors in either period. Our analysis reveals that competitors do take advantage of their counterpart bankruptcy state and increase their prices during the bankruptcy status.

# Do bankruptcies exhibit different pricing behaviour in International and US Domestic Markets?

To assess the differences in pricing realizations of bankrupt airlines and their competitors between domestic and international markets, we consider the following specification:

|  |  |
| --- | --- |
|  | (2) |

Notice that the four bankruptcy dummy variables from Equation (1) are now replaced by eight such variables in Equation (2) as the during and post-bankruptcy effects of bankruptcy effecting the bankrupt carrier and its competitors now further distinguish between US domestic and international markets. These new terms are defined as interaction terms, that is, ,, , and .

The estimation results are provided in Table 2. As in §‎4, four different fixed effects estimation specifications are considered, along with a mixed effects estimation, all in all providing consistent and robust results. The estimations clearly reveal that in US domestic markets the prices of the bankrupt carrier are lower during bankruptcy as well as during the post-bankruptcy period. However, in the Europe-US market there is a strong price reduction during the bankruptcy period, followed by a price correction upon emergence from bankruptcy; yet post-bankruptcy prices of the bankrupt carrier are still dramatically lower compared with pre-bankruptcy prices. As discussed below, there is a magnitude difference in the price drop between US domestic and trans-Atlantic markets while the carrier is under bankruptcy protection. With respect to the bankrupt carrier’s competitors, their prices slightly increase in US domestic markets during the bankruptcy period, remaining stable thereafter, whereas in the Europe-US market their prices decrease during the bankruptcy period as well as in the post-bankruptcy period, but not as pronounced as for the bankrupt carrier itself.

Table 2: Effects of Chapter 11 filings on prices in US domestic and international markets (dependent variable ln ), routes covering 50% of total traffic

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | -0.048\*\*\* | -0.047\*\*\* | -0.063\*\*\* | -0.044\*\*\* | -0.048\*\*\* |
|  | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
|  | 0.022\*\*\* | 0.020\*\*\* | 0.026\*\*\* | 0.021\*\*\* | 0.022\*\*\* |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
|  | -0.066\*\*\* | -0.064\*\*\* | -0.080\*\*\* | -0.052\*\*\* | -0.067\*\*\* |
|  | (0.003) | (0.003) | (0.004) | (0.003) | (0.003) |
|  | 0.015\*\*\* | 0.013\*\*\* | 0.025\*\*\* | 0.025\*\*\* | 0.015\*\*\* |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
|  | -0.476\*\*\* | -0.463\*\*\* | -0.411\*\*\* | -0.477\*\*\* | -0.475\*\*\* |
|  | (0.016) | (0.016) | (0.018) | (0.017) | (0.016) |
|  | -0.026\*\*\* | -0.033\*\*\* | -0.075\*\*\* | -0.019\*\*\* | -0.027\*\*\* |
|  | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
|  | -0.346\*\*\* | -0.332\*\*\* | -0.334\*\*\* | -0.346\*\*\* | -0.346\*\*\* |
|  | (0.016) | (0.016) | (0.018) | (0.017) | (0.016) |
|  | -0.049\*\*\* | -0.057\*\*\* | -0.100\*\*\* | -0.051\*\*\* | -0.049\*\*\* |
|  | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
|  | 0.161\*\*\* | 0.160\*\*\* | 0.140\*\*\* | 0.171\*\*\* | 0.154\*\*\* |
|  | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
|  |  |  |  |  | -0.213\*\*\* |
|  |  |  |  |  | (0.02) |
| Observations | 128,146 | 132,867 | 128,350 | 128,146 | 128,357 |
| Within R-squared/LL | 0.027 | 0.0256 | 0.0235 | 0.0238 | 81206 |

Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the four estimation models are defined in Table 1.

Estimation (1) from Table 2 shows that in US domestic markets the bankrupt carrier decreases prices during bankruptcy by 4.7%, followed by a further decrease of 2.7 percentage points in the post-bankruptcy period compared to the in-bankruptcy period. The competitors increase prices by around 2% in the in-bankruptcy period with no further major price changes in the post-bankruptcy period.

In the Europe-US market the bankrupt carrier cuts prices by a whopping drop of 50% during the in-bankruptcy period (this is due to the summation of and ) and manage to correct some of the price drop by raising the prices such that a drop of about 30% is experienced in the post-bankruptcy period compared with the pre-bankruptcy prices, as indicated by and . Interestingly, competitors marginally decrease prices by around 1% in the in-bankruptcy period and by 3% in the post-bankruptcy period compared to the pre-bankruptcy level. This behaviour is diametrically opposite to the behaviour in domestic markets.

