The Impact of Passenger Mix on Reported "Hub Premiums" in the U.S. Airline Industry*

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Abstract

This paper analyzes U.S. airline price and passenger data from 2000 disaggregated at the fareclass level. We find that while average prices to and from most airlines' hubs tend to be higher than those throughout the remainder of their systems, much of the difference can be explained by passenger mix (i.e. the proportion of leisure versus business passengers). Our results would tend to suggest, therefore, that many of the reported "hub premiums" in the previous literature may be overstated.

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1 Introduction

One of the most actively debated issues in the U.S. airline industry since its deregulation in 1978 has centered around the prices charged by network airlines for service to and from their hub airports. This topic, known as the "hub premium" debate, stems from the belief held by many travelers that they are being overcharged by network airlines on flights to and from their respective hubs.[1] In addition to much anecdotal evidence, numerous U.S. Government studies (e.g. U.S. General Accounting Office 1999, U.S. Department of Transportation 1990, U.S. General Accounting Office 1990) have found that "average fares" at concentrated hub airports tend to be higher–often substantially–than at other, non-hub airports. For example U.S. General Accounting Office (1999) reported that average fares at one hub were 83% higher than the national average, and another recent study (U.S. Department of Transportation 2001) goes so far as to refer to hubs as "pockets of pain."

The existing literature has studied and attempted to quantify the "hub premium" using–for the most part–one of two approaches. One set of studies (e.g. Morrison and Winston 1995, Borenstein 1999, Morrison and Winston 2000) analyzes a cross section of airports and attempts to relate airport concentration to average fares. These studies improve upon initial studies by the U.S. General Accounting Office (1990) and the U.S. Department of Transportation (1990) by attempting to control for factors known to impact fares, such as average distance, the proportion of connecting passengers, and frequent flyer tickets.[2] A second set of studies, (e.g. Borenstein 1989, Evans and Kessides 1993) disaggregates data at the carrier and route level–thus controlling for structural differences between routes–and attempts to distinguish between route and airport characteristics as sources of potential pricing power.[3] In general, this latter group of studies argues that high concentration by a single airline at an airport can lead to entry barriers in the form of frequent flyer programs, travel agency commission overrides, and long term leases on gates and airport facilities, among others, thus dampening non-stop competition and allowing the hub airline to charge supra-competitive fares. Borenstein (1989) also suggests that ownership of Computer Reservation Systems (CRSs) serves as an entry barrier by allowing large network airlines to bias the information presented to both travelers and travel agents, in favor of their own service.[4]

None of the studies mentioned above, however, have explicitly controlled for the passenger mix (the proportion of leisure versus business travelers), which is known to affect average fares, and thus, the estimation results in studies such as Borenstein (1989) and Evans and Kessides (1993) may suffer from omitted variable bias. Network airlines have long argued that average fares are higher on routes to and from their hubs

[1]See for example, "High Air Fares Getting Attention," *Cincinnati Enquirer*, December 20, 1999, "Flying Into Pockets of Pain: How Hub Airports Keep Fares High," *USA Today*, February 23, 1998, or "Behind these Sky-High Fares," *Denver Business Journal*, April 30, 1999.

[2]Whereas Morrison and Winston (1995) demonstrate that earlier findings by U.S. General Accounting Office (1990) are overstated after controlling for these factors, Borenstein (1999) finds similar results to the earlier government studies.

[3]While Borenstein (1989) finds evidence that concentration at either the route or airport level results in higher average fares, Evans and Kessides (1993), using a fixed effects approach, find that high market shares at the route level does *not* confer pricing power, while high concentration at the airport level does.

[4]It should be noted that the major U.S. airlines divested the majority of their CRS holdings during the 1990s.

compared to other routes within their networks because a greater proportion of passengers traveling to and from their hubs are business travelers, purchasing more flexible–and more expensive–unrestricted tickets. Since unrestricted tickets can cost several times as much as restricted coach tickets, network airlines argue that even a few extra unrestricted passengers per flight can have a relatively large impact on average fares. For example, an *Expedia.com* search for restricted, roundtrip, non-stop coach class tickets between Boston and Los Angeles yielded fares of $281, $295 and $295 on Delta, American, and United respectively. For *unrestricted* coach class tickets on the same flights, the fares were $2,583.50 on each of same three carriers.[5]

Given that most recent hub premium studies acknowledge that passenger mix impacts average fares, it is somewhat surprising that only one study (Gordon and Jenkins 2000) has explicitly attempted to control for this factor.[6] Using proprietary data from Northwest Airlines, the authors find that after controlling for passenger mix, distance, and the number of stops, Northwest's hub passengers receive a hub *discount* compared to Northwest's passengers traveling throughout the rest of its network. This study however, only focuses on Northwest Airlines and its methodology has been subject to criticism (for example, the authors treat passengers connecting from one of Northwest's regional partners as hub originating passengers). Thus, after more than a decade of debate, the hub premium controversy is still largely unresolved, a point echoed in a recent study by the Department of Transportation's Volpe Center:

> In analyzing these questions, researchers have employed various data sources and measurement techniques. Their studies also cover different time periods and use varying methods to control for the factors that influence an airline's costs and travelers' demands for their services, in order to isolate the degree to which airlines can set and maintain fares above competitive levels. None of these studies, however, has successfully isolated or controlled for differences in airlines' costs or in passengers' willingness to pay for different levels of service. As a result, the extent to which airlines are able to use "market power" to maintain high fares for trips to and from their hub airports remains controversial. (U.S. Department of Transportation 2000, page 2)

The purpose of this paper is to investigate the impact of passenger mix on the "hub premium" using fare data which has been disaggregated at the booking class level. To the best of our knowledge, this study is the first of its kind to use publicly available data which has been disaggregated at the fareclass level.[7] At the outset, it is important to note that there is no universally accepted definition of the "hub premium." While some studies are interested in the degree to which average fares (pooling all airlines) differ at hubs versus others airports (e.g. Morrison and Winston 1995, Borenstein 1999, Morrison and Winston 2000), others focus on comparing the prices of a network carrier's hub routes versus the prices of all airlines on otherwise similar

[5]Search performed on March 20, 2002 for travel between April 19–24, 2002.

[6]Several authors have attempted to indirectly control for passenger mix. For example, Borenstein (1989) includes a tourist index and Morrison and Winston (1995) excludes routes to and from popular tourist destinations.

[7]The data relied upon by Borenstein (1989) appears to have some disaggregated fare information, since he analyzes the 20th, 50th, and 80th percentile fares. However, the "hub premium" results reported in his Table 1 are limited to average fares. Moreover, the proportion of leisure and business travelers varies widely across routes, and hence, while the 80th percentile fare may represent a business traveler on some routes (i.e., Boston to Washington D.C.), it may represent a leisure passenger on others (i.e., Buffalo to Orlando). Evans and Kessides (1993) use all "coach" fares, however, the overwhelming majority of "business" fares are in fact *unrestricted* coach fares and thus, for all intensive purposes, their sample includes both types of travelers.

routes (e.g. Borenstein 1989, Evans and Kessides 1993). In this paper, we define the hub premium explicitly as the ability of a given network airline to charge passengers *in the same fare category* more per mile on routes to and from its hubs than on otherwise similar routes throughout the remainder of its network (i.e., those routes which connect via one of its hubs, or are between two non-hub airports). The prices on routes that neither originate nor terminate at a hub are widely considered to be good competitive benchmarks since the overwhelming majority of these routes are "spoke-to-spoke" routes which do not offer non-stop service, but provide competing one-stop service from numerous hubbing carriers. Thus, our approach differs from most other hub premium studies in that our primary focus is on comparing prices across different routes for a given airline. By focusing our analysis on the prices of a given airline, we can effectively control for the variations in cost and quality of service across different airlines. Even among the six "full service" airlines we study in this paper, costs and quality of service can differ significantly. For example, American, Continental and Delta all use Boeing 737-800 aircraft in two-class configurations. Whereas Delta and Continental configure their 737-800 aircraft with 154 and 155 seats respectively, American uses 134 seats, thus increasing unit costs and improving product quality.[8] For comparative purposes, we also estimate pooled OLS, instrumental variable (IV) regressions, as well as fixed effects models similar to those in Borenstein (1989) and Evans and Kessides (1993).

