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Domestic Market Power in the International Airline Industry

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Abstract

We posit and empirically test the hypothesis that airlines are able to charge a fare premium in markets that originate in their domestic country relative to similar markets that originate in foreign countries. To this end, we focus on intercontinental one-stop air travel trips for which the main, intercontinental, flight legs are identical, while the feeder legs depart from a mixture of domestic- and foreign origins. We collect a unique database of published fares for such trips and estimate reduced form fare regressions with main flight leg fixed effects. We find that trips from and to domestic airports (compared with foreign airports) are characterized by about 9.5 per cent higher fares, even after adding controls for airport dominance, trip operating costs, the competitive environment and origin catchment area characteristics. These findings demonstrate that airlines have substantial domestic market power, enabling them to raise fares at their domestic airports irrespective of aforementioned market conditions. The magnitude of this domestic country effect is large relative to the traditional airport dominance effect, suggesting that the distinction between domestic- and foreign origins is a crucial determinant of the degree of market power that airlines can exert in the international airline industry.

JEL classifications: L11, L13, L93, R40

Keywords: market power, airline competition, price discrimination, international aviation

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1 Introduction

This paper offers a new perspective on the sources of market power in the airline industry. We assess whether airlines have substantial domestic market power, by which we mean the ability to charge higher fares, other things equal, in their domestic country relative to foreign countries. To this end, we depart from the extant airline market power studies' focus on domestic airline competition, and consider an international airline industry in which airlines compete for traffic in their domestic country as well as in countries other than the one where they are principally established.

The study of the sources and consequences of airline market power has been central in the aviation economics literature since Levine (1987) and Borenstein (1989). Domestic airline industries, in particular the US domestic airline industry, have received considerable attention. Here, it is firmly established that one of the most important sources of airline market power is airport dominance, resulting in higher average fares paid for travel out of and into airports where one airline serves a large share of the market (see, e.g., Borenstein, 1989; Berry, 1990; Evans and Kessides, 1993; Lee and Luengo-Prado, 2005; Berry et al., 2006; Bilotkach and Pai, 2014; Zhang et al., 2014). This airport dominance effect is more important than route dominance in determining the degree of airline market power (Evans and Kessides, 1993; Bilotkach and Lakew, 2014). Others demonstrated that the relative value of the dominant airline's frequent flier program (Lederman, 2008), and bureaucratic control over (scarce) airport facilities (Ciliberto and Williams, 2010; Snider and Williams, 2015), represent two mechanisms through which airlines transform their dominant position into higher fares. Beyond domestic markets, the studies by Lijesen et al. (2001) and Bilotkach (2007) provided evidence of the airport dominance effect in international markets.

The main thrust of our paper concerns the ability of airlines to charge a fare premium at airports within their domestic country. We conceptualize this as an alternative source of market power that might play an important role in international airline competition. To empirically investigate this issue, we set out a novel identification strategy that enables estimation of the additional rate charged by airlines for trips made to and from domestic airports over the fares that they charge for comparable trips from foreign airports. An important aspect of our empirical approach is that we, among others, separate this "domestic country premium" from the traditional "airport dominance premium", so that the former indicates the fare markup that airlines can command at their domestic airports independently of whether they serve a large- or small share of the market at that airport.

Our focus on domestic market power in the airline industry is motivated by the following main reasons. First, it is likely that travelers view domestic- and foreign airlines as imperfect substitutes. In particular, travelers may be positively biased towards domestic products and services over foreign alternatives (e.g., Armington, 1969; Shimp and Sharma, 1987; Verlegh and Steenkamp, 1999; Nijssen and van Herk, 2009). Well-known motives for this bias include a desire to protect the domestic economy or national sentiments (Verlegh, 2007). Such motives might be especially relevant in the airline industry, since airlines are typically regarded as important drivers of economic activity and to some extent still represent objects of national pride.

Second, airlines typically have a long history of market presence in their domestic country. According to an extensive literature on pioneering advantages starting from Bain (1956), this may confer domestic airlines with persistent competitive advantages over (foreign) competitors that have entered the market in a later stage. For instance, it has been shown that early entry could lead to increased brand familiarity, persistent beliefs about the quality of the brand, or even brand-buying habits (see, e.g., Schmalensee, 1982; Bronnenberg et al., 2009, 2012).

Third, these competitive advantages may be reinforced by the domestic airline's frequent flier program. Given that travelers typically consider multiple nearby airports as viable substitutes (e.g., Ishii et al., 2009) and the domestic airline is likely to provide the most services out of these airports overall, the frequent flier program of the domestic airline offers domestic travelers the most valuable frequent flier program (i.e., best opportunities to earn and redeem miles). By creating switching costs and incentives to concentrate all their purchases with one airline (Lederman, 2007, 2008), domestic travelers that are program members become less likely to switch to foreign alternatives.[1]

Finally, despite far reaching liberalization of the airline industry, concerns remain regarding distortionary governmental involvement (see, e.g., de Wit, 2014; Morrison and de Wit, 2016). In a recent paper, de Wit (2014) provides an overview of protectionist measures taken by European governments in favor of their domestic airline. It is straightforward that governmental interventions of this sort hinders (foreign) competition and may sustain the ability of airlines to charge relatively high fares on their domestic-originating routes.

For our empirical analysis, we collect a unique dataset including published fares offered by two leading European airlines: Air France and Lufthansa. Published fares provide the opportunity to examine the revenue-maximizing price setting behavior of airlines, thus revealing their (anticipated)

[1] In light of frequent flier programs, one might be concerned that the premium paid by travelers reflects the implied price subsidy of the accumulated frequent flier miles. A back-of-the-envelope calculation provided in a later section, illustrates how our estimates of the domestic country premium are much larger than the upper bound of this implied price subsidy.

ability to command higher prices. The European airline industry is well-suited for our analysis because it is characterized by multiple closely spaced countries, a fine-meshed web of borders and distinct domestic airline brands (e.g., Air France for France, Lufthansa for Germany). Our identification strategy relies on the route network structure of European airlines, which contain a large number of one-stop connecting flights to a given destination from a mixture of domestic- and foreign origins. Taking advantage of this particular route network structure, we estimate the fare differences between domestic- and foreign-originating trips to intercontinental destinations that share the same main, intercontinental, flight leg. This allows us to answer the question whether airlines (e.g., Air France) charge higher fares for domestic-originating trips (e.g., Nice - Paris - New York) compared with highly equivalent foreign-originating trips (e.g., Turin - Paris - New York).

To disentangle the domestic country premium from the airport dominance premium, we match the fare data with data on the airlines' share of the total scheduled departing seats at each origin airport in our sample. As detailed in a later section, we argue that this measure of airport dominance is exogenous to the route-level fares in our fare data, because the number of scheduled departing seats is typically determined well in advance and is defined at the airport-level. We estimate reduced-form fare regressions with main flight leg fixed effects, an indicator for domestic origins and the measure for airport dominance. To further isolate the domestic country premium, we explicitly control for the level of competition on the markets, trip operating costs, and origin catchment area characteristics known or suspected to affect fare levels.

We report three main findings. First, fares for trips originating in the airlines' domestic airports are about 9.5 per cent more expensive than fares for virtually identical trips that originate in foreign airports, even after adding the aforementioned controls. Second, in the international airline markets considered in our analysis, the domestic country premium appears to prevail over the traditional airport dominance premium. Specifically, the domestic country premium approximates the premium an airline would be able to charge after a 64 per cent point increase in its airport-specific market share. Third, the domestic country premium is about three times as large on trips without a Saturday-night stayover relative to trips with a Saturday-night stayover — 19 versus 6.5 per cent —, suggesting that the premium is at least partly demand-driven and applies in particular to the domestic business travel segment.

Although it has been known that airlines engage in international price discrimination (see, e.g., Bachis and Piga, 2011), our analysis is the first to document that airlines charge a substantial premium over average fares for trips originating in their domestic country. Our findings suggest that, despite substantial deregulation of the international airline industry, airlines have a higher degree of market power on routes that originate in their domestic country relative to routes that originate in foreign countries. While a welfare assessment of this effect is beyond the scope of this paper, a key implication of our analysis is that domestic market power represents a substantial barrier for international airline industries to reach full competitiveness. Another major implication of our analysis is that, in international airline industries, a decrease in an airline's market share at one of its domestic airports would do little harm to the market power of this airline. This represents a crucial difference with domestic airline industries, where a distinction between domestic- and foreign airlines is not applicable and policy making has been predominantly concerned with airline market power at dominated airports (see e.g., the AIR-21 legislation in the US airline industry, described and evaluated by Snider and Williams, 2015).