Illustrating these results, we consider two sample examples of international markets LHR- JFK and CDG-MIA which are provided in Figure 1 and Figure 2, respectively. One can observe how the average fare by AA has dropped from an average of about 15 cents per km prior to bankruptcy to about 7 cents per km. However, this drop in fares has started about a year prior to bankruptcy. A similar picture emerges from the CDG-MIA market where AA’s dropped from a level of about 8 cents per km to about 5 cents. Presumably, early indicators were in place that have signalled the potential customers about the risk faced with flying AA. Indeed, the stock price has been steadily plummeting since the end of 2010. This is in line with Busse (2002) suggesting that the deteriorating financial condition of AA has induced it to initiate a price war.[[7]](#footnote-7) Clearly, not all markets exhibit such a drop in fares as, in general, we do not observe uniform behaviour in markets due to the multiple other factors in place.



Figure 1. Monthly fares in the LHR-JFK market; Notes: AA = American Airlines, BA = British Airways, DL = Delta Air Lines, VS = Virgin Atlantic; Vertical lines indicate bankruptcy period.



Figure 2. Monthly fares in the CDG-MIA market; Notes: AA = American Airlines, AF = Air France; 8 fare observations of the seasonal XL Airways are not plotted[[8]](#footnote-8); Vertical lines indicate bankruptcy period.

*Considering domestic markets,* we find that many markets do not exhibit a visible fare drop upon bankruptcy (or financial distress). When a fare drop is highly visible, we notice, again, that it starts prior to the actual bankruptcy announcement. This is illustrated in Figure 3 for the JAF-LAX market.



Figure 3. Monthly fares in the JFK-LAX market; Notes: AA = American Airlines, B6 = Jetblue Airways, DL = Delta Air Lines, UA = United Airlines, VX = Virgin America; 22 fare observations of QF (Qantas Airways) are not plotted; Vertical lines indicate bankruptcy period.

An important insight is that although directionally the effect of bankruptcy in international markets may be consistent with some of the results from domestic markets, the magnitude of these effects can vary dramatically. Specifically, price adjustments in international markets are, in general, of a higher magnitude than in US domestic markets.

These insights are important highlighting a key difference between domestic and international markets. In domestic markets, the effects of bankruptcy are quite limited in terms of price impact. In international markets the effects are dramatic. This can be driven by the nature of competition in domestic versus international markets. In domestic markets, consumers can wait until very close to the departure and observe the financial recovery strength of the bankruptcy carrier and, hence, the reduction in fares of the bankrupt carriers is rather limited, while, at the same time, the competing carriers can charge some premium for the benefit of flying with them. In international markets the effect is dramatically different. Consumers generally plan their travels well in advance and flying with a bankrupt carrier imposes a significant amount of risk to bear. As such, the bankrupt carrier drops its prices to attract passengers. The competing carriers cannot completely ignore this fare reduction and need to respond with some comparative measures. Another potential difference between US domestic markets and intercontinental markets is asymmetric information. Namely, since the bankrupt carrier is American, it is very possible that European passengers possess less information regarding the bankrupt carrier than their US counterparts.[[9]](#footnote-9)

To evaluate the results presented in Table 2, it is useful to contrast them with existing econometric studies in regard to Chapter 11 effects on pricing behaviour. Three papers have explored the effects of Chapter 11 focusing on US domestic markets. Ciliberto and Schenone (2012a) find that bankrupt airlines’ prices in US domestic markets drop by 3% while under bankruptcy protection and increase by 4% after emerging. They do not find evidence of significant price changes by the bankrupt airline’s competitors in either period. Their investigation is based on bankruptcies in the US airline industry between 1992 and 2007. Barla and Koo (1999) conduct a similar investigation over a period from 1987 to 1993. Their research shows that the competitors of bankrupt airlines also change their prices, in most of the cases to an even higher degree than the bankrupt airline itself. This could be an indication of predation strategies. Borenstein and Rose (1995) also analyse 1987 to 1993 US domestic data. Their results indicate that the bankrupt carriers lower their prices in the pre-bankruptcy and in-bankruptcy period but their competitors do not change prices in either period. The different results of Barla and Koo (1999) and Borenstein and Rose (1995) for the same time period can be partially explained by the fact that Borenstein and Rose include a large number of smaller markets which show different behaviour (Barla and Koo, 1999).

In general, there is no indication of predation because price changes by competitors are of a smaller magnitude than price changes of the bankrupt carrier itself. In both market types, prices of bankrupt carriers are lower during bankruptcy compared to the pre-bankruptcy level. However, the price drop prior bankruptcy can only be found in international markets, as discussed earlier.

To conclude, despite the difference time spans considered by the existing studies and despite the difference in their results, two common insights are consistent which are also relevant for this work: Bankrupt carriers lower their prices during bankruptcy, and competitors respond to these price drops differently in domestic and in international markets.

Our results also bear insights on the ongoing discussion on the claimed distorting effects imposed by US bankruptcy rules. The observation that price changes are significantly different in international markets as compared to domestic markets may suggest a distortion in the competitive environment due to bankruptcy protection. Certainly Ch 11 has an impact. Had the bankrupt carrier been actually forced to liquidate and exit the market, the remaining competing carriers would have not been in a situation where they had to drop prices. On the contrary, most likely they would have been able to raise prices above and beyond those observed in domestic markets. This suggests that the asymmetric bankruptcy protection rules, especially in international markets, may have an impact on markets- whether it is a distortive effect is a matter of debate (Bock et al, 2018).