In general, we find that much of the observed "hub premium" can be explained by fareclass mix. Indeed, controlling for fareclass reduced the hub premium for restricted coach passengers at 18 of the 19 hubs in our sample, often substantially. For premium passengers (those purchasing unrestricted coach, business and first class tickets), the results were more mixed, with the hub premium falling at 12 airports, but increasing at the other 7. Controlling for passenger mix reduced the average (across the 19 hubs in our analysis) hub premium from 20.8% to 11.9% for restricted coach passengers; for premium passengers, the average hub premium fell to 13.8%. In general, our findings are consistent with Ramsey pricing: leisure travelers have much more price-elastic demand than business travelers, and thus, the less convenient and lower quality connecting service offered by competing carriers is likely to have a greater disciplining effect on restricted coach fares than on premium fares for service to and from hubs.[9] Results from our fixed effects estimation also find that controlling for passenger mix significantly reduces estimated hub premiums, however, there was no systematic difference between premium and restricted coach passengers. In particular, while the average fareclass aggregated premium in our fixed effects estimation was 18.9%, it fell to 10.2% and 11.0% for restricted coach and premium passengers respectively.

Although passenger mix is an important element in understanding the hub premium debate, we stress that our analysis does not account for a number of other quality of service factors–and their associated time savings–which likely impact average prices at hubs such as greater flight frequency or preferences for non-stop

[8] Source: Airline websites.

[9] For discussions of Ramsey pricing in the context of the airline industry, the reader is referred to Levine (2002) or Transportation Research Board (1999).

service. Moreover, our analysis does not consider the effect of frequent flyer tickets.[10] Consequently, our results are likely to overstate the true hub premium.

The remainder of this paper is organized as follows. Section 2 outlines the origins of the hub premium debate. Section 3 provides an overview of the data used for this study and presents preliminary findings. Section 4 summarizes the estimation results for individual, pooled, and fixed effect regressions by fareclass. Section 5 provides concluding remarks.

2 Origins of the Debate

The modern hub premium debate is rooted in airport level summary statistics linking above averages fares at hub airports to various measures of concentration. Consider for example, Table 1, which compares the average price per mile charged by hub carriers at their hubs, Origin and Destination (O&D) passenger shares and aircraft departure shares across the main U.S. airline hubs and the top 100 non hub airports. O&D passengers are those who are either beginning or ending their journey at the given airport and thus exclude "flow" passengers, that is, those who are merely connecting through that airport.

Insert Table 1 Here: Major U.S. Airline Hubs (2000)

Although Table 1 demonstrates that average prices to and from hubs tend to be higher than at other large U.S. airports, a number of studies (e.g. Morrison and Winston 1995) have shown that a simple comparison of average fares across airports can be misleading, since it fails to control for a number factors known to impact fares, such as the proportion of passengers traveling non-stop (presumably a higher quality product), the proportion of travelers choosing to purchase more flexible–and more expensive–unrestricted tickets, average distance, frequent flyer awards, and route density.[11] Table 2 below demonstrates how some of these factors varied across the networks of the six largest U.S. airlines in 2000.

Insert Table 2 Here: Some Possible Explanations for Observed Higher Prices At Hubs (2000)

Table 2 is consistent with the assertion made by airlines that a greater proportion of passengers travelling to and from hubs choose to purchase premium tickets, compared to passengers on routes neither originating nor terminating at an airline's hubs (i.e., the system remainder). One question which comes to mind is whether or not these hub cities generate proportionally more business travellers, or, whether the higher proportion

[10]Morrison and Winston (1995) found that controlling the frequent flyer awards (a greater proportion of which are redeemed by hub originating passengers) reduces the "hub premium" by 2.5 percentage points.

[11]Moreover, recent studies by Morrison (1999) and Morrison and Winston (2000) have shown that much of the difference in averages fares across airports can be explained by the proliferation of low fare carriers, which tend to avoid congested airports, and thus, lower average fares at non-hubs. For example, Morrison (1999) analyzes average fares at 11 concentrated hub airports in 1996 and finds that they are 21% higher than average fares at 64 of the other largest U.S. airports, but 7% *lower* than a control group of airports which excludes those served by Southwest Airlines. Morrison and Winston (2000), using 1998 data, find similar results.

of premium tickets is simply the result of airlines making fewer discounted seats available on flights to and from their hubs. Although an analysis of this question is not possible using publicly available data, Gordon and Jenkins (2000) found no evidence that Northwest made fewer discounted seats available on routes to and from their hubs compared to the remainder of their network. Moreover, data from the DOT's 1995 *American Travel Survey* confirm that hub cities, in general, generate a lower proportion of vacation travel than non-hubs. For example, for all travellers in the survey travelling by air, we computed the proportion, by destination, who stated that the primary purpose of their trip was "vacation." Of the eighteen hub cities listed in Table 2, only four (San Francisco, Denver, Salt Lake City and Miami) had vacation proportions above the median value for the 161 MSAs in the survey (.459) and eight hub cities were in the bottom quartile. Table 2 also illustrates that a far greater proportion of a network airline's passengers travelling to and from its hubs benefit from non-stop service compared to travellers throughout the remainder of its network.

3 Is There Evidence of a Hub Premium?

Our objective is to determine whether or not the six largest U.S. network airlines systematically charge higher prices to passengers traveling to and from their hubs compared to those traveling throughout the remainder of their networks after controlling for fareclass, distance, and other factors. That is, is there evidence of a hub premium?

3.1 Data

The data for this study is taken from the U.S. Department of Transportation's OD1B Origin and Destination Survey for calender year 2000, which represents a 10% sample of all tickets reported by U.S. Scheduled Passenger Carriers.[12] For the purposes of this study, we consider all domestic passengers in the data set traveling on roundtrip and one-way itineraries with three or fewer flight coupons per directional trip leg.[13] Moreover, we excluded zero fare, bulk fare and frequent flyer itineraries from our analysis. To account for possible coding errors, we also exclude tickets in which the price paid was less than 1.5 cents per mile for restricted coach and 3.0 cents per mile for unrestricted coach, business or first class. From the "directional" itineraries in the OD1B data, we construct non-directional airport-pair routes. There are 44,088 unique routes in our dataset representing over 39 million actual flight itineraries. Thus, a route is a unique pair of airports that does not distinguish point of origin or the particular routing–i.e. non-stop Boston to Seattle passengers travel on the same route as Seattle to Boston passengers making a connection in Chicago. Note

[12] This data is available from the Department of Transportation and from a number of DOT certified vendors. The specific data set used for our analysis is Data Base Products' "Hub Sup" Low Level O&D Data.

[13] A separate flight "coupon" is required for each flight with a unique flight number on a given itinerary. We exclude "interline" passengers (those using multiple marketing carriers on a single itinerary), "open-jaw" (i.e., BOS-LAX-JFK) and "circle" (i.e., BOS-LAX-SFO-BOS) itineraries. The proportion of passengers flying on one, two and three coupon directional legs was 64.25%, 34.33% and 1.42% respectively.

therefore, that each route, as we have defined it, consists of potentially many "routings," depending on the connecting point(s).

Our measure of price is the price paid per mile, inclusive of all taxes and fees. In computing the price per mile, we use the non-stop distance between the two endpoint airports, since passengers are not expected to want to pay more for circuitous routings. Since we are interested in the effect of fareclass mix, we consider restricted coach passengers and "premium" passengers (defined as unrestricted coach, business and first class) separately. Slightly over 80% of all of the passengers in our sample traveled on restricted coach fares and roughly 20% used premium fares, the overwhelming majority of which were unrestricted coach passengers. When an itinerary consisted of multiple faretype coupons, the faretype of the longest distance coupon was used.

3.2 Preliminary Findings

Tables 3–5 summarize the prices paid per mile by travelers for each of the six largest network airlines on routes to and from their respective hubs compared to travel throughout the remainder of their networks, by O&D mileage band and fareclass category. The percentage differences from the system remainder represent, by hub and mileage band, the difference that passengers traveling to and from the hub paid vis-à-vis passengers traveling throughout the remainder of that airline's network. Tables 3–5 also indicate the distribution of O&D passengers for each airline by hub and route distance. For example, Table 3 indicates that American Airlines passengers traveling between 1,000 and 1,250 miles to and from Chicago O'Hare (ORD) paid, on average, 19.0 cents per mile, which is 5.0% above what American Airlines' passengers paid for travel on routes between 1,000 and 1,250 miles which neither originate nor terminate at any of American's three hubs. This could include, for example, connecting passengers traveling on American from Austin to Fort Lauderdale or non-stop passengers traveling on American from Boston to Orlando. Moreover, Table 3 indicates that 12.2% of American's passengers traveling to and from Chicago O'Hare travelled within this mileage band. The *Average* figures summarizing the percentage difference from system remainder reported at the bottom of each carrier's table, weight each hub's price differences by the proportion of travelers in each mileage band.