Existing insights on airline market power are predominantly established in domestic airline industries. Our findings demonstrate that these insights are not always directly transferable to an international context. In order to gain a more comprehensive understanding of competition between domestic- and foreign airlines, more research that addresses the particular geographical- and cultural aspects of international airline markets is warranted.

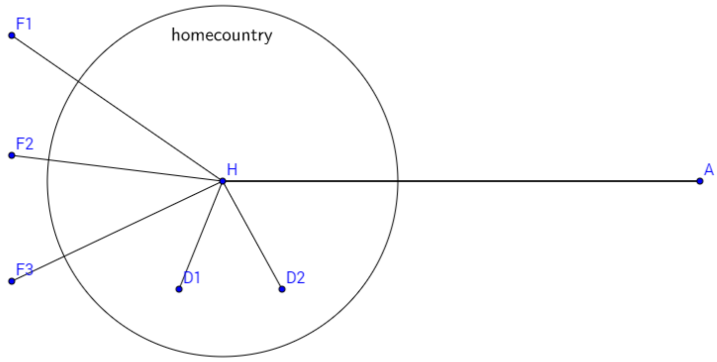
This paper proceeds as follows. Section 2 presents our identification strategy. Section 3 provides a description of the data and preliminary evidence. Section 4 discusses the empirical analysis and findings. Section 5 concludes.

2 Identification Strategy

Our main goal is to estimate the premium over average fares that airlines command on trips from and to their domestic country. To this end, we set out a novel identification strategy that relies on the route network structures of European airlines, who offer a range of one-stop flights through their hubs that arrive at the same destination airport but depart from a mixture of domestic- and foreign airports. Consider a stylized display of such a route network in Figure 1. The airline provides services to destination A, via its hub H, from a set of domestic airports $D = \{D_1, D_2\}$, and foreign airports $F = \{F_1, F_2, F_3\}$. Our identification strategy focuses on the question whether this airline charges higher fares, other things equal, for the flights leaving from the domestic airports D compared with those leaving from the foreign airports F.

We exploit the fact that seats on flights from hub H to destination A are offered both with seats on domestic-originating feeder flights as well as foreign-originating feeder flights, while the

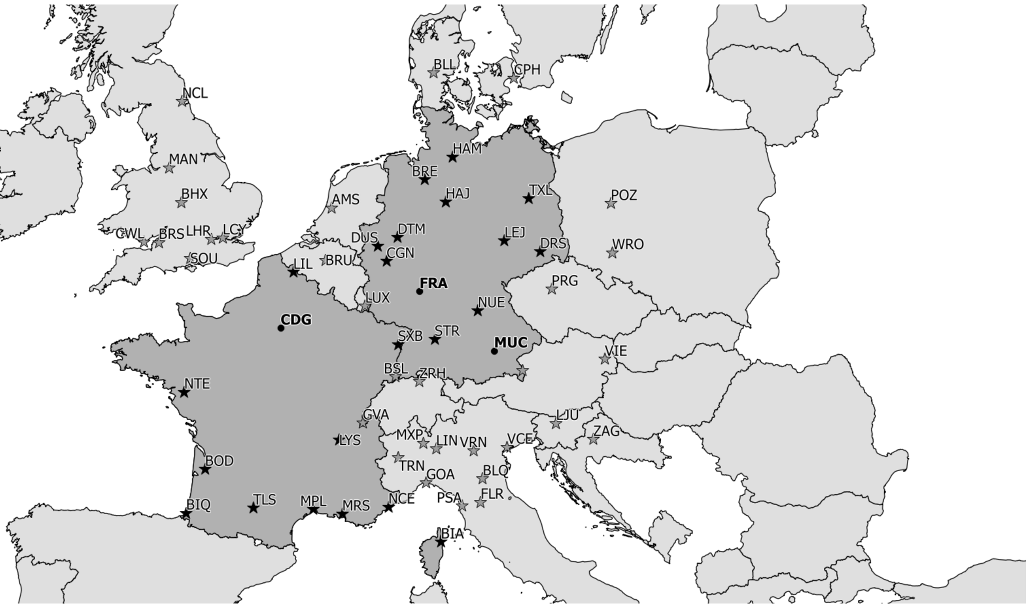
Figure 1: Stylized route network of a European airline



fares are defined on the origin-destination level. Thus, a domestic- and a foreign-originating traveler that share the same airplane for the vast majority of their trip potentially face completely different fares. By comparing the fares charged to these two groups of travelers, while keeping fixed other ticket characteristics such as the type of seat and number of days booked in advance, we isolate the domestic country premium. Simultaneously, we use variation in airport-specific airline market shares, competition on the origin-destination market, flight time, and the origin catchment area population and gross domestic product per capita, to disentangle the domestic country premium from the effects of airport dominance, competition, trip operating costs, and origin demand characteristics, respectively.

To clarify our choice for this identification strategy, we briefly discuss some of its advantages over other candidate strategies. For instance, one might consider to identify the domestic country premium by estimating the fare differential between domestic- and foreign airlines serving the same markets (i.e., an inter-airline comparison strategy instead of our intra-airline comparison strategy). Nevertheless, it is key to note that the majority of the non-stop markets with presence of both domestic- and foreign airlines are operated from and to strongly dominated (hub) airports. An inter-airline comparison on non-stop markets would therefore perfectly confound the domestic country premium with the airport dominance effect. Alternatively, one could consider an inter-airline comparison on one-stop markets. However, this becomes problematic as airlines serving the same market are not necessarily serving the same routes, introducing substantial noise to the estimation (e.g., covariance in hubs, different levels of detour). Instead, our identification strategy enables us to empirically separate the domestic country premium from the airport dominance premium, and

Figure 2: Origins



at the same time ensures the comparability of the domestic- and foreign-originating trips due to the identical main flight leg.

3 Data

Our data consists of published fares for return trip air travel offered by two major European airlines: Air France and Lufthansa. Besides representing two of the largest airlines in Europe, both airlines are the distinct domestic airline brand of their respective countries. The published fares are recovered from the booking pages of the airline websites, in an 8-week period covering February, March and April 2016. In addition, we augment the fare data with information on airline market shares at the origin airports, regional statistics and manually collected data on the number and identity of the competing airlines in each of the markets in our sample.

3.1 Fare data collection

The fare data covers 72 European origins and 4 non-European destinations, amounting to 288 origin-destination markets (see Table 1). The number of origins and destination is based on the aspire to capture a broad and varied range of markets, and the need to keep the data collection at a

Table 1: Data dimensions

Dimension	Instances
Airlines (2)	Air France (AF), Lufthansa (LH)
Destinations (4)	Sao-Paolo (GRU), New-York (JFK), Los-Angeles (LAX), Shanghai (PVG)
Origins (72)	Amsterdam (AMS), Milan Bergamo (BGY), Birmingham (BHX), Bastia (BIA), Biarritz (BIQ), Billund (BLL), Bologna (BLQ), Bordeaux (BOD), Bremen (BRE), Bristol (BRS), Brussels (BRU), Basel (BSL), Bratislava (BTS), Cologne Bonn (CGN), Copenhagen (CPH), Brussels Charleroi (CRL), Cardiff (CWL), Dresden (DRS), Dortmund (DTM), Dsseldorf (DUS), Eindhoven (EIN), East Midlands (EMA), Florence (FLR), Genoa (GOA), Geneva (GVA), Hannover (HAJ), Hamburg (HAM), Hahn (HHN), Jersey (JER), Leeds Bradford (LBA), London City (LCY), Leipzig/Halle (LEJ), London Gatwick (LGW), London Heathrow (LHR), Lille (LIL), Milan Linate (LIN), Ljubljana (LJU), Liverpool (LPL), London Luton (LTN), Luxembourg (LUX), Lyon (LYS), Manchester (MAN), Malmo (MMX), Montpellier (MPL), Marseille (MRS), Milan Malpensa (MXP), Nice (NCE), Newcastle (NCL), Weeze (NRN), Nantes (NTE), Nurnberg (NUE), Poznan (POZ), Prague (PRG), Pisa (PSA), Rotterdam (RTM), London Southend (SEN), Southampton (SOU), London Stansted (STN), Stuttgart (STR), Strasbourg (SXB), Berlin Schonefeld (SXF), Salzburg (SZG), Toulouse (TLS), Turin (TRN), Treviso (TSF), Berlin Tegel (TXL), Venice Marco Polo (VCE), Vienna (VIE), Verona (VRN), Wroclaw (WRO), Zagreb (ZAG), Zurich (ZRH)
Booking days (2)	56 days (early-book), 7 days (late-book)
Length-of-stay (2)	10 days (long-stay), 4 days (short-stay)

manageable level. Specifically, the destinations are geographically dispersed and represent four of the most economically relevant intercontinental destinations from a European perspective. The set of origins contains all airports with >1mio travelers in 2014, that are either located in France or Germany or within the 750km radius of one of the main hubs of Air France or Lufthansa. The latter selection ensures that domestic- and foreign-originating trips are of roughly similar distance, and that all trips originate in the same geographical region of Mid-Western Europe, see Figure 2. Given that our identification strategy relies on fares for one-stop connecting travel, the hubs of

Air France (i.e., Paris) and Lufthansa (i.e., Frankfurt and Munich) are omitted. The remaining origin-destination markets all represent markets where the airlines do not operate non-stop services.