# Robustness checks

We carry out four types of robustness checks. The first relates to the threshold values used for market selection (§‎6.1) and the length of the panel under consideration (§‎6.2). The second studies sensitivity to inclusion of certain variables. The third relates to the importance of alliance membership in competitive markets (§‎6.4). The last integrates the bankruptcy of Japan Airlines (§‎6.5).

## Thin and Thick Markets

First, we explore the sensitivity of our estimation results to the exclusion of thinner and thicker markets. Because of possible distortive effects of very thin markets, in the analysis so far we have considered only the routes which cover 50% of the total traffic in domestic and international markets respectively. In this section we consider an even tighter threshold where we limit the attention to the densest routes which cover 25% of the total traffic in domestic and international markets, respectively. We also consider estimations where we relax this threshold to include routes that encompass 75% of the total traffic in domestic and international markets, respectively. These estimations support the overall insight that international markets exhibit stronger price responses to a Chapter 11 filing than domestic markets.

AA operated in 47 (resp., 14) of the 213 (resp., 23) Europe-US routes during bankruptcy, and in 41 (resp., 12) after emerging from Chapter 11. In US domestic markets AA operated during bankruptcy in 275 (resp., 88) of the 1676 (resp., 243) routes in the sample, and in 285 (resp., 94) after emerging from Chapter 11 protection in the 75% (resp., 25%) threshold. Pinnacle Airlines operated in 189 (resp., 7) of the 1676 (resp., 243) domestic routes in the sample during bankruptcy and in 143 (resp., 5) after emerging from Chapter 11 in the 75% (resp., 25%) threshold. Lastly, Mesa Air operated in 157 (resp., 23) of the 1676 (resp., 243) domestic routes in the bankruptcy period and in 140 (resp., 22) after emerging in the 75% (resp., 25%) threshold.

In Table 3 we present estimations for markets covering 25% of traffic to explore the impact of bankruptcy in the thickest markets. Generally, we find consistent results. However, it appears that in these very thick markets the response of the competitors is rather mute in international markets as we do not find any significance of the corresponding terms ( and ).

Table 3. Effects of Chapter 11 filings on prices in US domestic and international markets (dependent variable ln Pcrt), routes covering 25% of total traffic

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | -0.037\*\*\* | -0.037\*\*\* | -0.060\*\*\* | -0.033\*\*\* | -0.038\*\*\* |
|  | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
|  | 0.021\*\*\* | 0.020\*\*\* | 0.025\*\*\* | 0.023\*\*\* | 0.021\*\*\* |
|  | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
|  | -0.073\*\*\* | -0.070\*\*\* | -0.091\*\*\* | -0.058\*\*\* | -0.074\*\*\* |
|  | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
|  | 0.003 | 0.002 | 0.014\*\*\* | 0.014\*\*\* | 0.002 |
|  | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
|  | -0.539\*\*\* | -0.533\*\*\* | -0.442\*\*\* | -0.541\*\*\* | -0.538\*\*\* |
|  | (0.021) | (0.021) | (0.024) | (0.022) | (0.021) |
|  | 0.001 | -0.008 | -0.049\*\*\* | 0.006 | 0.002 |
|  | (0.006) | (0.006) | (0.007) | (0.007) | (0.006) |
|  | -0.438\*\*\* | -0.425\*\*\* | -0.398\*\*\* | -0.440\*\*\* | -0.437\*\*\* |
|  | (0.022) | (0.022) | (0.025) | (0.023) | (0.022) |
|  | 0.001 | -0.008 | -0.048\*\*\* | -0.002 | 0.003 |
|  | (0.006) | (0.006) | (0.007) | (0.007) | (0.006) |
|  | 0.184\*\*\* | 0.181\*\*\* | 0.161\*\*\* | 0.201\*\*\* | 0.171\*\*\* |
|  | (0.011) | (0.011) | (0.012) | (0.011) | (0.011) |
|  |  |  |  |  | -0.144\*\*\* |
|  |  |  |  |  | (0.036) |
| Observations | 51,871 | 53,724 | 51,947 | 51,871 | 51,949 |
| Within R-squared/LL | 0.0373 | 0.0348 | 0.0270 | 0.0325 | 33437 |

Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the four estimation models are defined in Table 1.

Proceeding with thinner markets, in Table 4 we present estimations for markets covering 75% of traffic to explore the impact of bankruptcy in the thickest markets. Those additional markets do not qualitatively change the insights derived in §‎5.