The most direct comparison in the literature to the figures in Table 3 are the those reported in Borenstein (1989), Table 1. In general, the fareclass pooled "hub premium" figures in Borenstein (1989) tend to be somewhat higher than those reported in Table 3–the notable exception being US Airways to and from Pittsburgh, which Borenstein (1989) finds to be 16.6% higher than the remainder of USAir's network, versus 39.3% in our Table 3. This difference is likely related to USAir's acquisition of Piedmont Airlines, which was completed in 1989. For the other hubs that can be compared directly, we find the following (Borenstein (1989) Table 1 vs. our Table 3): American at DFW (41.8% vs. 30.5%), Delta at ATL (56.1% vs. 10.1%), Northwest at MSP (21.7% vs. 15.2%) and United at ORD (40.7% vs 25.1%). Thus, on a fareclass aggregated basis, the unadjusted "hub premiums" at four of the five airports common to both studies appears to have declined since 1987 (the date of Borenstein's data). The large change in the pooled "hub premium" at

Atlanta is almost certainly due to the growth of lowfare carrier AirTran (formerly ValuJet) which did not exist in 1987, but whose market share of O&D passengers at Atlanta had reached 14.1% by 2000.

Insert Table 3 Here: Price Per Mile and Difference from System Remainder (All Passengers)

The importance of controlling for passenger mix when attempting to quantify the hub premium can be seen by comparing Table 3 to Tables 4 and 5, which summarize the data for restricted coach and premium passengers separately. In Table 4 (restricted coach passengers), we see that the average percentage differences decline (relative to Table 3) at 18 of the 19 hubs (the sole exception being Salt Lake City, which already has a negative passenger weighted average price difference). Moreover, for Miami, Detroit, Memphis and Minneapolis, the average price difference becomes *negative*, implying that restricted coach passengers originating or terminating at these hubs pay less per mile, on average, than their non-hub counterparts. At other airports such as Chicago O'Hare, Atlanta and San Francisco, the average price difference is less than 5% for restricted coach passengers. On average, controlling for passenger mix reduces the average price differences by roughly 14.5 percentage points for restricted coach passengers compared to the pooled (i.e. Table 3) results. Moreover, our results for Northwest are very similar to Gordon and Jenkins (2000), which find hubs discounts for restricted coach passengers of roughly 6%.[14]

For premium passengers (Table 5), the average price difference declines (relative to Table 3) at 11 of the 19 hubs (including all Continental and US Airways hubs), but increases sharply at Chicago O'Hare (for both United and American), Atlanta and Denver. On average, controlling for passenger mix reduces the average price differences by roughly one percentage point for premium passengers compared to the fareclass aggregated data. Similar to restricted coach passengers, our results for Northwest's premium passengers are effectively the same as Gordon and Jenkins (2000) who find an average premium of roughly 2–3% across Northwest's three hubs.[15]

It is important to note that the average price difference can decline–relative to Table 3–for both restricted coach *and* premium passengers at a given hub, and that this in fact is the case at 11 of the 19 hubs in our sample. This is due the fact that premium tickets tend to cost significantly more than restricted coach tickets, and, as indicated in Table 2, the proportion of passengers purchasing premium tickets is typically higher for travel to and from hubs than throughout the remainder of a carrier's network. Thus, when fares are aggregated across passenger types, the averages fares at hubs tend to be biased upwards relative to the system remainder.

Insert Tables 4 and 5 Here: Price Per Mile and Difference from System Remainder For Restricted Coach and Unrestricted Coach Passengers

[14] Gordon and Jenkins (2000) aggregate their hub premium results across all three Northwest hubs.

[15] Like the results in Tables 4 and 5, Gordon and Jenkins (2000) account for passenger mix, but do not control for flight frequency or the proportion of passengers flying non-stop.

Although the results in Tables 3–5 are illuminating, care must be taken in their interpretation. To begin with, during our sample period, United, Delta and US Airways all had significant "low fare" divisions in their networks designed to compete directly with Southwest and other low fare carriers. These divisions, known as *Shuttle* by United, *Delta Express* and US Airways *MetroJet*, operated in short and medium haul markets, primarily along the East and West Coasts and to and from Florida. Since a disproportionate share of flights operated by these low fare divisions neither originated nor terminated at one of their parent carrier's hubs–the one main exception being *Shuttle* by United at San Francisco (SFO)–the average fares paid by the control group passengers (i.e., the system remainder) on routes of 1,250 miles or less will tend to be biased downwards for these carriers, thus inflating the hub price differences. Secondly, the differences at Chicago O'Hare (ORD) vis-à-vis the remainder of American and United's systems are likely to be biased upwards since Chicago O'Hare was one of four airports in the U.S. operating under the High Density Rule in 2000, and thus, prices to and from O'Hare likely reflect the additional cost of acquiring slots or the scarcity rents caused by government imposed limits on the number of flights.[16] Third, Tables 3–5 do not reflect the differences in average route density (the number of O&D passengers per day) across the various hubs.[17] For example, the median density on routes that Delta serves non-stop from Atlanta is 187, compared to a median route density of 51 at Cincinnati. Similarly, the median route densities at US Airways' two small hubs (Charlotte and Pittsburgh) are 127 and 128 passengers per day respectively, compared to a median density at Philadelphia of 357. Since less dense routes necessitate the use of smaller aircraft with higher per seat-mile operating costs, routes served to and from small hubs will tend to have higher costs, and hence prices, compared to larger hubs. Fourth, a greater proportion of passengers in the control group are connecting, rather than non-stop passengers, and thus, are effectively receiving a lower quality product than those passengers traveling to and from the various hubs. As seen Table 2, the percentage of passengers flying non-stop to and from the nineteen hubs in our analysis ranges from 79.2% at Washington-Dulles to 95.5% at Houston Intercontinental. Conversely, the proportion the carriers' passengers flying non-stop throughout the remainder of their respective networks ranges from roughly 2% on Northwest to 39.6% on American. Thus, even after controlling for passenger mix and distance, the observed price differences for travel to and from hubs compared to the remainder of each carrier's system will tend to be overstated in Tables 4 and 5, since they do not control for a number of factors, many of which impact product quality or costs. Finally,

[16]For the period of analysis in our paper, the High Density Rule (HDR) applied to Chicago O'Hare, Washington National (DCA), and New York's La Guardia (LGA) and JFK airports. In order to operate at these airports, carriers must possess take-off and landing "slots." Although many slots were initially grandfathered, a secondary market allows them to be bought, sold and leased. The HDR was lifted at ORD on July 1, 2002.

[17]It should be noted that there is a subtle but important distinction in the definition of a route's density. While density–as we've defined it–is based on the number of O&D passengers, in a network setting, density is perhaps better measured by total passengers (O&D in additional to flow) since this ultimately determines suitable equipment type which in turn influence costs (Brueckner, Dyer, and Spiller 1992, Brueckner and Spiller 1994). A complete measure of route density, therefore, would attempt to measure the number of onboard passengers travelling on each of the potential composite spokes which could be combined to create a feasible routing on the airport pair route. However, limitations in the data reported to the Department of Transportation make this approach difficult. For example, while onboard passengers are reported at the segment level in the DOT's T100 Database, there is no equivalent database for certain commuter carriers (those carriers reporting under the DOT's Form 298C), many of which serve as regional codeshare partners for some of the major network carriers. Thus, for the purposes of this analysis (including the estimations in Section 4), we proxy for density using O&D passengers only.

we should emphasize that care must be taken when comparing the results of Tables 3–5 across carriers, since the premiums at each carriers' hubs are relative to the prices paid in the remainder of their own systems. Thus, while a given carrier may have small (or negative) hub premiums relative to the remainder of its own network, the absolute prices at its hubs may be higher than at other carriers' hubs if its overall prices tend to be higher.

4 Estimation Results

Our approach to assess the effect of hubs on airline prices is to estimate a price equation. In this equation, an appropriate measure of price for a given route and airline is regressed on measures of competition including hub indicators in addition to control variables that may influence the cost and demand characteristics on that route. Thus, the price equation can be thought of as reduced form specification, where demand and supply characteristics of the route are included as explanatory variables.