For each airline and origin-destination market combination, we collect the available fares from the airlines' websites for four distinct trips that vary based on the number of days due to departure, 56 or 7 days, and the length-of-stay at the destination, 4 or 10 days (i.e., the number of days between the outbound flight and the return flight). Variation on these dimensions permits us to investigate the differential impact of the domestic country premium on trips booked long before or shortly before departure, trips with a short stay or a longer stay at the destination and trips with- or without a Saturday-night stayover.

All aforementioned data dimensions are listed in Table 1. Combining these dimensions, we arrive at 2 (airlines) * 4 (destinations) * 72 (origins) * 2 (booking day categories) * 2 (length-of-stay categories) = 2304 distinct trips. These trips are distributed over the 8-week period between February 8th and April 3rd 2016, so that each trip is assigned a specific departure date within this period. This results in a schedule that governs at what day to collect the fare data for which trips (see Appendix A for further details). Following this schedule we collect the fares for all outbound- and return flights that are available for a given trip. Besides fares, we obtain general information such as the departure- and arrival times and operating airlines, among others.

For some trips there where no available flights (e.g., due to missing links in the networks of the airlines). From the remaining trips, we select the trips with at least a one-stop outbound- and a one-stop return flight, with stopovers at a main hub of the ticketing airline. Note that this is a prerequisite for our identification strategy and effectively means that we do not use trips for which the only available flights are multi-stop flights or one-stop flights through a partner's hub. To further ensure the comparability of the trips in our sample, we apply four additional criteria. First, we select all flights where the main flight leg is operated by Air France or Lufthansa. This prevents that service quality differences among partner airlines obscure the calculated fare differentials. We do however allow for tickets where the feeder leg is operated by a (regional) partner (e.g., Swiss operating the feeder leg for a one-stop flight offered by Lufthansa), because this is a common practice in the airline industry and would lead to many trips without available flights.[2] Second, we remove all rail-air and bus-air connections to ensure included observations represent air fares. Third, we drop all flights

[2] We checked if operation of one or both of the feeder legs by a regional partner (instead of the ticketing airline) impacts fares and found no statistically significant effect. Moreover, inclusion of covariates related to regional partner operations did not substantially alter the point estimates of our main effects or other covariates.

that include an airport transfer.[3] Flights involving an airport transfer convey additional time- and monetary costs on the traveler and are therefore difficult to compare with flights without an airport transfer. Fourth, we only keep flights with a layover time of less than six hours. This excludes, among others, flights that include an overnight-stay at the hub location.

The final fare data set contains 1067 trips that satisfy the above criteria. The last step in constructing our fare data is the selection of an outbound- and return flight combination for each of the trips. Within each trip, we select the outbound- and the return flights with the lowest fare.[4]

3.2 Supplementary data

The fare data is augmented with data from three additional sources. First, we retrieve airline market shares at each origin airport in our sample from FlightMaps Analytics software (Innovata, 2016). The market shares are measured in terms of the airline's share of all scheduled departing seats at the origin airport in March 2016. In order to assess the potentially different impacts of airline- and alliance market share, we calculate both the share of departing seats operated by the airline or one of its affiliates (i.e., subsidiary airlines in which the major airline owns a majority stake), and the aggregated share of departing seats operated by the airline or one its alliance partners and their respective affiliates.

Second, we collect the most recent data on population and gross domestic product per capita of each origin airport's catchment area from Eurostat (Eurostat, 2016). In line with a recent study on airport catchment areas in Europe (Maertens, 2012), we model the airport catchment areas as the NUTS 3 regions whose geographical midpoints are within the 100km radius of the airport. The origin catchment population is equal to the sum of the population of all NUTS 3 regions within the origin airport's catchment area. Likewise, the origin gross domestic product per inhabitant is the weighted average of the gross domestic product per inhabitant of each relevant NUTS 3 region.

Third, we manually collect information on the competing airlines in each of the markets in our sample by consulting the ITA Matrix (ITA Software, 2016). The number of competitors on a given market is defined as the number of non-cooperating airlines operating flights on that market. Thus, airlines within the same alliance or operating under a code sharing agreement are regarded as a single competitor. The main reason for choosing a competitor count approach instead of, for example, the

[3] The only flights in our sample for which this is the case are flights involving a transfer from Paris Orly International Airport (ORY) to Paris Charles de Gaulle Airport (CDG), or vice versa.

[4] In case the fare of two or more flights are equal, the flight with the lowest journey time is chosen.

Table 2: Descriptives of total sample and domestic- and foreign-originating subsamples

Variable	Total sample		Domestic-originating		Foreign-originating	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
DomestOrig (1/0)	0.242	0.428				
Fare (EURO)	963.977	384.852	1,083.178	440.445	925.962	357.376
MarketShare^{Airline} (%)	21.146	19.129	45.318	13.729	13.438	13.295
MarketShare^{Alliance} (%)	29.879	21.956	50.074	13.553	23.439	20.144
Competitors (#)	2.580	1.216	2.062	1.142	2.745	1.193
NonStop (1/0)	0.155	0.362	0.047	0.211	0.189	0.392
Population (mio)	6.920	4.466	6.365	4.462	7.097	4.456
GDP per capita (k)	33.046	8.503	32.288	4.596	33.288	9.404
FlightTime (hrs)	24.054	3.148	23.714	3.097	24.163	3.159
LateBook (1/0)	0.480	0.500	0.484	0.501	0.478	0.500
ShortStay (1/0)	0.491	0.500	0.488	0.501	0.478	0.500
SatNight (1/0)	0.721	0.449	0.721	0.449	0.721	0.449

Note(s): Units of measurement given in parentheses

Herfindahl-Hirschman Index, is that the market shares at the market level needed to calculate this index cannot be defined in a straightforward way for connecting markets.[5]

3.3 Descriptive statistics

The 1067 trips in our sample relate to 49 origins, 4 destinations, and 187 origin-destination markets.[6] Of these trips, 258 are domestic-originating (≈ 24 per cent) and 809 are foreign-originating (≈ 76 per cent). Table 2 provides descriptive statistics for the total sample and these two subgroups.

The mean fare in the data sample is EURO 964. The domestic-originating trips are priced higher,

[5]Note that connecting markets consist of two separate leg markets. Importantly, a given market consists of a multitude of different leg market combinations. Even if one would collect market shares for all these separate leg markets, it is not possible to determine which part of these market shares can be attributed to the origin-destination market, as the individual leg markets are typically part of multiple origin-destination markets.

[6]The discrepancy between the number of origins and destinations on the one hand, and the number of origin-destination markets on the other hand, arises as not every origin is connected to every destination

on average, than the foreign-originating trips. Not surprisingly, both the airline- and alliance market shares are higher at domestic airports. The average domestic airport market share of the airlines and alliances are 45 and 50 per cent respectively, versus foreign airport market shares of 13 and 23 per cent. The summary statistics furthermore show that airlines face slightly less competition in domestic-originating markets compared to foreign-originating markets. This holds for both the number of competitors and the number of markets in which a non-stop competitor is present. In terms of the average population and gross domestic product per capita, the domestic- and foreign origins are very similar. As can been seen in Table 2, the average round-trip flight time in the sample is 24 hours, and the domestic- and foreign-originating flight times tend to coincide. Finally, as indicated by the last three binary variables, the ratios of late- or early-booked trips (1 = early; 0 = late), short- or long-stay trips (1 = short; 0 = late) and trips including- or excluding a Saturday night-stayover (1 = including; 2 = excluding) are more or less evenly distributed over the domestic- and foreign-originating trips.