Table 4. Effects of Chapter 11 filings on prices in US domestic and international markets (dependent variable ln Pcrt), routes covering 75% of total traffic

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | -0.042\*\*\* | -0.042\*\*\* | -0.049\*\*\* | -0.042\*\*\* | -0.042\*\*\* |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
|  | 0.011\*\*\* | 0.010\*\*\* | 0.011\*\*\* | 0.005\*\*\* | 0.011\*\*\* |
|  | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
|  | -0.049\*\*\* | -0.046\*\*\* | -0.056\*\*\* | -0.035\*\*\* | -0.049\*\*\* |
|  | (0.002) | (0.002) | (0.003) | (0.002) | (0.002) |
|  | 0.011\*\*\* | 0.014\*\*\* | 0.011\*\*\* | 0.025\*\*\* | 0.010\*\*\* |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
|  | -0.486\*\*\* | -0.480\*\*\* | -0.427\*\*\* | -0.486\*\*\* | -0.485\*\*\* |
|  | (0.019) | (0.019) | (0.020) | (0.020) | (0.019) |
|  | -0.031\*\*\* | -0.038\*\*\* | -0.077\*\*\* | -0.018\*\*\* | -0.031\*\*\* |
|  | (0.004) | (0.004) | (0.005) | (0.004) | (0.004) |
|  | -0.362\*\*\* | -0.353\*\*\* | -0.357\*\*\* | -0.363\*\*\* | -0.362\*\*\* |
|  | (0.017) | (0.017) | (0.018) | (0.018) | (0.017) |
|  | -0.070\*\*\* | -0.080\*\*\* | -0.115\*\*\* | -0.075\*\*\* | -0.068\*\*\* |
|  | (0.004) | (0.004) | (0.005) | (0.005) | (0.004) |
|  | 0.086\*\*\* | 0.085\*\*\* | 0.082\*\*\* | 0.093\*\*\* | 0.079\*\*\* |
|  | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
|  |  |  |  |  | -0.371\*\*\* |
|  |  |  |  |  | (0.016) |
| Observations | 281,889 | 292,616 | 282,475 | 281,889 | 282,490 |
| Within R-squared/LL | 0.0120 | 0.0115 | 0.0118 | 0.0110 | 161300 |

Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the four estimation models are defined in Table 1.

## Different horizons

In this subsection we restrict our analysis to the duration of the bankruptcy of AA while incorporating only one year before and after the bankruptcy. That is, in this section we have truncated the horizon to include a time frame beginning one year before AA declared bankruptcy (November 2010) until one year after AA emerged from Chapter 11 (October 2014). This is done in order to limit the price effects to compare them with the immediate year prior to bankruptcy and avoid comparisons with long-term behavior of prices in domestic and international markets.

The results provided in Table 5 reveals a consistent message. Qualitatively, the directional results are consistent, although the magnitude change is different. The most significant difference from earlier estimations is that in international markets the bankrupt carrier drops prices by about 17% during bankruptcy whereas the competitors adjust their prices down by about 3%. This can be compared with the effect in domestic markets: 3% drop by the bankrupt carrier during bankruptcy (compared with 3% drop in domestic markets) and less than a half percent drop by the competitors

This reveals that in international markets the effect is not merely due to the financial distress of the airline, which begins much earlier than the bankruptcy declaration. Even when limiting the time frame, we observe that we still depict a significant drop in international markets that by far exceeds that in domestic markets.

Table 5: Effects of Chapter 11 filings on prices in US domestic and international markets (dependent variable ln ), routes covering 50% of total traffic

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | -0.031\*\*\* | -0.032\*\*\* | -0.024\*\*\* | -0.022\*\*\* | -0.032\*\*\* |
|  | (0.003) | (0.003) | (0.004) | (0.003) | (0.003) |
|  | -0.004\* | -0.004\* | -0.007\*\*\* | -0.000 | -0.003 |
|  | (0.002) | (0.002) | (0.003) | (0.002) | (0.002) |
|  | -0.060\*\*\* | -0.059\*\*\* | -0.053\*\*\* | -0.049\*\*\* | -0.061\*\*\* |
|  | (0.004) | (0.003) | (0.004) | (0.004) | (0.004) |
|  | -0.003 | -0.003 | -0.006\*\* | 0.011\*\*\* | -0.002 |
|  | (0.003) | (0.002) | (0.003) | (0.003) | (0.003) |
|  | -0.154\*\*\* | -0.127\*\*\* | -0.287\*\*\* | -0.178\*\*\* | -0.159\*\*\* |
|  | (0.019) | (0.018) | (0.016) | (0.020) | (0.019) |
|  | -0.030\*\*\* | -0.048\*\*\* | -0.011\* | -0.028\*\*\* | -0.031\*\*\* |
|  | (0.006) | (0.005) | (0.007) | (0.006) | (0.006) |
|  | -0.110\*\*\* | -0.082\*\*\* | -0.232\*\*\* | -0.140\*\*\* | -0.116\*\*\* |
|  | (0.023) | (0.022) | (0.020) | (0.024) | (0.023) |
|  | -0.043\*\*\* | -0.062\*\*\* | -0.024\*\*\* | -0.053\*\*\* | -0.044\*\*\* |
|  | (0.007) | (0.006) | (0.008) | (0.007) | (0.007) |
|  | 0.164\*\*\* | 0.157\*\*\* | 0.149\*\*\* | 0.164\*\*\* | 0.154\*\*\* |
|  | (0.007) | (0.007) | (0.008) | (0.008) | (0.007) |
|  |  |  |  |  | -0.218\*\*\* |
|  |  |  |  |  | (0.023) |
| Observations | 68,430 | 73,149 | 68,610 | 68,430 | 68,621 |
| Within R-squared/LL | 0.0146 | 0.0149 | 0.0144 | 0.0126 | 53935 |

Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the four estimation models are defined in Table 1.