In general, the approach used in the literature to estimate airline price equations has been to pool the data of different carriers together and use firm dummy variables to control for firm specific effects such as differences in costs or quality of service. This approach assumes however, that the effects of the various right hand side variables on prices is constant across all carriers. There may be reasons to expect however, that specific competitive factors affect carriers in different ways. For example, the degree of head-to-head competition from low fare carriers varies substantially across the different network carriers, as has the way in which the network carriers have responded to them. A Chow test on our data soundly rejects pooling, and thus, we begin by estimating ordinary least square (OLS) and instrumental variable (IV) models for each of the six large network airlines individually. Moreover, Chow tests for each of the six carriers rejects pooling at the fareclass level, and thus, we estimate separate regressions for restricted coach and premium passengers as well. In addition to the individual airline regressions, we also report pooled OLS and IV regressions (Section 4.2), in addition to fixed effect models (Section 4.3), so that our results may be compared more directly to the literature.

4.1 Individual Airline Regressions

Since the variance in the number of passengers for a given carrier across routes is fairly large, we restrict our estimations to routes where the carrier served, on average, at least one passenger per day in 2000 (this screen eliminates between one-half and two-thirds of the routes served by a given carrier). The basic equation we estimate is the following:

$$\ln(P_j) = X_j'\beta + \varepsilon_j$$

where $\ln(P_j)$ is the natural log of the carrier's average price per mile on route j, X_j is a vector of regressors (including a constant) and ε_j is a random error term assumed to be i.i.d. with mean zero and variance σ_ε^2.

The vector X includes a constant plus:

$rshare_j$ (route market share), the carrier's share of O&D passengers in 2000 on route j. Previous research (e.g. Borenstein 1989) has shown that a high route share for an airline may confer pricing power on that route so we expect the coefficient to be positive. In order to deal with the possible endogeneity in the determination of prices and market shares on a given route, our IV estimations instrument for $rshare_j$ using 1999 route share.[18]

$lowfare_j$, (low-fare competition), a dummy variable which takes the value 1 if low fare carriers collectively have greater than a 1% share of O&D passengers on route j and 0 otherwise. We include in our list of low-fare carriers: JetBlue, Frontier, Tower, AirTran, Midway, Legend, National, Vanguard, Spirit, ProAir, ATA, Southwest, Access Air and Sun Country.[19] Numerous studies (e.g. Morrison 2001, Morrison and Winston 2000, Transportation Research Board 1999) have found that competition by low-fare carriers has a large impact on the prices of all carriers serving that route, and thus, we expect the estimated coefficient to be negative.[20]

$lnmiles_j$, (distance), the natural log of non-stop distance for route j. Other things being equal, we expect average price per mile to decline as trip distance increases, since the per mile costs associated with a given flight decline sharply as distance increases. We use a route's non-stop distance as opposed to itinerary distance because passengers are not expected to be willing to pay more for circuitous routings.

$lnmktpax_j$, (density), the natural log of total route passengers for all carriers serving route j in 1999. Greater route density allows airlines to exploit well-known economies of density by using larger, more cost efficient aircraft (Brueckner, Dyer, and Spiller 1992, Brueckner and Spiller 1994). We proxy for route density using the total number of O&D passengers who travelled on that route in 1999.

$owprop_j$, (one-way tickets), the proportion of the carrier's passengers purchasing one-way tickets on route j. We control for the fact that airlines tend to price one-way tickets more expensively (per leg) than round trip tickets.

Slots. For the period of our analysis, four airports in the U.S. had government imposed limits on the number of takeoffs and landings that may take place each hour. To account for the effects of these restrictions on prices (either the scarcity value or the additional cost of acquiring slots), we include dummy variables for each slot controlled airport, which take the value 1 if either endpoint on route j is one of the four slot constrained airports (Chicago O'Hare (ORD_j), Kennedy (JFK_j), La Guardia (LGA_j) and Reagan National (DCA_j)) and 0 otherwise.

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[18] We also tried the intra-route rank instrument used by Evans and Kessides (1993), which takes the values 1 and 2 for the carriers with the largest and second largest route market shares respectively, and takes the value 3 for all other carriers serving that route. However, we found that 1999 route share provided a better fit.

[19] The results do not vary significantly if the threshold is set at 5% or 10%.

[20] We could have included other variables to control for the route market structure. We also tried the route Herfindahl index but the described dummy perform better.

Hubs. We want to determine if airlines systematically charge higher prices per mile for flights originating or terminating at one of their hubs, beyond any potential pricing power conferred by route market share. Therefore, we include *hub dummies* for each of the carrier's hubs which equal 1 if either endpoint of route j is a hub for that airline and 0 otherwise. Our approach differs from Borenstein (1989) or Evans and Kessides (1993) in that we control explicitly for the presence of a particular hub as opposed to using airport market shares.[21] We believe that this approach may be more revealing than those used in previous studies by allowing us to distinguish potential differences between the hubs of a given airline. Tables 3–5 also suggest that the estimated coefficients on the hub dummy variables will tend to be lower for restricted coach passengers compared to the fareclass aggregated regressions.

Readers familiar with the literature will note that we do not include $nsprop_j$, the proportion of the carrier's passengers flying non-stop on route j, as one of our regressors. The reason we have excluded it from this section of our analysis is that we cannot disentangle its effect with those of the various hub dummies. Thus, the estimated coefficients on the hub dummies in these specifications likely reflect–in part–differences in the proportion of non-stop service at hubs versus non-hubs in addition to the hub premium. Our fixed effects results reported in Section 4.3 include $nsprop_j$ (in one of our specifications) so that we may compare those results with those in the previous literature.

The IV (instrumenting for $rshare_j$) and OLS results for the six major network carriers are summarized in Tables 6–8 below. Note that US Airways did not serve JFK airport in 2000 (nor does it today) and since American and United operate hubs at Chicago O'Hare, the *ORD* dummy variable is dropped in the corresponding regressions.

Insert Tables 6, 7 and 8 Here: Estimation Results

The estimated coefficients from Tables 6–8 are, in general, as expected. The estimated coefficients on *rshare* for the fareclass disaggregated regressions are typically positive when significant, with the exception of United's premium passengers, for which the coefficient is both negative and significant. This somewhat surprising finding is likely the result of the highly publicized labor problems that United experienced throughout the summer of 2000 which resulted in the cancellation or delay of thousands of its flights. For example, data from the Department of Transportation's *Air Travel Consumer Reports* for July of 2000 indicates that nearly one third (31.5%) of United's scheduled flights arrived late 70% of the time or more compared to less than 1% for both Delta and American. In order to win back business customers following these labor problems, United was forced to discount prices in addition to offering their top tier frequent flyers additional incentives (double the standard bonus miles) on all flights throughout the latter half of 2000.[22] For other carriers, the impact of higher route share on prices is relatively modest. For example, prices for Northwest's restricted

[21]Whereas Evans and Kessides (1993) use the simple average of the carrier's market share of O&D passengers at both endpoints, Borenstein (1989) uses the weighted average.

[22]See, for example, "United Airlines tries to woo back wary travellers," *Cedar Rapids Gazette,* September 14, 2000.

coach passengers (the subgroup of passengers with the largest significant estimated coefficient on *rshare*) are 6% higher on routes where Northwest has a 75% route share compared with an otherwise similar route with a 25% route share. In contrast, the impact of low fare service has a very strong, negative impact on prices. Overall, the presence of a low fare carrier lowers prices on a route by between 15% and 23%. As expected, the impact of a low fare carrier is usually much greater on restricted coach fares than on premium fares. The estimated coefficients on *lnmiles* are consistently negative and significant and indicate that controlling for other factors, doubling a flight's length roughly reduces the price per mile by 60% to 70% for restricted coach passenger and by 40% to 50% for premium passengers. Care must be taken when interpreting the coefficients on *lnmiles* since many airline taxes and fees are independent of trip length and will therefore have a disproportionate impact (per mile) on short flights.

The overall impact of passenger density is, as expected, negative and significant for all carriers when fareclasses are aggregated. In general, a ten-fold increase in market density (i.e. 1,000 versus 100 passengers per day) reduces prices by between 21% and 55%. Looking at the fareclass disaggregated results, increased density tends to lowers prices for restricted coach passengers more than for premium passengers, which is consistent with the fact that dense markets attract more competition from low fare carriers, which in turn tends to put more downward pressure on leisure than business fares. The estimated coefficients on *owprop* are positive and significant for all carriers, as expected, due to the fact that one-way tickets are generally more expensive (per leg) than roundtrip tickets. Moreover, the estimated coefficients on *owprop* tend to be small for premium passengers, consistent with the fact that many unrestricted roundtrip tickets are priced the same as two separate one-way tickets.