3.4 Preliminary evidence

To further explore the patterns in our sample, we provide several data visualizations. Figures 3 and 4 show the distributions of domestic- and foreign-originating fares by airline and destination, respectively. The dashed curve represents the domestic-originating fares, while the solid curve represents the foreign-originating fares. The means of the two distributions are depicted by the dashed- and solid vertical lines, respectively. Congruent with the descriptives, the figures show that domestic-originating trips are generally more expensive. Importantly, this pattern is persistent across the two airlines and the four destinations. In terms of destinations, it is worth noting that the fare difference is especially prevalent for trips to Shanghai. The most striking insight, however, is that the distributions of the domestic-originating fares are roughly bimodal, whereas the foreign-originating fares approximate unimodal distributions. This pattern is consistent with an underlying interaction effect between the indicator for domestic-originating trips on the one hand, and a binary variable such as the indicators for booking days, length-of-stay or Saturday-night stayovers on the other hand.

We explore the latter conjecture by plotting domestic- versus foreign-originating fares on subsamples created by splitting the sample based on the values of the aforementioned binary indicators. Figure 5 presents the most interesting of these figures, depicting the distribution of domestic- and foreign-originating fares for trips with- and without a Saturday-night stayover individually.[7] The

[7]The other figures, depicting the distribution of domestic- and foreign-originating fares for trips booked 56 days

Figure 3: Domestic-originating versus foreign-originating fares by airline

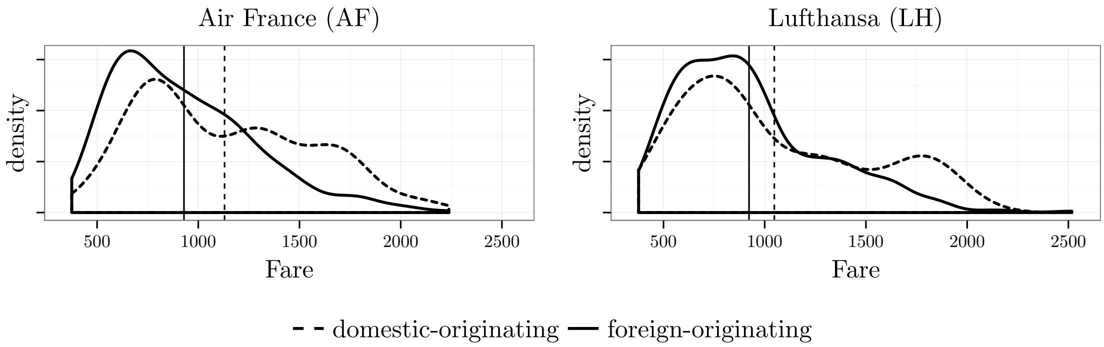
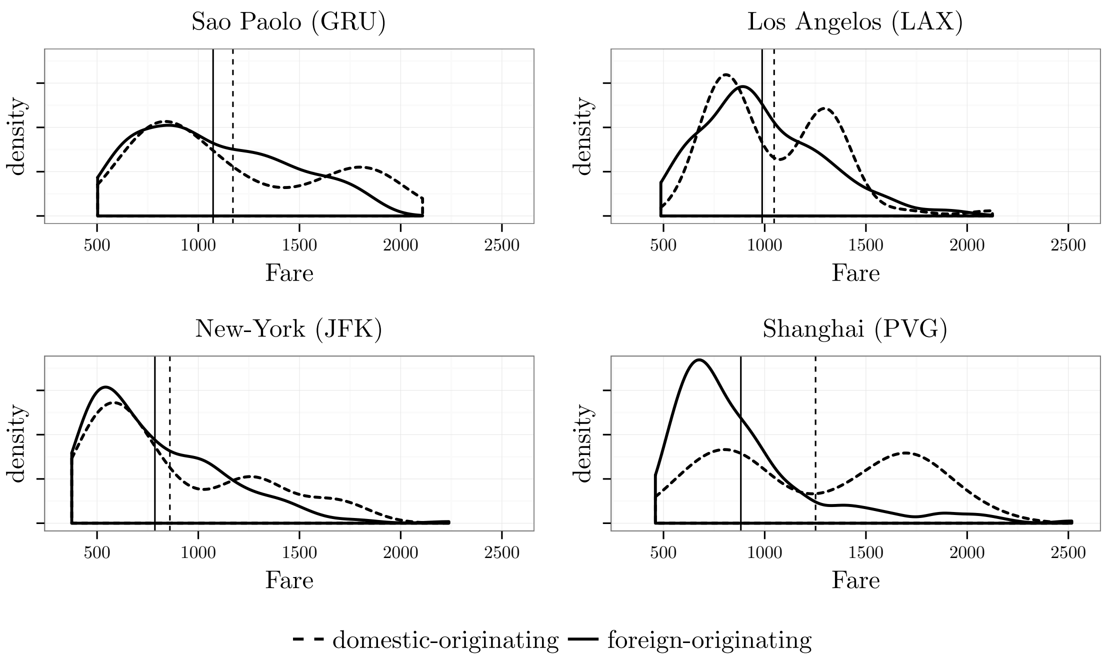


Figure 4: Domestic-originating versus foreign-originating fares by destination



patterns strongly suggest that the bimodality of domestic-originating fare distributions is caused by an interaction between domestic-originating trips and trips without a Saturday-night stayover. More

versus 7 days in advance and trips with a 10 days length-of-stay versus a 4 days length-of-stay, are provided in Appendix B. Closer inspection of these figures, leads to the conclusion that there is no clear interaction between domestic-originating trips and the number of days booked in advance and only a marginal interaction between domestic-originating trips and the length-of-stay. The latter, however, likely results from the strong correlation between trips with a 4 days length-of-stay and trips without a Saturday-night stayover.

Figure 5: Domestic-originating versus foreign-originating fares (by Saturday-night stayover)

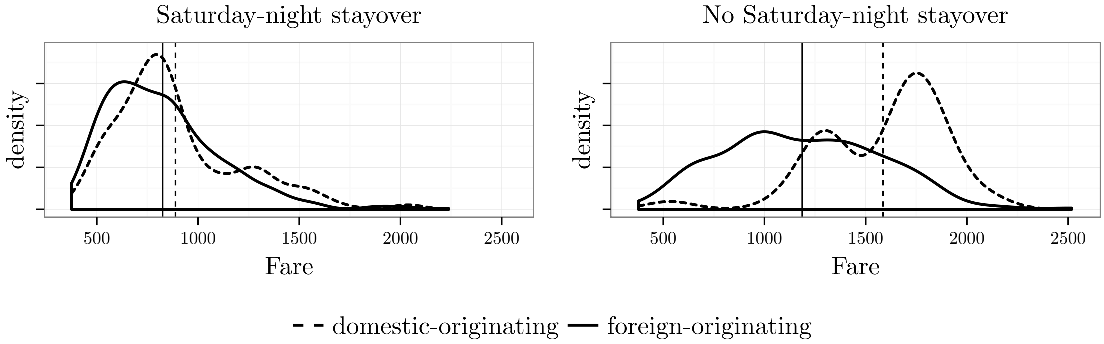
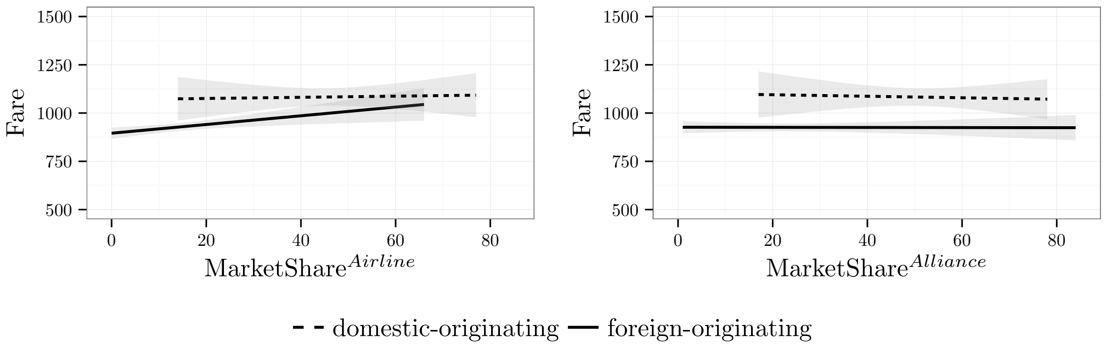


Figure 6: Association between fares and market shares decomposed by domestic and foreign-origins



specifically, although domestic-originating trips are priced higher in general, the magnitude of the difference between domestic- and foreign-originating trips is vastly more profound in the subsample containing the trips without a Saturday-night stayover. Given that trips without a Saturday-night stayover are predominantly bought by business travelers (Stavins, 2001), this suggests that the domestic country premium applies in particular to the business travel segment.