## Alternative formulations

Similar to Zou et al. (2012), in this subsection we run reduced form equations without the variables that may be endogenously determined. Specifically, we execute the estimations without HHI and with an alternative to HHI.

We first report the estimations without HHI in Table 6. These clearly reveal no significant difference from the results reported earlier in Table 2 in §‎5.

Table 6: Effects of Chapter 11 filings on prices in US domestic and international markets (dependent variable ln ), routes covering 50% of total traffic

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | -0.052\*\*\* | -0.051\*\*\* | -0.066\*\*\* | -0.048\*\*\* | -0.052\*\*\* |
|  | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
|  | 0.017\*\*\* | 0.015\*\*\* | 0.020\*\*\* | 0.016\*\*\* | 0.017\*\*\* |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
|  | -0.073\*\*\* | -0.070\*\*\* | -0.085\*\*\* | -0.059\*\*\* | -0.073\*\*\* |
|  | (0.003) | (0.003) | (0.004) | (0.003) | (0.003) |
|  | 0.008\*\*\* | 0.008\*\*\* | 0.018\*\*\* | 0.018\*\*\* | 0.009\*\*\* |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
|  | -0.472\*\*\* | -0.459\*\*\* | -0.410\*\*\* | -0.473\*\*\* | -0.472\*\*\* |
|  | (0.016) | (0.016) | (0.018) | (0.017) | (0.016) |
|  | -0.021\*\*\* | -0.028\*\*\* | -0.071\*\*\* | -0.014\*\*\* | -0.022\*\*\* |
|  | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
|  | -0.344\*\*\* | -0.330\*\*\* | -0.332\*\*\* | -0.344\*\*\* | -0.345\*\*\* |
|  | (0.016) | (0.016) | (0.018) | (0.017) | (0.016) |
|  | -0.043\*\*\* | -0.051\*\*\* | -0.094\*\*\* | -0.045\*\*\* | -0.043\*\*\* |
|  | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
|  |  |  |  |  | -0.216\*\*\* |
|  |  |  |  |  | (0.020) |
| Observations | 128,146 | 132,867 | 128,350 | 128,146 | 128,357 |
| Within R-squared/LL | 0.0193 | 0.0180 | 0.0182 | 0.0159 | 80742 |

Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the four estimation models are defined in Table 1.

Next, we carry out estimations where we replace HHI with the carrier’s market share in the corresponding market-month combination. These are reported in Table 7. Again, these estimations do not reveal any major departure from the insights derived thus far.

Table 7: Effects of Chapter 11 filings on prices in US domestic and international markets (dependent variable ln ), routes covering 50% of total traffic

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | -0.051\*\*\* | -0.050\*\*\* | -0.066\*\*\* | -0.047\*\*\* | -0.051\*\*\* |
|  | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
|  | 0.018\*\*\* | 0.017\*\*\* | 0.024\*\*\* | 0.017\*\*\* | 0.019\*\*\* |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
|  | -0.071\*\*\* | -0.068\*\*\* | -0.084\*\*\* | -0.057\*\*\* | -0.071\*\*\* |
|  | (0.003) | (0.003) | (0.004) | (0.003) | (0.003) |
|  | 0.010\*\*\* | 0.009\*\*\* | 0.022\*\*\* | 0.020\*\*\* | 0.010\*\*\* |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
|  | -0.469\*\*\* | -0.457\*\*\* | -0.401\*\*\* | -0.470\*\*\* | -0.469\*\*\* |
|  | (0.016) | (0.016) | (0.018) | (0.017) | (0.016) |
|  | -0.022\*\*\* | -0.029\*\*\* | -0.071\*\*\* | -0.015\*\*\* | -0.023\*\*\* |
|  | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
|  | -0.345\*\*\* | -0.330\*\*\* | -0.333\*\*\* | -0.344\*\*\* | -0.345\*\*\* |
|  | (0.016) | (0.016) | (0.018) | (0.017) | (0.016) |
|  | -0.043\*\*\* | -0.051\*\*\* | -0.095\*\*\* | -0.045\*\*\* | -0.043\*\*\* |
|  | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
|  | 0.073\*\*\* | 0.071\*\*\* | 0.109\*\*\* | 0.076\*\*\* | 0.068\*\*\* |
|  | (0.005) | (0.005) | (0.002) | (0.005) | (0.005) |
|  |  |  |  |  | -0.222\*\*\* |
|  |  |  |  |  | (0.020) |
| Observations | 128,146 | 132,867 | 128,350 | 128,146 | 128,357 |
| Within R-squared/LL | 0.0212 | 0.0197 | 0.0348 | 0.0177 | 80848 |

Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the four estimation models are defined in Table 1.