The estimated coefficients for the various slot dummy variables indicate that there are substantial differences between the four slot controlled airports. Flights to and from La Guardia are more expensive on all carriers regardless of fareclass when compared to otherwise comparable routes to and from other airports. For restricted coach passengers, flights to and from LGA are between 6% and 19% more expensive than otherwise comparable routes; for premium passengers, they are 10% to 28% more expensive (for carriers with significant IV coefficients at the 5% level). Flights to and from DCA tend to be more expensive for premium passengers, however, restricted coach passengers do not–in general–pay more to fly to and from DCA compared to other airports. The fact that business passengers bear a greater proportion of the extra costs (or scarcity rents) of serving DCA is likely due to its close proximity to the Washington D.C. (compared to Dulles or BWI) which makes it a particularly attractive airport for business travellers. The estimated coefficients on *JFK* tend to be mixed, with some carriers (i.e. United) charging higher prices for service to and from JFK and other carriers (i.e. Northwest and Delta) charging generally lower prices. For the four network carriers which do not operate hubs at O'Hare, prices on routes to and from ORD are generally not higher for restricted coach passengers, but are between 7% and 20% higher for premium passengers.

4.1.1 Hub Premiums

The estimated coefficients on the various hub dummy variables are generally consistent with the findings from Tables 3–5: much of the observed "hub premium" is explained by passenger mix. In particular, controlling for passenger mix lowered the estimated coefficients for restricted coach passengers at 18 of the 19 hubs (the exception being Miami, where the coefficient remains negative), vis-à-vis the fareclass aggregated model, and at 12 of the 19 hubs for premium passengers. For example, while the fareclass aggregated regressions would indicate that US Airways' flights to and from Pittsburgh are 23.9% more expensive per mile than its otherwise similar routes neither originating nor terminating in Pittsburgh, the separated fareclass regressions indicate that the prices for restricted coach passengers are only 5.8% higher, and prices for premium passengers are 18.3% higher. Overall, controlling for passenger mix has the greatest impact at hubs which are relatively smaller cities, such as Memphis, Pittsburgh, Charlotte and Cincinnati. This is to be expected, since these hubs generate the highest proportions of passengers purchasing unrestricted fares (see Table 2). Put differently, these cities tend to generate proportionally fewer leisure travelers than other larger cities. The hubs with the highest premiums (with estimated IV coefficients significant at the 5% level) for restricted coach passengers are Newark (36.9%) and Denver (29.4%) whereas the hubs with the lowest premiums for restricted coach passengers are Miami (-6.9%) and Salt Lake City (3.8%). The estimated coefficients for Chicago O'Hare (for American), Memphis and San Francisco are not significant at the 5% level, indicating that there is no evidence of a hub premium for restricted coach passengers at these airports. For premium passengers, the hubs with the highest (and significant at the 5% level) premiums are Denver (40.5%), Washington-Dulles (23.9%) and Chicago O'Hare (32.6% for United, 20.8% for American) and the hub with the lowest premium is Memphis (-10.3%). The estimated coefficients for Miami, Salt Lake City, Detroit and Minneapolis are not significant, indicating that there is no evidence of a hub premium for premium passengers at any of these hubs. It should be noted that the estimated coefficients on the Chicago O'Hare hub dummies for American and United capture both the hub premium effect in addition to the effect of the *ORD* slot dummy, which is dropped for estimation purposes for these carriers since it is perfectly correlated with the ORD hub dummy variable. Finally, our results for Northwest tend to be consistent–for the most part–with those of Gordon and Jenkins (2000). In particular, we find that the fareclass aggregated regressions would indicate positive and significant hub premiums averaging 16% across Northwest's three hubs. However, controlling for fare mix results in negative or insignificant coefficients for four of the six subgroups of passengers, the exceptions being restricted coach passengers at Detroit and Minneapolis.

In summary, the results from Tables 6-8 confirm that failing to control for passenger mix tends to inflate the hub premium. Aggregating across fare types inflates the average (across our nineteen hubs) hub premium by over 70% (i.e., from 11.9% to 20.8%) for restricted coach passengers and by over 50% (i.e., from 13.8% to 20.8%) for premium passengers.

4.2 Pooled Regressions

We next report results from pooled IV and OLS regressions by combining the data for each of the six carriers from the previous section. Thus, the model becomes:

$$\ln(P_{ij}) = X_{ij}'\beta + \varepsilon_{ij}$$

where $\ln(P_{ij})$ is the natural log of carrier i's average price per mile on route j, X_{ij} is a vector of regressors defined analogously to X_j in the previous section (plus five airline dummies), and ε_{ij} is an error term assumed to be i.i.d. with mean 0 and variance σ_{ε}^2. The hub dummies take the value 1 if for carrier i, either endpoint of route j is one of carrier i's hubs, and 0 otherwise. Note that the interpretation of the estimated coefficients on the hub dummies in these pooled regressions differs from the interpretation in the separate regressions. In particular, the hub dummies now capture price differences between carrier i's flights to and from one of its hubs compared to other flights for that carrier (not to and from that hub) and the flights of all other network carriers, both to and from that hub and elsewhere.

The results of the pooled estimations are summarized in Table 9. In general, the results from Table 9 are similar to those in Tables 6–8, with the estimated coefficients on *rshare* and *owprop* being positive and significant, and those on *lowfare*, *lnmiles* and *lnmktpax* all being negative and significant. The estimated coefficients on the four slot controlled airport dummies are also all significant at the 5% level, with *JFK* being negative overall and for restricted coach passengers. Since the prices of a given carrier are now being compared to those of the other network carriers, the interpretation of the estimated coefficients on the hub dummies is slightly different. For example, Table 9 indicates that flights on Delta to and from Cincinnati are, on average, 26.5% more expensive than flights with similar route characteristics on other network carriers (including those to and from Cincinnati, but on other carriers) in addition to Delta's other flights which neither originate nor terminate at Cincinnati. For restricted coach passengers, Delta's flights to and from Cincinnati are roughly 11.2% more expensive and for its premium passengers, their flights are roughly 14.9% more expensive.[23] Note that in order to correctly interpret the impact of American and United's O'Hare hub, one must first add the appropriate estimated coefficient from the *ORD* slot dummy to *AA hub3* or *UA hub3*.

In general, Table 9 confirms that controlling for passenger mix impacts the "hub premium": the estimated coefficients are lower for each of the nineteen hubs except Miami (which remains negative) for restricted coach passengers versus the fareclass aggregated model. Note that in the present context, we use the convention "hub premium" to distinguish it from the hub premium defined earlier in the paper (i.e., comparing the hub versus non-hub prices for an individual carrier.) For premium passengers, the estimated coefficients are lower at fifteen of the nineteen hubs. Controlling for passenger mix inflates the average "hub premium" by

[23] As noted earlier, the average route density to and from Cincinnati is very small, even when compared to other small hubs such as Charlotte and Pittsburgh. Thus, a large proportion of flights to and from Cincinnati use smaller aircraft (including many regional jets) which tend to have higher per seat-mile operating costs than larger aircraft.

over 9 percentage points (21.1% vs. 11.9%) for restricted coach passengers and by over 8 percentage points (21.1% vs. 12.9%) for premium passengers.

Insert Table 9 Here: Pooled IV and OLS Results for Network Carriers

4.3 Fixed Effects

Finally, in order to compare our results more directly to Evans and Kessides (1993), we also estimate IV, OLS, fixed effects and fixed effects IV models for all carriers (not only the six network carriers) using the top 1,000 routes. Like Evans and Kessides (1993), we eliminate from our sample observations where a carrier has less than a 1% share of a route's total O&D traffic. Summary statistics for the variables used in this section are presented in Table 10 below and are extremely similar to those reported by Evans and Kessides (1993), Table 1.[24]

Insert Table 10: Variable Definitions and Descriptive Statistics For Fixed Effects Estimations

Fixed effects estimation allows us to control for unobservable effects correlated with the observed explanatory variables, lessening possible biases due to omitted variables. Like Evans and Kessides (1993), our data rejected the random effects model and therefore, we do not report the results for this specification. The route fixed effects control for demand and cost differences that are common for all airlines serving the same route (such as route density or passenger facility charges) but that vary across routes. Note that this approach does not permit identifying the effects of variables that do not vary within a route. The equation we estimate is:

$$\ln(P_{ij}) = X'_{ij}\beta + u_j + \varepsilon_{ij},$$

where $\ln(P_{ij})$ is the natural log of carrier i's average price per mile on route j, X_{ij} is a vector of regressors that varies with the airline's identity within a route and u_j are the route fixed effects. The random error ε_{ij} is assumed to be i.i.d. with zero mean and variance σ^2_ε. The vector X includes a carrier's route market share, the proportion of one-way tickets, the proportion of non-stop tickets (for certain specifications), a set of hub dummies, and airline dummies which will capture firm differences constant across routes (i.e. quality of service, etc.).