An obvious drawback of the figures provided so far, is that they do not disentangle the fare impact of originating from an airline's domestic country from the fare impact that can be attributed to airport dominance. Therefore, Figure 6 shows the association between fares and market shares in the subsets of domestic- and foreign-originating trips. The dashed line represents the linear relationship between fares and market shares for the subset of domestic-originating trips, whereas the solid line represents this relationship for the subset of foreign-originating trips. In the left panel the market shares are defined on the airline level, whereas the right panel employs the market shares at the alliance level. These figures essentially portray a main premise of this paper: given an airport-specific market share, irrespective whether this is defined on the airline- or the alliance level, airlines charge higher fares for domestic-originating trips compared to their foreign-originating counterparts. In the following section, we turn to the econometric analysis of this effect, in order to account for other potential confounding factors and provide an explicit estimate of the domestic country premium.

4 Empirical Analysis

4.1 Model specifications

In line with our identification strategy, we employ reduced form fare regressions with main flight leg fixed effects. Note that within main flight legs the airline and destination are given, therefore heterogeneity from these sources will be captured by the fixed effects. We capture other trip characteristics by including indicators for booking days, length-of-stay and Saturday-night stayovers. Thus, we measure average fare differences between domestic- and foreign-originating trips, that have identical main flight legs and are equal in terms of booking days, length-of-stay and Saturday-night stayover.[8] We then use variation in the airline market shares at the origin airports to separate the domestic country premium from the airport dominance premium. To further isolate the domestic country premium, we include a range of additional controls capturing the trip operating costs, competitive environment and origin demand characteristics known or expected to affect fare levels (details are provided below).

Specifically, our baseline model specification is as follows:

$$\ln Fare_{ijnm} = \gamma DomestOrigin_{jn} + \theta MarketShare_{jn} + \omega \boldsymbol{z}_i + \lambda \boldsymbol{x}_{ijn} + \delta_m + u_{ijnm}, \qquad (1)$$

where $\ln Fare_{ijnm}$ is the natural log of the fare on trip i, operated by airline j, from origin airport n, with main flight leg m; δ_m represents the main flight leg fixed effect; $\boldsymbol{z}_i$ is a vector of trip characteristics; $\boldsymbol{x}_{ijn}$ is a vector of controls; $MarketShare_{jn}$ is a measure of the airport-specific airline- or alliance market share; and $DomestOrigin_{jn}$ is an indicator for domestic-originating trips,

[8] Note that we implicitly assume that, conditional on main flight leg and the included trip characteristics, the fares for the trips are date- and day-of-the-week invariant. This is a reasonable assumption given that we randomly assigned the trips to the departure dates. In a later section, we provide the results of a sensitivity analysis that proves the robustness of our estimates to this assumption.

defined as follows:

$$DomestOrigin_{jn} = \begin{cases} 1, & \text{if origin airport } n \text{ is in the domestic country of airline } j \\ 0, & \text{else.} \end{cases}$$

Consequently, γ provides an estimate of the percentage fare differential between trips that depart from domestic airports and those that depart from foreign airports (i.e., the domestic country premium), while θ provides an estimate of the percentage fare impact of one additional percent point market share at the origin airport (i.e., the airport dominance premium).

To account for the interaction between domestic country- and Saturday-night stayover effects, we specify the following interaction model:

$$\begin{aligned} \ln Fare_{ijnm} = {} & \gamma_1 \big[DomestOrigin_{jn} \cdot (1 - SatNight_i)\big] + \gamma_2 \big[DomestOrigin_{jn} \cdot SatNight_i\big] + \\ & \theta_1 \big[MarketShare_{jn} \cdot (1 - SatNight_i)\big] + \theta_2 \big[MarketShare_{jn} \cdot SatNight_i\big] + \\ & \omega \boldsymbol{z}_i + \lambda \boldsymbol{x}_{ijn} + \delta_m + u_{ijnm}, \end{aligned} \tag{2}$$

where $SatNight_i$ is an indicator for trips that include a Saturday-night stayover, defined as follows:

$$SatNight_i = \begin{cases} 1, & \text{if trip } i \text{ involves a Saturday-night stayover} \\ 0, & \text{else.} \end{cases}$$

Here, γ_1 provides the domestic country premium for trips without a Saturday-night stayover, while γ_2 denotes this premium for trips with a Saturday-night stayover. Similarly, θ_1 and θ_2 indicate the airport dominance premium on trips without- and with a Saturday-night stayover, respectively.

In line with the literature, several additional controls are included. Following, amongst others, Van Dender (2007), Brueckner et al. (2013), and Bilotkach and Lakew (2014), we control for origin demand and willingness-to-pay by using proxies based on the origin population and gross domestic product. Specifically, we deploy the origin airport catchment's area population and gross domestic product per capita as a proxy for air travel demand and willingness-to-pay, respectively. In line with Brueckner et al. (2013), we control for the competitive environment by using competitor counts. In addition, we include an indicator for whether one of the competitors is offering a non-stop alternative in this market. Finally, a measure of the distance between origin and destination is usually included as a proxy for the operating costs of the trip (see, e.g., Borenstein, 1989). We opt for capturing trip operating costs using the round-trip flight time which arguably provides a more accurate approximation of actual flight distance and operating costs.

A potential econometric concern with our model specification, is the endogeneity of the market share measures. However, it is important to note that we calculate market shares based on the number of scheduled seats. These are directly related to the number of scheduled flights and aircraft type, which in the airline industry are typically determined well in advance. Thus, our market share measure resembles the lagged endogenous instruments frequently used in the aviation economics literature to avoid simultaneity bias (i.e., the current fare level is not likely to affect the schedule made months ago) and diminish the potential for omitted variable bias (see e.g., Greenfield, 2014). Moreover, given that the market shares are defined on the airport level, inconsistent estimates would only arise in case of omitted variables that affect the airline's aggregate market share at the origin airport. For these reasons, we conjecture the costs of an adjustment (e.g., using an instrumental variable approach) to be worse than the conceivable limited impact of endogeneity.

4.2 Estimation results

Tables 3 and 4 report our model estimation results. Table 3 shows the results of the baseline models, as specified in Eq. (1). Table 4 shows the results of the interaction models given in Eq. (2). Robust standard errors, with clustering at the origin-airline level, are provided in parentheses.[9] Complete tables for both the baseline- and the interaction models, including the coefficient estimates of the controls, are provided in Appendix C.

In Table 3, column (1) provides the results of a base model, regressing the log of fares on the domestic origin indicator, main flight leg fixed effects, and trip characteristics. The coefficient on the domestic origin indicator is equal to 0.1421, which reflects a domestic country premium of about 14 per cent. To control for airport dominance, we add the airport-specific market share of each airline and each alliance group in columns (2) and (3), respectively. The airline market share substantially reduces the fare differential between domestic- and foreign-originating trips to around 9.5 per cent. Although the direct effect of airport dominance on fares is small and not statistically significant at conventional levels (p-value = .0701), the impact on the domestic country premium demonstrates the importance of disentangling the airport dominance effect.[10] On the other hand, significant effects

[9] As our key variables are gathered at the origin-airline level, clustering at the origin-airline level seems to be appropriate. Moreover, it is worth mentioning that clustering at the origin level, which is at a higher level of aggregation, yields only minor changes in our standard errors. Given this observation and the consensus that more clusters are generally better (Cameron and Miller, 2015), we report the origin-airline clustered standard errors.

[10] The correlation of 0.7 between the domestic origin indicator and the airport-specific airline market share measure, might raise concerns about multicollinearity. The Variation Inflation Factors, however, range between 1.49 and 2.34

Table 3: Baseline model estimation results

	Dependent variable: lnFare			
	(1)	(2)	(3)	(4)
DomestOrig	0.1421	0.0969	0.1363	0.0949
	(0.0184)^a	(0.0310)^a	(0.0310)^a	(0.0305)^a
MarketShare^{Airline}		0.0014		0.0015
		(0.0008)^c		(0.0008)^c
MarketShare^{Alliance}			0.0002	
			(0.0009)	
Main flight leg fixed effect	Yes	Yes	Yes	Yes
Trip characteristics	Yes	Yes	Yes	Yes
Additional controls	No	No	No	Yes
Observations	1,067	1,067	1,067	1,067
Adjusted R^2	0.5105	0.5124	0.5101	0.5134
F Statistic	49.3345^a	47.6719^a	47.2537^a	39.7909^a
	(df = 1043)	(df = 1042)	(df = 1042)	(df = 1037)

Note(s): ^{c}p<0.1; ^{b}p<0.05; ^{a}p<0.01

Cluster-robust standard errors in parentheses

for airport-specific market shares do not arise when market shares are defined on the alliance level, as reported in column (3). Thus, while airlines are able to raise fares at airports where they serve a large share of the market, we do not find evidence of an umbrella effect at airports where one of their alliance partners is dominant.