## US-Japan market

Japan Airlines bankruptcy covered the period between January 2010 and March 2011. This allows us to explore the robustness of our results in international markets. Incorporating the US-Japan markets in our analysis revealed a combined fare decrease of about 20% in international markets by the bankrupt carrier, a drop which increases to a cumulative of about 30% in post-bankruptcy period (Table 8). The competing carriers in international markets drop their fares as well in both bankruptcy and post-bankruptcy periods.

The change in magnitude suggests different effects in US-EU and US-Japan markets. This necessitates a closer look at those two different markets. To that end, we introduce a set of interaction terms between the bankruptcy variables and a dummy for US-Japan markets. The result of this estimation is provided in column 5. Indeed, in those two international market types the magnitude drop in prices by the bankrupt and competing carriers differ quite a bit. Noticing that the coefficient of is 0.383 which almost eradicates the fare drop implied by , which equals -0.475. That is, while in US-EU markets the bankrupt carrier drops prices by about 40%, in US-Japan the drop shrinks to about 13% (=1-exp(-0.050-0.475+0.383)). Interestingly, in US-Japan the competing carriers increase their fares (by about 5%). Overall, it suggests that different dynamics are in place for the different international markets. It could be driven by the fact that Japan offers a similar bankruptcy protection process or that in our specific timeframe this market has experienced consecutive bankruptcies by JAL and AA or that both belong to the same alliance (Oneworld).

Table 8: Effects of Chapter 11 filings on prices in US domestic, US-EU and US-Japan markets (dependent variable ln ), routes covering 50% of total traffic

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | -0.049\*\*\* | -0.048\*\*\* | -0.062\*\*\* | -0.045\*\*\* | -0.050\*\*\* |
|  | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
|  | 0.021\*\*\* | 0.020\*\*\* | 0.023\*\*\* | 0.020\*\*\* | 0.021\*\*\* |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
|  | -0.066\*\*\* | -0.063\*\*\* | -0.077\*\*\* | -0.052\*\*\* | -0.067\*\*\* |
|  | (0.003) | (0.003) | (0.004) | (0.003) | (0.003) |
|  | 0.017\*\*\* | 0.015\*\*\* | 0.025\*\*\* | 0.027\*\*\* | 0.016\*\*\* |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
|  | -0.215\*\*\* | -0.211\*\*\* | -0.206\*\*\* | -0.226\*\*\* | -0.475\*\*\* |
|  | (0.009) | (0.009) | (0.010) | (0.009) | (0.016) |
|  | -0.009\*\* | -0.015\*\*\* | -0.039\*\*\* | -0.008\* | -0.026\*\*\* |
|  | (0.004) | (0.004) | (0.004) | (0.004) | (0.005) |
|  | -0.234\*\*\* | -0.212\*\*\* | -0.234\*\*\* | -0.227\*\*\* | -0.346\*\*\* |
|  | (0.011) | (0.010) | (0.012) | (0.011) | (0.016) |
|  | -0.037\*\*\* | -0.039\*\*\* | -0.069\*\*\* | -0.037\*\*\* | -0.049\*\*\* |
|  | (0.004) | (0.004) | (0.004) | (0.004) | (0.005) |
|  |  |  |  |  | 0.383\*\*\* |
|  |  |  |  |  | (0.019) |
|  |  |  |  |  | 0.055\*\*\* |
|  |  |  |  |  | (0.007) |
|  |  |  |  |  | 0.205\*\*\* |
|  |  |  |  |  | (0.021) |
|  |  |  |  |  | 0.044\*\*\* |
|  |  |  |  |  | (0.007) |
|  | 0.161\*\*\* | 0.160\*\*\* | 0.143\*\*\* | 0.170\*\*\* | 0.161\*\*\* |
|  | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| Observations | 131,679 | 136,516 | 131,880 | 131,679 | 131,679 |
| Within R-squared/LL | 0.0263 | 0.0246 | 0.0224 | 0.0233 | 0.0302 |

Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Estimation models 1-4 are defined in Table 1, Estimation 5 is similar to Estimation 1 with the addition of the Japan variables.

## Alliance membership

In airline markets, primarily due to international ownership restrictions, airlines often sign horizontal agreements with other carriers to facilitate transfer of passengers between carriers to expand the reach and scope of their networks. While fundamentally these agreements are at the bilateral level, over time such agreements have evolved into multi-lateral arrangements, known as alliances (see review by Douglas and Tan, 2017). There are three primary alliances operated by full service carriers and often carriers within the same alliance will serve parallel routes. While legally those agreements cannot serve as an instrument to coordinate fares, the mere notion that carriers collaborate on certain operational aspects of the business, implicitly diminishes the degree of rivalry between them. At the time of AA’s Chapter 11 bankruptcy, it was in a joint venture with British Airways and Iberia (Ustaomer et al., 2015). This joint venture involved, amongst other aspects, revenue sharing, which would have lessened the competitive rivalry between the partners.