We compare two basic models. Model 1 follows the same approach used throughout Section 4.2 by attempting to directly capture the impact of hubs on average prices by including dummy variables for each of the nineteen hubs. Again, due to collinearity between the hub dummy variables and *nsprop*, we exclude *nsprop* from Model 1. Model 2, on the other hand, follows the previous literature which attempts

[24]Note that the fares in our dataset include all fees and taxes, which likely explains why our mean fare is somewhat higher than the mean fare reported by Evans and Kessides (1993).

to indirectly capture the effects of hubs on prices using $endptms_{ij}$, defined as the simple average of airline i's market share of O&D passengers at the two endpoints of route j. Consistent with Evans and Kessides (1993), we also include *nsprop* in Model 2. Evans and Kessides (1993) found that when $endptms_{ij}$ is used to measure airport presence, the estimated coefficient on $rshare_{ij}$ becomes insignificant with fixed effects estimation. The authors concluded that there is "no significant correlation between route market share and price." Results for OLS, IV, fixed effect (FE) and fixed effect IV (FE-IV) regressions are summarized in Tables 11, 12 and 13, for all passengers, coach passengers and premium passengers respectively.

Insert Tables 11, 12 and 13 Here: Fixed Effect Results

Both models provide a similar fit for all specifications and the fit is better for the fixed effect models than for the OLS and IV regressions. Overall, the "hub premium" results from Model 1 are similar to those from the individual (Tables 6-8) and pooled (Table 9) regressions for the larger set of routes. In absolute terms, for the OLS and IV regressions, the "hub premiums" for the smaller sample of routes are higher than those for the larger sample of routes reported in Table 9, as one would expect, since the sample now includes low fare carriers. Thus, the average "hub premium" for the top 1,000 routes (in the IV corrected Model 1) is 18.2% for restricted coach passengers and 28.0% for premium passengers, compared to 11.9% and 12.9% for the larger set of routes (but restricted set of carriers) in Table 9. The "hub premiums" in Model 1 for the FE-IV model, however, are substantially lower than those for either the IV or the OLS model. Moreover, the estimated coefficients from the FE-IV model indicate that failing to control for fareclass inflates the average "hub premium" for restricted coach passengers by 85% (from 10.2% to 18.9%); for premium passengers, the average "hub premium" is inflated by over 70% (from 11% to 18.9%).

In general, the estimated coefficients using Model 2 are similar to those of Evans and Kessides (1993): route share becomes insignificant in explaining prices (in the FE-IV specification), whereas airport market share (*endptms*) is positive and significant. However, we do not reproduce this result with Model 1, which uses hub dummies instead of *endptms*, as we obtain a positive and significant estimated coefficient for $rshare_{ij}$.[25]

5 Conclusions

What does our analysis add to the decade-long debate over "hub premiums?" Our analysis indicates that much of the observed difference in average prices charged by airlines at their hubs compared to the remainder of their networks can be explained by passenger mix. Controlling for passenger mix alone lowered apparent hub premiums for both unrestricted coach and premium passengers at 12 of the 19 hub airports in our sample, often substantially. Stated differently, failing to control for passenger mix overstates the hub premium for restricted coach passengers by an average of 73.8%, inflating the average hub premium from 11.9% to 20.8%

[25]For our data set, the correlation between *rshare* and *endptms* is 0.83. We suspect that the somewhat surprising result of Evans and Kessides (1993)–that route share does not impact prices–may be due to multicollinearity.

(see Tables 6–8). For premium passengers, failing to control for passenger mix inflates the hub premium by an average of 50.8%. Although our methodology differs from previous studies comparing the average fares of all airlines across airports, our results would tend to indicate that the reported "hub premiums" in many of these studies may tend to be inflated by failing to explicitly control for passenger mix.

Nevertheless, our analysis does find evidence that most network airlines do indeed charge more per mile for service to and from their hubs compared to service throughout the remainder of their networks even after controlling for factors such as passenger mix, density, distance and a number of other factors. Furthermore, these hub premiums, when they exist, tend to be larger for passengers purchasing unrestricted coach, business and first class tickets. However, it is these passengers who are most likely to place a high value on the time savings and convenience offered by high frequency, non-stop service to a wide array of destinations made possible by the hub-and-spoke system. Moreover, the hubs with the largest premiums often tend to be in relatively small cities (Cincinnati, Charlotte and Pittsburgh for example) which typically serve thinner average routes using smaller and more costly to operate (per seat-mile) aircraft, and which absent the hub, would have substantially less service. Finally, it is important to emphasize that the results in our study do not control for a number of other important factors which produce significant benefits to travellers and are likely to inflate our reported hub premiums. These include flight frequency, frequent flyer tickets, and the preference for non-stop over connecting service.

Table 1: Major U.S. Airline Hubs (2000)

	Average Price Per Mile (cents)	O&D Passenger Share	Share of Domestic Aircraft Departures
Largest 100 Non-Hubs	**27.1**	**40.6%**	**38.4%**
American			
Dallas (DFW)	30.7	54.7	70.4
Miami (MIA)	22.4	39.2	62.2
Chicago O'Hare (ORD)	30.2	32.0	43.4
Continental			
Cleveland (CLE)	37.1	46.5	71.6
Newark (EWR)	33.8	53.9	64.0
Houston (IAH)	28.2	64.6	82.2
Delta			
Atlanta (ATL)	33.5	61.3	75.8
Cincinnati (CVG)	45.9	75.5	90.9
Salt Lake City (SLC)	19.6	51.0	66.2
Northwest			
Detroit (DTW)	35.2	55.9	81.0
Memphis (MEM)	35.4	48.3	72.5
Minneapolis (MSP)	31.0	61.0	81.0
United			
Denver (DEN)	29.2	50.0	71.8
Washington Dulles (IAD)	26.7	41.0	45.9
Chicago O'Hare (ORD)	30.2	44.3	45.1
San Francisco (SFO)	23.1	44.9	53.3
US Airways			
Charlotte (CLT)	52.7	68.3	87.2
Philadelphia (PHL)	44.4	50.8	62.5
Pittsburgh (PIT)	53.4	68.3	81.2

All domestic itineraries excluding interline, zero fare, and frequent flyer tickets. Share figures for largest 100 non-hubs computed as the mean of the largest carrier at each airport. O&D Passenger Shares represent the hub carrier's market share of all passengers either beginning or ending their journey at the given hub airport. Share of domestic aircraft departures based on hub airlines' share of passenger aircraft departures at the given airport. Average price per mile includes all fees and taxes, and is based on non-stop distance between airports.
Source: U.S. DOT T100 and DB1A Databases

Table 2: Some Possible Explanations for Observed Higher Prices At Hubs (2000)

	% of Passengers Flying Non-stop	% of Passengers Using Premium Tickets	% of Carrier's Total O&D Passengers	Median Passenger Trip Length (Miles)
American				
Dallas (DFW)	95.2	27.6	22.8	937
Miami (MIA)	86.6	21.0	7.0	1,097
Chicago O'Hare (ORD)	93.8	25.2	17.8	802
System Remainder	*39.6*	*19.2*	*52.2*	*1,411*
Continental				
Cleveland (CLE)	91.4	14.1	12.5	622
Newark (EWR)	95.3	15.1	35.5	1,008
Houston (IAH)	95.5	9.9	23.8	964
System Remainder	*3.8*	*5.0*	*28.2*	*1,301*
Delta				
Atlanta (ATL)	95.1	14.9	24.3	606
Cincinnati (CVG)	87.3	28.9	5.3	623
Salt Lake City (SLC)	80.0	6.1	6.5	630
System Remainder	*31.2*	*9.3*	*64.0*	*1,005*
Northwest				
Detroit (DTW)	93.3	13.4	25.6	534
Memphis (MEM)	85.0	23.0	5.4	683
Minneapolis (MSP)	93.0	18.0	26.1	980
System Remainder	*2.0*	*7.8*	*42.9*	*1,182*
United				
Denver (DEN)	89.3	12.9	16.1	905
Washington Dulles (IAD)	79.2	17.0	6.3	1,452
Chicago O'Hare (ORD)	93.4	21.6	22.2	837
San Francisco (SFO)	84.3	28.3	18.2	678
System Remainder	*21.5*	*16.1*	*37.3*	*1,368*
US Airways				
Charlotte (CLT)	88.7	44.4	8.0	543
Philadelphia (PHL)	84.5	33.0	15.0	678
Pittsburgh (PIT)	85.2	37.7	9.4	467
System Remainder	*37.1*	*23.7*	*67.9*	*722*

Notes: All domestic itineraries excluding interline, zero fare, and frequent flyer tickets. "Premium" tickets include Unrestricted Coach, Business and First Class. System Remainders include all passengers not traveling to/from one of the airlines' respective hubs. % of Carrier's Total O&D Passengers represent the proportion of carrier's total passengers either starting or completing their travel at the given hub.
Source: U.S. DB1A and T100 Databases.