In addition to airline market shares, column (4) adds the set of controls discussed in the previous section. The resulting domestic country premium remains virtually identical to the model without the controls. The stability of the estimate provides confidence that the coefficient on the domestic origin indicator captures something specifically related to domestic-originating markets allowing the

for the key variables in our baseline models, which is well below of what is usually considered problematic. In addition, the estimates are stable over the different model specifications. Hence, we conjecture multicollinearity not to be a substantial concern.

Table 4: Interaction model estimation results

	Dependent variable: lnFare		
	(1)	(2)	(3)
$\text{DomestOrigin}_{NoSatNight}$	0.3097	0.1941	0.1907
	$(0.0357)^a$	$(0.0433)^a$	$(0.0431)^a$
$\text{DomestOrigin}_{SatNight}$	0.0770	0.0629	0.0639
	$(0.0190)^a$	$(0.0330)^c$	$(0.0334)^c$
$\text{MarketShare}^{Airline}_{NoSatNight}$		0.0039	0.0039
		$(0.0010)^a$	$(0.0010)^a$
$\text{MarketShare}^{Airline}_{SatNight}$		0.0004	0.0005
		(0.0008)	(0.0009)
Main flight leg fixed effect	Yes	Yes	Yes
Trip characteristics	Yes	Yes	Yes
Additional controls	No	No	Yes
Observations	1,067	1,067	1,067
Adjusted R^2	0.5236	0.5286	0.5291
F Statistic	49.8098^a	46.9793^a	39.6367^a
	(df = 1042)	(df = 1040)	(df = 1035)

Note(s): ^{c}p<0.1; ^{b}p<0.05; ^{a}p<0.01

Cluster-robust standard errors in parentheses

airline to charge higher prices, which cannot be captured by conventional controls for the competitive environment, trip operating costs, and origin demand characteristics.

The interaction models in Table 4 provide estimates of the domestic country- and airport dominance premiums for trips with- and without Saturday-night stayover separately. As illustrated by the data visualizations, the premiums clearly differ in this dimension by showing higher premiums for trips that do not involve a Saturday-night stayover. Column (1) shows the results of a model, in which the regressors consist of main flight leg fixed effects, the trip characteristics (i.e., including a general Saturday-night stayover indicator), and the interactions between the domestic origin-and Saturday-night stayover indicators. The coefficient on the indicator for domestic-originating trips without a Saturday-night stayover equals 0.3097. In other words, domestic-originating trips that do not include a Saturday-night stayover are about 31 per cent more expensive relative to foreign-originating trips that also do not include Saturday-night stayover. In comparison, the point estimate of the domestic country premium on trips with a Saturday-night stayover suggests that domestic-originating trips that include a Saturday-night stayover are only about 7.7 per cent more expensive than foreign-originating trips that include a Saturday-night stayover. Hence, the model estimates confirms our observation from the data visualizations that the domestic country premium is vastly more profound on trips without a Saturday-night stayover.

Column (2) includes the airport-specific airline market shares, which are interacted with the Saturday-night stayover indicator in similar fashion as we specified the interaction effects between the domestic origin- and Saturday-night stayover indicators. The resulting coefficients on the market share measures suggest that the fare impact of airport dominance is statistically- and economically relevant on trips excluding a Saturday-night stayover, but not on trips including a Saturday-night stayover. As is the case in our baseline models, controlling for the airport dominance effect substantially reduces the domestic country premiums. Specifically, our estimate of the domestic country fare premium on trips without a Saturday-night stayover decreases from 31.0 to 19.4 per cent, whereas the premium on trips with a Saturday-night stayover decreases from 7.7 to 6.3 per cent and now falls just outside the conventional levels of statistical significance (p-value = 0.0571).[11] Including the set of controls, as is done in column (3), does not substantially alter these findings. The domestic country premium on trips without a Saturday-night stayover — 19.1 per cent — is approximately three times as large as the domestic country premium on trips with a Saturday-night stayover which equals 6.4 per cent.

The model estimation results offer the following three main takeaways. First, international trips to and from domestic origin airports are characterized by substantially higher fares relative to comparable trips originating in foreign airports, even after controlling for airport dominance, trip operating costs, the competitive environment and origin demand characteristics. Second, the domestic country premium appears to prevail over the traditional airport dominance premium in the international air transport markets considered here. While controlling for airport-specific airline market share, we

[11] Note that these estimates relate to a model in which we control for airport dominance by the airline, using the airport-specific market shares of the airlines. Controlling for airport dominance by the alliance (we do not explicitly report this model in Table 4), results in insignificant estimates of the airport dominance and contributes very little to the model reported in column (1).

find an average domestic country fare premium of around 9.5 per cent. In comparison, this premium is approximately equal to the premium an airline would be able to charge after a 63 per cent point increase in its airport-specific market share. Third, the domestic country premium is about three times as large on trips that do not involve a Saturday-night stayover. Hence, in line with results from the airport dominance literature (e.g., Lee and Luengo-Prado, 2005), the domestic country premium appears to apply in particular to travelers flying for business purposes.

4.3 Robustness checks

Table 5 reports various sensitivity analyses to explore the robustness of our interaction model estimates. All models include as regressors the interactions of the domestic origin indicator and airport-specific airline market share with the Saturday-night stayover indicators, as well as the full range of trip characteristics and controls.

Columns (1) and (2) report the results of two models with alternative fixed effects specifications In column (1) the fixed effects are defined as the combination of the outbound- and return main leg flight numbers. Trips operated under the same flight number are likely to have similar unobservable characteristics, such as, for example, departure- and arrival times, and type of aircraft. Hence this specification controls explicitly for such unobservable heterogeneity that, if not randomly distributed across domestic- and foreign-originating trips, might confound our estimates. In column (2) we deploy flight date fixed effects in addition to the regular main flight leg fixed effects. These flight date fixed effects control for any unobservable fare trend or day-of-the-week effect.The estimates of the domestic country- and airport dominance premiums provided by these alternative fixed effects specifications are in line with the estimates provided by the main flight leg fixed effects specifications reported in column (3) of Table 4. The point estimates of the domestic country premium are virtually the same using the main leg flight number fixed effects, and slightly larger using the combination of main flight leg- and flight dates fixed effects. However, in both cases the point estimates are well within the 95 confidence interval of the reported premium in column (3) of Table 4, suggesting that any bias due to unobservable heterogeneity across flight numbers, booking- and flying dates does not impact substantially the estimated parameters of interest. Hence, these results do not warrant altering our fixed effects specification and we continue — in line with our identification strategy — with the main flight leg fixed effects.

As aforementioned in the discussion about the collection of fare data, we applied a number of criteria to ensure the comparability of the trips in our sample. To check whether our estimates are

Table 5: Robustness checks for interaction model estimates

	Dependent variable: lnFare				
	Alternative fixed effects		*Alternative sample selection criteria*		
	(1)	(2)	(3)	(4)	(5)
$\text{DomestOrigin}_{NoSatNight}$	0.1913	0.2141	0.1958	0.1996	0.1598
	$(0.0455)^a$	$(0.0444)^a$	$(0.0421)^a$	$(0.0432)^a$	$(0.0432)^a$
$\text{DomestOrigin}_{SatNight}$	0.0552	0.0776	0.0459	0.0818	0.0486
	$(0.0303)^c$	$(0.0336)^b$	(0.0340)	$(0.0357)^b$	(0.0357)
$\text{MarketShare}^{Airline}_{NoSatNight}$	0.0038	0.0037	0.0041	0.0038	0.0036
	$(0.0010)^a$	$(0.0011)^a$	$(0.0009)^a$	$(0.0011)^a$	$(0.0011)^a$
$\text{MarketShare}^{Airline}_{SatNight}$	0.0004	0.0004	0.0004	0.0003	0.0003
	(0.0008)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
Main flight leg fixed effect	No	Yes	Yes	Yes	Yes
Main flight nr. fixed effect	Yes	No	No	No	No
Flight dates fixed effect	No	Yes	No	No	No
Trip characteristics	Yes	Yes	Yes	Yes	Yes
Additional Controls	Yes	Yes	Yes	Yes	Yes
Observations	1,067	1,067	1,121	1,139	1,109
Adjusted R^2	0.5563	0.6968	0.5199	0.5156	0.5400
F Statistic	19.3053^a	20.6025^a	40.1186^a	40.0766^a	32.7302^a
	(df = 993)	(df = 941)	(df = 1089)	(df = 1107)	(df = 1067)