Taking into account Oneworld alliance membership, the degree of concentration in the various international markets increases. Accordingly, it worth exploring whether alliance membership affects price responses due to bankruptcy. Specifically, we ask whether alliance members adjust their prices differently than non-alliance competitors. To that end, we reformulate (2) to capture the effects of the alliance membership. Separating the responses by members of the same alliance, and , from the responses of other carriers, and ,we consider the following specification:

|  |  |
| --- | --- |
|  | (3) |

In Table 9 we estimate (3) following the same variations as before. The key results persist. The main difference that emerges, is that by separating the responses of the alliance members from the non-alliance competitors, we observe that alliance members seem to be not adjusting their fares when their counterpart goes into bankruptcy, while upon emergence from bankruptcy their pricing behaviour is in line with the other competitors.

Table 9: Effects of Chapter 11 filings on prices in US domestic and international markets (dependent variable ln ), routes covering 50% of total traffic

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | -0.048\*\*\* | -0.047\*\*\* | -0.063\*\*\* | -0.044\*\*\* | -0.032\*\*\* |
|  | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
|  | 0.022\*\*\* | 0.020\*\*\* | 0.025\*\*\* | 0.021\*\*\* | -0.003 |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
|  | -0.066\*\*\* | -0.064\*\*\* | -0.080\*\*\* | -0.052\*\*\* | -0.061\*\*\* |
|  | (0.003) | (0.003) | (0.004) | (0.003) | (0.004) |
|  | 0.015\*\*\* | 0.013\*\*\* | 0.025\*\*\* | 0.025\*\*\* | -0.002 |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.003) |
|  | -0.476\*\*\* | -0.463\*\*\* | -0.415\*\*\* | -0.477\*\*\* | -0.159\*\*\* |
|  | (0.016) | (0.016) | (0.018) | (0.017) | (0.019) |
|  | -0.040\*\*\* | -0.048\*\*\* | -0.106\*\*\* | -0.033\*\*\* | -0.054\*\*\* |
|  | (0.005) | (0.005) | (0.006) | (0.006) | (0.007) |
|  | 0.010 | 0.003 | 0.011 | 0.017\*\* | 0.024\*\* |
|  | (0.008) | (0.008) | (0.009) | (0.009) | (0.010) |
|  | -0.346\*\*\* | -0.332\*\*\* | -0.338\*\*\* | -0.346\*\*\* | -0.116\*\*\* |
|  | (0.016) | (0.016) | (0.018) | (0.017) | (0.023) |
|  | -0.051\*\*\* | -0.060\*\*\* | -0.119\*\*\* | -0.054\*\*\* | -0.055\*\*\* |
|  | (0.005) | (0.005) | (0.006) | (0.006) | (0.008) |
|  | -0.045\*\*\* | -0.052\*\*\* | -0.042\*\*\* | -0.048\*\*\* | -0.020\* |
|  | (0.008) | (0.008) | (0.009) | (0.009) | (0.012) |
|  | 0.161\*\*\* | 0.160\*\*\* | 0.140\*\*\* | 0.171\*\*\* | 0.154\*\*\* |
|  | (0.005) | (0.005) | (0.005) | (0.005) | (0.007) |
|  |  |  |  |  | -0.216\*\*\* |
|  |  |  |  |  | (0.023) |
| Observations | 128,146 | 132,867 | 128,350 | 128,146 | 68,621 |
| Within R-squared/LL | 0.0273 | 0.0258 | 0.0247 | 0.0240 | 53960 |

Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the four estimation models are defined in Table 1.

# Conclusions

In this paper, we explore the question of whether the effect of Chapter 11 on airline price behaviour differs between domestic and international markets – to our knowledge this is the first analysis which goes beyond the effects in domestic markets. We examined the influence of Chapter 11 on prices in the Europe-US markets as well as in US domestic markets, thereby revealing potential differences in pricing between these two market types. In general, compared to US domestic markets, the impact of a Chapter 11 filing on prices seems to be more pronounced in international markets. This is indicated by larger magnitudes of the respective price changes.

The empirical investigation of the Chapter 11 effects on fares in international markets compared to US domestic markets reveals several important results: (i) we find that in the Europe-US market a Chapter 11 filing leads to a significant price cut by the bankrupt carrier in the in-bankruptcy period followed by a price correction after emerging from Chapter 11, still resulting with a significantly lower fares prior to the bankruptcy period; (ii) we also find that the competitors’ prices increase in domestic markets during bankruptcy with no further change afterwards, whereas in international markets competitors drop their prices slightly during the bankruptcy period as well as in the post-bankruptcy period.

Existing studies (Ciliberto and Schenone, 2012a; Barla and Koo, 1999; Borenstein and Rose, 1995) on US domestic markets are consistent with the directional results observed in this work. Yet, our analysis reveals the major difference in pricing between domestic and international markets induced by bankruptcies.