Table 3: Price Per Mile and Difference from System Remainder (All Passengers)

American	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	DFW	MIA	ORD	Remainder	DFW	MIA	ORD	DFW	MIA	ORD
< 250	48.6	69.4	79.0	81.8	-40.6	-15.2	-3.4	8.4	6.3	5.0
250-500	34.0	37.1	44.4	30.8	10.4	20.5	44.2	11.0	1.4	11.0
500-750	31.5	23.1	33.7	27.4	15.0	-15.7	23.0	14.0	7.4	28.1
750-1000	30.7	20.8	30.3	22.9	34.1	-9.2	32.3	22.0	10.8	19.4
1000-1250	25.7	19.5	19.0	18.1	42.0	7.7	5.0	22.1	51.8	12.2
1250-1500	28.1	16.5	13.0	17.1	64.3	-3.5	-24.0	16.4	7.7	4.5
1500-1750	25.2	16.3	14.7	14.7	71.4	10.9	0.0	4.8	1.6	13.2
1750-2000	–	15.6	20.6	13.1	–	19.1	57.3	0.0	0.7	4.1
2000+	14.0	15.2	11.9	14.3	-2.1	6.3	-16.8	1.3	12.3	2.6
Average					30.5%	2.0%	18.8%			

Continental	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	CLE	EWR	IAH	Remainder	CLE	EWR	IAH	CLE	EWR	IAH
< 250	151.3	101.5	54.6	68.5	120.9	48.2	-20.3	2.7	11.0	9.7
250-500	54.2	62.1	36.0	39.5	37.2	57.2	-8.9	38.4	10.2	13.4
500-750	39.6	32.3	23.8	27.9	41.9	15.8	-14.7	11.8	15.2	9.8
750-1000	17.4	17.3	25.4	21.4	-18.7	-19.2	18.7	11.6	13.1	21.7
1000-1250	20.9	17.3	22.1	17.0	22.9	1.8	30.0	15.6	21.3	16.4
1250-1500	16.8	27.5	24.7	14.8	13.5	85.8	66.9	0.7	5.1	17.5
1500-1750	11.2	18.2	20.7	13.2	-15.2	37.9	56.8	3.4	6.0	8.4
1750-2000	9.8	16.0	16.9	11.2	-12.5	42.9	50.9	6.6	0.5	2.1
2000+	12.6	16.2	14.5	9.6	31.3	68.8	51.0	9.4	17.5	1.0
Average					25.6%	30.4%	22.4%			

Delta	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	ATL	CVG	SLC	Remainder	ATL	CVG	SLC	ATL	CVG	SLC
< 250	104.5	127.7	46.2	65.7	59.1	94.4	-29.7	4.3	4.5	0.1
250-500	45.9	70.8	33.7	47.6	-3.6	48.7	-29.2	25.2	27.1	10.1
500-750	27.4	46.0	19.5	29.4	-6.8	56.5	-33.7	38.2	22.9	45.8
750-1000	24.6	27.7	21.9	19.2	28.1	44.3	14.1	16.8	23.1	6.0
1000-1250	21.4	22.0	18.0	15.1	41.7	45.7	19.2	2.0	4.7	5.8
1250-1500	18.0	23.6	16.0	16.4	9.8	43.9	-2.4	0.6	1.4	5.9
1500-1750	17.9	15.5	17.7	14.4	24.3	7.6	22.9	4.1	4.4	5.9
1750-2000	17.9	16.5	14.8	13.0	37.7	26.9	13.8	4.2	8.4	14.5
2000+	18.2	16.3	12.8	11.3	61.1	44.2	13.3	4.7	3.6	6.0
Average					10.1%	47.5%	-12.4%			

Northwest	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	DTW	MEM	MSP	Remainder	DTW	MEM	MSP	DTW	MEM	MSP
< 250	65.3	101.4	103.2	83.2	-21.5	21.9	24.0	14.6	2.7	2.6
250-500	44.8	53.2	47.3	49.0	-8.6	8.6	-3.5	23.6	25.1	19.9
500-750	37.6	35.4	36.5	32.9	14.3	7.6	10.9	23.9	26.0	14.9
750-1000	18.5	24.7	27.7	23.5	-21.3	5.1	17.9	11.6	27.2	15.2
1000-1250	17.3	19.4	29.1	18.1	-4.4	7.2	60.8	9.0	4.8	13.9
1250-1500	15.3	19.0	14.8	15.5	-1.3	22.6	-4.5	0.5	3.4	18.9
1500-1750	10.9	19.0	17.1	13.7	-20.4	38.7	24.8	6.8	5.0	13.0
1750-2000	15.4	16.9	—	11.8	30.5	43.2	50.8	7.3	5.1	0.0
2000+	17.3	12.0	11.0	10.4	66.3	15.4	5.8	2.7	0.7	1.5
Average					-2.0%	11.5%	15.2%			

Table 3 (Cont.)

US Airways	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	CLT	PHL	PIT	Remainder	CLT	PHL	PIT	CLT	PHL	PIT
< 250	121.3	133.8	126.8	77.0	57.5	73.8	64.7	5.6	7.9	9.8
250-500	69.0	70.0	67.3	47.3	45.9	48.0	42.3	34.9	29.1	47.1
500-750	42.3	32.9	33.7	28.8	46.9	14.2	17.0	42.5	16.9	7.7
750-1000	34.6	17.8	19.1	17.4	98.9	2.3	9.8	5.2	24.4	18.5
1000-1250	33.3	19.7	26.5	13.1	154.2	50.4	102.3	0.0	5.3	3.9
1250-1500	22.3	21.8	23.4	14.9	49.7	46.3	57.0	2.0	2.6	1.6
1500-1750	20.3	17.8	16.8	14.2	43.0	25.4	18.3	0.1	2.3	0.4
1750-2000	14.2	—	13.3	11.2	26.8	0.0	18.8	2.6	0.0	3.5
2000+	16.2	14.0	15.6	9.9	63.6	41.4	57.6	7.1	11.6	7.5
Average					50.6%	32.0%	39.3%			

United	Price per Mile (cents)					% Difference from System Remainder				% of Passengers in Mileage Band			
Mileage	DEN	IAD	ORD	SFO	Rem.	DEN	IAD	ORD	SFO	DEN	IAD	ORD	SFO
< 250	97.6	63.0	76.6	44.1	55.2	76.8	14.1	38.8	-20.1	1.4	5.1	4.8	1.2
250-500	49.8	36.7	45.0	28.8	28	77.9	31.1	60.7	2.9	6.9	11.6	13.8	35.7
500-750	31.4	31.8	34.5	18.8	28.1	11.7	13.2	22.8	-33.1	17.4	14.2	27.7	13.9
750-1000	29.2	18.9	25.8	26.8	20.8	40.4	-9.1	24.0	28.8	40.3	12.0	16.6	6.9
1000-1250	24.3	20.8	18.9	21.4	17.7	37.3	17.5	6.8	20.9	9.9	1.7	9.7	0.1
1250-1500	22.5	24.8	14.2	17.2	15.6	44.2	59.0	-9.0	10.3	7.3	11.3	3.4	2.4
1500-1750	19.7	17.9	15.5	17.8	15.4	27.9	16.2	0.6	15.6	12.0	2.0	15.2	1.2
1750-2000	17.6	21.6	21.4	18.7	13.6	29.4	58.8	57.4	37.5	3.2	2.1	7.5	8.0
2000+	11.9	21.1	11.5	18.8	13.6	-12.5	55.1	-15.4	38.2	1.6	40.1	1.4	30.8
Average						35.8%	35.7%	25.1%	13.4%				

Notes: All domestic itineraries excluding interline, zero fare, bulk fare and frequent flyer tickets.
Source: U.S. DOT DB1A Database, 2000.