Note(s): ^{c}p<0.1; ^{b}p<0.05; ^{a}p<0.01
Cluster-robust standard errors in parentheses

sensitive to these criteria, we estimate the preferred interaction model from column (3) in Table 4, on samples where we do not enforce these restrictions. In column (3) we report the results on a sample including potential feeder flights that are operated by bus or rail. Hence, if for certain trips airlines offer a rail-air or bus-air alternative that has a lower fare than the lowest priced air-air alternative, this alternative ends up in our final sample. Similarly, we allow flights with a layover time of more than six hours in column (4) and do not exclude trips that involve an airport transfer in column (5). Although fewer restrictions implies a larger sample size, the obvious disadvantage is that the trip observations are less comparable. Nonetheless, the results on these alternative samples provided in columns (3), (4) and (5) tend not to be dramatically different from the estimates reported in column (3) of Table 4. Most notably, the coefficient of the domestic country premium on trips with a Saturday-night stayover is somewhat smaller and no longer statistically significant in the samples allowing for bus- and rail feeder flights and airport transfers. This likely arises as both bus- and rail feeder flights and airport transfers are typically lower priced and, at the same time, more common in domestic-originating markets, causing downward pressure on domestic-originating fares.

In general, our results are robust with respect to various fixed effects specifications and the criteria used in the data collection. Although the domestic country premium on trips with a Saturday-night stayover is somewhat more sensitive, there are no sign-changes and the magnitude of the premiums remain within the same order of magnitude — between 16-21.5 per cent for trips without a Saturday-night stayover and 4.5-8 per cent for trips with a Saturday-night stayover.

4.4 Discussion

The key takeaway from the preceding sections is that airlines charge a fare premium in markets that originate in their domestic country. This premium brings about substantial fare differences between virtually identical domestic- and foreign-originating trips and, importantly, emerges independently of the airport dominance effect, trip operating costs, the level of competition on the market, and origin demand characteristics. We therefore interpret these findings as a manifestation of the relative market power of airlines at domestic airports vis-á-vis foreign airports. It is worth stressing that our results should be interpreted as relative effects. That is, the fare differences could either reflect the ability of airlines to convert competitive advantages in their domestic country into higher fares and increased profits, or may echo that airlines need to employ a foreign discount to attract foreign travelers.[12]

We do also find some evidence of the airport dominance effect in our data, albeit the magnitude of the effect on fare levels is relatively small. This implies that market power in international airline industries is largely independent of the airlines' market share at the origin endpoint. Instead, the distinction between domestic- and foreign origins becomes crucial in determining the degree of

[12] Note that offering a fare below costs might still be profitable, because it might allow airlines to achieve higher load factors or enable increased frequencies on the main flight leg.

market power that airlines have. Consequently, an airline is nearly just as able to charge a premium on trips departing from a domestic airport where it has a relatively low market share versus trips from a domestic airport where it has a clearly dominant position. In the same vein, a decrease in an airline's market share at one of its domestic airports would make little difference to the fare premium that this airline is able to command in the international markets connected to that airport.

The finding of differential premiums for trips with- and without a Saturday-night stayover rules out that cost differences between the markets are responsible for the fare patterns in our data, and is therefore consistent with out market power interpretation. The higher premium for trips without a Saturday-night stayover conceivably arises because those trips are targeted at business travelers (see, e.g., Stavins, 2001). Although leisure- and business travelers may both prefer their domestic airline, the latter are generally assumed to be less price sensitive and therefore might be willing to pay a higher premium. An alternative line of reasoning holds that due to their higher opportunity costs of time, business travelers are less likely to take the effort of searching for lower fares (Bachis and Piga, 2011). Finally, business travelers are more likely to be active participants in frequent flier programs, and may therefore attach a greater value to the miles of the domestic airline.

In our view, it is, nevertheless, unlikely that frequent flier programs drive the entire domestic country premium that is identified in our analysis. Foremost, our analysis focuses on the lowest available fares which qualify for the lowest proportional miles accrual, and in turn, are not likely to be bought by travelers who strongly value frequent flier miles.[13] Moreover, back-of-the-envelope calculations suggest that our estimates of the domestic country premium are large relative to the implied price subsidy of frequent flier miles.[14] Finally, we also find some evidence of the domestic

[13]A quick analysis of the Lufthansa tickets in our data, illustrates that 93 per cent of the tickets are Economy Saver, Economy Basic, or Economy Basic Plus tickets, which accrue 50 per cent of the actual trip miles or less. Unfortunately, we cannot provide a similar analysis for the full sample due to unavailability of Air France booking class data.

[14]Consider the following simple back-on-the-envelope calculation to determine the order of magnitude of the implied price subsidy of frequent flier miles. We assume a traveler is flying on a ticket with 100 per cent miles accrual and only qualifies for the lowest tier within the frequent flier program (i.e., gains no miles accrual bonus). Under these assumptions, the maximum number of miles to be earned on a domestic-originating trip is approximately 14,000 for both Air France and Lufthansa. Furthermore we assume that travelers spend their award miles on gift vouchers only, as their monetary value is most clear. In both programs there are opportunities to buy gift vouchers of 10 euro for 3000 and 4000 miles. Hence, the implied price subsidy —taking into account the average fare of about 1000 euro in our data set— is in the order of magnitude of 3.5-4.6 per cent. This implied price subsidy is likely to be an overestimation, because not every domestic traveler participates in the airline's frequent flier program, the majority of the tickets in our sample has a miles accrual percentage of 50 per cent or less, and redemption rates are typically far below 100 per

country premiums on trips that include a Saturday-night stayover, which are typically bought by leisure travelers for which frequent flier programs are not likely to play a major role.

In sum, besides the ability to raise fares through frequent flier programs, our analysis suggests that additional competitive advantages enjoyed by airlines in their domestic country are likely to play a role in sustaining their ability to charge higher fares for domestic-originating travel.

5 Conclusion

Herein we documented that airlines charge a substantial premium of about 9.5 per cent over average fares on trips that originate in domestic airports relative to comparable trips that originate in foreign airports. Importantly, we conceptually and empirically distinguished this domestic country premium from the airport dominance premium and found the former to prevail in the international airline markets studied in this paper. Furthermore, the domestic country premium is substantially higher on trips without a Saturday-night stayover, which indicates that the premium applies in particular to the domestic business segment and corroborates a market power interpretation of the identified fare patterns.

These findings contribute to the empirical literature on airline market power. Whilst our current analysis does not permit us to empirically pinpoint the underlying mechanisms that drive our results, domestic market power is established as an important and policy-relevant economic force in international airline competition. For instance, domestic airlines' favorable position over foreign competitors when operating out of their domestic country, could represent a substantial barrier to the ongoing process of liberalization and market integration in international aviation.

A first direction for future research on this subject is to investigate what factors confer market power on domestic airlines. We discussed a number of potential domestic advantages, including a traveler bias for domestic products, general brand effects, frequent flier programs, and governmental protectionism. Discerning the relative importance of such underlying factors is an imperative step towards a welfare assessment of domestic market power. Furthermore, we examine domestic market power in markets that are characterized by the presence of one distinct domestic airline and the absence of low-cost carriers. It would be interesting if further research could investigate to what extent these and other local market conditions, impacts the degree of domestic market power that airlines are able to exercise.

cent (e.g., Smith and Sparks, 2009).

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Appendix A. Data collection approach

We collect fare data according to the following schedule. First, we subdivide the 72 origins into 4 groups of 18 origins by dividing the origins into three strata (i.e., French origins, German origins, other origins) and subsequently randomly distributing the origins within each stratum to one of the 4 groups (i.e., stratified random sampling). Next, we combine the airlines (2) * destinations (4) * groups of origins (4) * booking day categories (2) * length-of-stay categories (2) = 128 sets of 18 trips. Note that these sets of trips only vary in terms of origin (i.e., the within-set variation in airline-, destination-, booking days- and length-of-stay categories is zero). Finally, we randomly assign each of these 128 sets of trips to one departure date in the 8-week period between February 8th and April 3rd in 2016. This assignment is performed in such a way that each date in this 8-week period is assigned 2 sets of trips, except for all Mondays which are assigned 4 sets of trips to ensure that we will have a fair share of trips without a Saturday-night stayover in our final data set. The top and bottom 4 rows of the data collection schedule are printed in Figure 6 (full schedule available upon request).