There are key elements that relate to airline pricing decisions during and post bankruptcy protection (see section ‎2): (1) Possible cost reductions; (2) A decline in demand; (3) A focus on short term profit maximization; and (4) Predation strategies by competitors. While we do not directly observe the carriers’ cost reductions, we can certainly add the following conclusions: (i) with respect to predation: There is no evidence indicating predation strategies by competitors either in domestic or in international markets; (ii) a focus on short term profit maximization: This seems to exist in the pre-bankruptcy period, but only in international markets. International markets indicate slightly decreasing prices for the bankrupt airline in the three months prior to the bankruptcy filing. However, US domestic markets show even slightly increasing prices in the same period. Therefore, the expected pre-bankruptcy price drop because of a shifting focus on short term profit maximization is, if at all, only slightly present in international markets. Consequently, reversed causality is not a factor in regard to the pre-bankruptcy performance of the bankrupt carrier; (iii) lastly, the effects of declining demand and reduced unit costs cannot be identified separately because controlling for unit costs is not possible. However, the permanent price drop of bankrupt airlines in US domestic markets suggests that the bankrupt carrier effectively reduced its unit costs.

Our analysis was limited due to the scope of available data. For the main test, we analysed the effect of the bankruptcy of American Airlines, which filed for Chapter 11 protection in November 2011, and emerged from it in December 2013. We analysed its behaviour and that of its competitors in domestic and the North American-European market. As a control, we also analysed the effect of the bankruptcy of Japan Airlines, which covered January 2010 until March 2011 – Japan has similar bankruptcy provisions to those of Chapter 11. We found similar results to the North American - Europe case, though the price response was smaller. We also analysed the effect of membership of airline alliances, and note that the alliance members seem not to be adjusting their fares when their counterpart goes into bankruptcy.

In order to derive policy conclusion, the results of our study have to be carefully interpreted. The results certainly do not lead to demand a direct intervention in the market - for example in limiting the air fare decrease to a certain threshold to prevent competing European airlines from 'unfair' competition, because the reduction of airfares of both the Chapter 11 carrier and the EU- carriers increases consumer surplus. In order to create a more balanced level playing field European carriers might interpret the results to demand from policy something similar like a Chapter 11 in order to have the opportunity to restructure and react competitively to US carriers. However, such an interpretation neglects the long run effects of Chapter 11. While our results support the conclusion that in the short run competition is maintained, our results do not provide any evidence on the concern that in the longer run Chapter 11 may sustain chronic inefficiencies.

The presence of Chapter 11 makes it easier for the US carriers to compete on international markets. In this way, it may have a bearing on the “level playing field” issue. However, it is important to recognise that this does *not* come about as a result of government subsidies – there are no mechanisms for the carrier to access government subsidies, even through the termination of pension plans (Bock et al, 2018). Chapter 11 makes it easier for the carrier to end contracts with private sector entities. While it does have an effect on the competitive balance, it is up to other countries to allow their airlines similar advantages. This is the case in Europe (and under certain situations, once off subsidies are permitted).

In conclusion, there is evidence that carriers are affected more by Chapter 11 or equivalent bankruptcy provisions in international markets. There remain several questions for further research. One of these is why this is so- there are several ways in which international markets are different from domestic markets. The effects on cost is another. A further aspect is the effect on service levels. These issues have been explored in the analysis of domestic markets – future research could explore these effects in international markets as well.

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1. Specifically, Item 19 of the U.S.-EU Joint Committee (2011) states that “The European delegation raised American Airlines' recent filing for Chapter 11 bankruptcy and said that it viewed Chapter 11 as a government subsidy and was concerned about the competitive impact of bankruptcy on the trans-Atlantic aviation market. The U.S. delegation responded that it did not consider Chapter 11 bankruptcy to be a government subsidy or support, that no government funds were involved in Chapter 11, and that Chapter 11 had not been shown to distort competition.” [↑](#footnote-ref-1)
2. In a robustness check we restrict the data to eliminate observations more than one year prior to bankruptcy. This results with more moderate fare drop due to bankruptcy. [↑](#footnote-ref-2)
3. In §‎6.1 we provide statistics regarding market participation with the corresponding density cut-offs (i.e., of 25% and 75%). [↑](#footnote-ref-3)
4. The HHI as an explanatory variable raises some concerns about endogeneity because market share is a function of price. However, excluding the HHI from the regression does not significantly influence the results of the different scenarios. [↑](#footnote-ref-4)
5. The core analysis comparing the effects in domestic and international markets is carried out in the next section. In the appendix we also provide estimations where the domestic and international markets are estimated separately, thereby eliminating the variable INT. [↑](#footnote-ref-5)
6. The percentage effect of a unit change of an explanatory variable on in a log-linear model is calculated as follows: 100\*[exp()-1]. Hence, a coefficient of -0.06 implies a drop of 100\*[exp(-0.06)-1]=5.8%. [↑](#footnote-ref-6)
7. We revisit this point in §‎6.2 to verify that our analysis qualitatively holds also when restricted to the period between November 2010 (one year prior to bankruptcy) and October 2014 (one year past emergence). [↑](#footnote-ref-7)
8. Those flights were operated in the summers of 2013-2015. [↑](#footnote-ref-8)
9. We thank the anonymous referee for suggesting this mechanism for explaining the pricing difference between the two market types. [↑](#footnote-ref-9)