Table 6: Data collection schedule (top and bottom)

Id	Day	Airl	Dest	Origin	Bookdays	LengthStay	Outbound	Return	Booking
1	MO	AF	PVG	GR3	56 days	4 days	8-2-2016	12-2-2016	14-12-2015
2	MO	LH	GRU	GR1	56 days	4 days	8-2-2016	12-2-2016	14-12-2015
3	TU	LH	LAX	GR1	56 days	4 days	9-2-2016	13-2-2016	15-12-2015
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
126	TH	LH	GRU	GR3	7 days	10 days	31-3-2016	10-4-2016	24-3-2016
127	FR	AF	GRU	GR1	7 days	4 days	1-4-2016	5-4-2016	25-3-2016
128	SA	AF	JFK	GR1	7 days	4 days	2-4-2016	6-4-2016	26-3-2016

Example: On December 14th 2015 we collect the fare data for:

- 18 trips from the origins in group 3 (GR3) to Shanghai (PVG), with an outbound flight departure date of February 8th 2016 and a return flight departure date on February 12th 2016, operated by Air France (AF);
- 18 trips from the origins in group 1 (GR1) to Sao Paolo (GRU), with an outbound flight departure date of February 8th 2016 and a return flight departure date on February 12th 2016, operated by Lufthansa (LH).

Appendix B. Domestic-originating versus foreign-originating fares

Figure 7: Domestic-originating versus foreign-originating fares (by booking days due to departure)

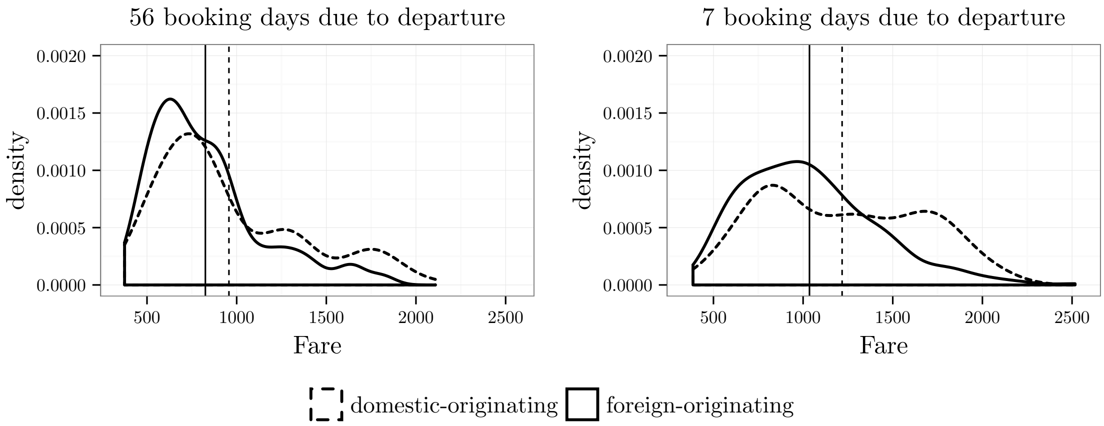
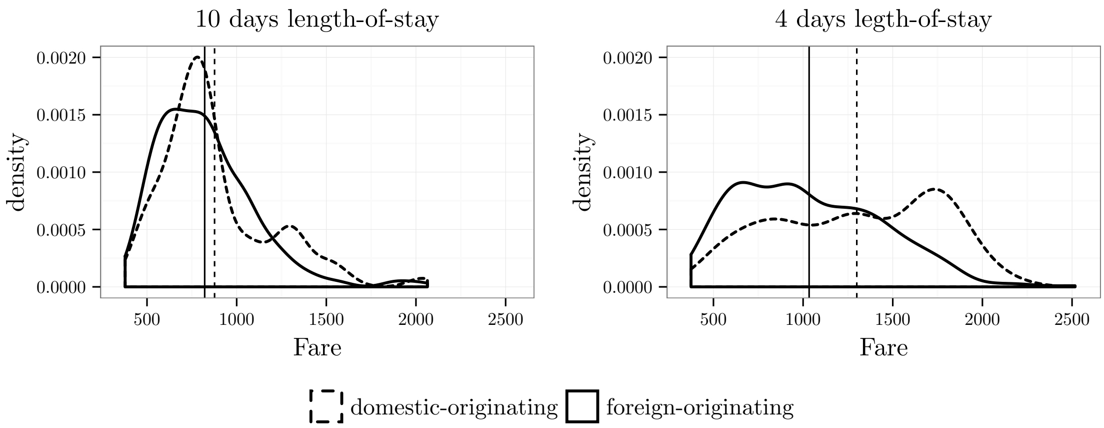


Figure 8: Domestic-originating versus foreign-originating fares (by length-of-stay at destination)



Appendix C. Full estimation results

Table 7: Baseline model estimation results (full table)

	Dependent variable:			
	logFare			
	(1)	(2)	(3)	(4)
DomestOrig	0.1421	0.0969	0.1363	0.0949
	$(0.0184)^a$	$(0.0310)^a$	$(0.0310)^a$	$(0.0305)^a$
$\text{MarketShare}^{Airline}$		0.0014		0.0015
		$(0.0008)^c$		$(0.0008)^c$
$\text{MarketShare}^{Alliance}$			0.0002	
			(0.0009)	
LateBook	0.2189	0.2188	0.2189	0.2186
	$(0.0162)^a$	$(0.0162)^a$	$(0.0162)^a$	$(0.0162)^a$
ShortStay	0.0089	0.0092	0.0087	0.0100
	(0.0196)	(0.0195)	(0.0195)	(0.0195)
SatNight	−0.4076	−0.4063	−0.4079	−0.4048
	$(0.0246)^a$	$(0.0246)^a$	$(0.0246)^a$	$(0.0242)^a$
FlightTime				0.0125
				(0.0239)
Pop				0.0028
				(0.0023)
Gdp				0.0021
				(0.0014)
Comp				−0.0125
				(0.0093)
NonStop				−0.0250
				(0.0392)
Constant	7.0867	7.0709	7.0831	6.6923
	$(0.0362)^a$	$(0.0369)^a$	$(0.0374)^a$	$(0.6401)^a$
Observations	1,067	1,067	1,067	1,067
Adjusted R^2	0.5105	0.5124	0.5101	0.5134
F Statistic	49.3345^a	47.6719^a	47.2537^a	39.7909^a
	(df = 1043)	(df = 1042)	(df = 1042)	(df = 1037)

Note(s): ^{c}p<0.1; ^{b}p<0.05; ^{a}p<0.01

Cluster-robust standard errors in parentheses

Table 8: Interaction model estimation results (full table)

	Dependent variable:		
	logFare		
	(1)	(2)	(3)
$\text{DomestOrigin}_{NoSatNight}$	0.3097	0.1941	0.1907
	$(0.0357)^a$	$(0.0433)^a$	$(0.0431)^a$
$\text{DomestOrigin}_{SatNight}$	0.0770	0.0629	0.0639
	$(0.0190)^a$	$(0.0330)^c$	$(0.0334)^c$
$\text{MarketShare}^{Airline}_{NoSatNight}$		0.0039	0.0039
		$(0.0010)^a$	$(0.0010)^a$
$\text{MarketShare}^{Airline}_{SatNight}$		0.0004	0.0005
		(0.0008)	(0.0009)
LateBook	0.2203	0.2218	0.2216
	$(0.0157)^a$	$(0.0158)^a$	$(0.0158)^a$
ShortStay	0.0094	0.0086	0.0093
	(0.0197)	(0.0198)	(0.0197)
SatNight	−0.3505	−0.3005	−0.3004
	$(0.0276)^a$	$(0.0320)^a$	$(0.0317)^a$
FlightTime			0.0152
			(0.0242)
Pop			0.0021
			(0.0025)
Gdp			0.0020
			(0.0014)
Comp			−0.0116
			(0.0095)
NonStop			−0.0221
			(0.0394)
Constant	7.0451	6.9933	6.5496
	$(0.0400)^a$	$(0.0436)^a$	$(0.6481)^a$
Observations	1,067	1,067	1,067
Adjusted R^2	0.5236	0.5286	0.5291
F Statistic	49.8098^a	46.9793^a	39.6367^a
	(df = 1042)	(df = 1040)	(df = 1035)
Note(s):	^{c}p<0.1; ^{b}p<0.05; ^{a}p<0.01		
	Cluster-robust standard errors in parentheses		