Table 4: Price Per Mile and Difference from System Remainder For Restricted Coach Passengers

American	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	DFW	MIA	ORD	Remainder	DFW	MIA	ORD	DFW	MIA	ORD
< 250	34.1	57.9	55.7	68.1	-49.9	-15.0	-18.2	5.4	3.3	3.1
250-500	27.5	31.0	29.2	23.8	15.5	30.3	22.7	10.8	1.0	9.0
500-750	24.2	19.3	22.5	22.9	5.7	-15.7	-1.7	14.6	8.2	26.9
750-1000	21.8	15.5	20.7	18.6	17.2	-16.7	11.3	23.3	10.5	18.6
1000-1250	18.4	15.2	14.6	15.2	21.1	0.0	-3.9	24.3	53.2	13.9
1250-1500	17.0	12.4	10.8	13.3	27.8	-6.8	-18.8	15.6	8.5	5.3
1500-1750	15.4	12.9	10.8	12.5	23.2	3.2	-13.6	4.6	1.8	15.7
1750-2000	–	13.2	13.3	10.7	–	23.4	24.3	0.0	0.8	4.4
2000+	12.8	10.5	11.3	11.0	16.4	-4.5	2.7	1.6	12.8	3.2
Average					14.6%	-4.1%	0.6%			

Continental	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	CLE	EWR	IAH	Remainder	CLE	EWR	IAH	CLE	EWR	IAH
< 250	121.1	76.4	47.3	60.2	101.2	26.9	-21.4	1.6	5.6	9.9
250-500	40.3	45.5	31.8	33.7	19.6	35.0	-5.6	35.2	8.9	13.9
500-750	29.3	26.0	22.2	24.7	18.6	5.3	-10.1	10.8	15.9	10.5
750-1000	16.4	15.5	20.8	19.1	-14.1	-18.8	8.9	13.2	14.8	21.8
1000-1250	18.0	14.8	17.4	15.4	16.9	-3.9	13.0	17.0	23.8	16.3
1250-1500	14.5	20.4	17.4	13.0	11.5	56.9	33.8	0.7	5.1	16.4
1500-1750	10.4	15.2	14.5	11.7	-11.1	29.9	23.9	3.9	6.5	8.0
1750-2000	9.3	13.5	13.5	10.1	-7.9	33.7	33.7	7.5	0.6	2.2
2000+	10.0	13.3	12.5	8.5	17.6	56.5	47.1	10.2	18.9	1.0
Average					12.3%	17.5%	8.8%			

Delta	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	ATL	CVG	SLC	Remainder	ATL	CVG	SLC	ATL	CVG	SLC
< 250	63.4	80.3	39.2	63.7	-0.5	26.1	-38.5	2.9	2.2	0.1
250-500	34.2	48.5	31.5	37.1	-7.8	30.7	-15.1	24.2	24.2	10.2
500-750	22.6	28.2	18.6	24.0	-5.8	17.5	-22.5	40.1	20.3	47.1
750-1000	18.1	20.4	18.1	16.6	9.0	22.9	9.0	16.7	26.1	5.7
1000-1250	17.9	16.3	15.1	13.3	34.6	22.6	13.5	2.1	5.7	5.7
1250-1500	15.4	17.6	13.3	13.8	11.6	27.5	-3.6	0.6	1.6	5.8
1500-1750	15.2	12.5	14.6	12.4	22.6	0.8	17.7	4.4	5.6	5.7
1750-2000	14.2	12.0	11.2	11.2	26.8	7.1	0.0	4.3	10.1	13.8
2000+	14.4	10.5	11.2	9.2	56.5	14.1	21.7	4.7	4.1	6.0
Average					2.9%	20.6%	-8.8%			

Northwest	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	DTW	MEM	MSP	Remainder	DTW	MEM	MSP	DTW	MEM	MSP
< 250	46.8	62.0	69.2	66.2	-29.3	-6.3	4.5	14.0	1.4	1.4
250-500	34.7	35.6	33.3	39.3	-11.7	-9.4	-15.3	23.0	22.2	19.2
500-750	27.3	25.5	25.3	27.3	0.0	-6.6	-7.3	22.6	26.5	14.3
750-1000	15.7	17.2	19.3	19.9	-21.1	-13.6	-3.0	12.5	29.1	14.8
1000-1250	15.1	13.1	18.6	15.9	-5.0	-17.6	17.0	9.8	5.3	12.8
1250-1500	13.9	15.2	12.6	13.8	0.7	10.1	-8.7	0.5	3.9	21.8
1500-1750	10.0	13.4	11.9	12.2	-18.0	9.8	-2.5	7.7	5.4	13.9
1750-2000	11.4	12.5	—	10.3	10.7	21.4	0.0	7.4	5.6	0.0
2000+	12.3	9.6	10.5	9.0	36.7	6.7	16.7	2.6	0.8	1.8
Average					-9.6%	-6.6%	-4.1%			

Table 4 (Cont.)

US Airways	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	CLT	PHL	PIT	Remainder	CLT	PHL	PIT	CLT	PHL	PIT
< 250	72.3	89.1	67.5	55.5	30.3	60.5	21.6	3.4	3.2	4.3
250-500	35.7	45.9	41.6	31.3	14.1	46.6	32.9	28.6	21.2	38.9
500-750	24.1	20.4	23.7	21.7	11.1	-6.0	9.2	44.9	17.2	9.3
750-1000	22.6	14.7	15.2	14.8	52.7	-0.7	2.7	6.1	32.5	26.2
1000-1250	20.1	13.2	15.8	11.5	74.8	14.8	37.4	0.0	6.0	4.6
1250-1500	15.9	11.9	15.7	12.1	31.4	-1.7	29.8	2.9	2.9	1.9
1500-1750	19.9	13.8	15.4	11.7	70.1	17.9	31.6	0.1	2.6	0.6
1750-2000	10.4	—	10.5	9.5	9.5	—	10.5	4.0	0.0	4.9
2000+	10.2	11.0	10.0	8.3	22.9	32.5	20.5	9.9	14.5	9.3
Average					16.9%	16.6%	20.2%			

United	Price per Mile (cents)					% Difference from System Remainder				% of Passengers in Mileage Band			
Mileage	DEN	IAD	ORD	SFO	Rem.	DEN	IAD	ORD	SFO	DEN	IAD	ORD	SFO
< 250	81.8	46.7	48.0	35.4	42.9	90.7	8.9	11.9	-17.5	1.2	3.2	3.7	1.0
250-500	41.5	31.3	29.5	21.4	23.4	77.4	33.8	26.1	-8.5	6.5	11.8	11.0	29.6
500-750	26.3	22.6	25.1	15.0	23.6	11.4	-4.2	6.4	-36.4	17.5	14.0	27.5	12.8
750-1000	23.8	15.7	18.6	21.6	17.7	34.5	-11.3	5.1	22.0	40.5	12.9	16.7	8.4
1000-1250	20.0	15.6	14.8	19.7	15.0	33.3	4.0	-1.3	31.3	10.0	1.8	11.1	0.1
1250-1500	19.2	21.0	11.5	13.0	13.0	47.7	61.5	-11.5	0.0	7.5	12.0	3.9	2.8
1500-1750	14.9	15.1	11.1	13.1	12.8	16.4	18.0	-13.3	2.3	11.9	2.1	17.0	1.4
1750-2000	14.7	16.9	12.7	11.5	11.2	31.3	50.9	13.4	2.7	3.3	2.1	7.5	9.2
2000+	11.1	16.0	10.5	13.4	10.8	2.8	48.1	-2.8	24.1	1.7	40.1	1.7	34.8
Average						31.9%	30.4%	4.0%	3.2%				

Notes: Restricted Coach domestic itineraries excluding interline, zero fare, bulk fare and frequent flyer tickets.
Source: U.S. DOT DB1A Database, 2000.

Table 5: Price Per Mile and Difference from System Remainder For Premium Passengers

American	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	DFW	MIA	ORD	Remainder	DFW	MIA	ORD	DFW	MIA	ORD
< 250	61.0	77.4	99.2	101.8	-40.1	-24.0	-2.6	16.5	17.7	10.7
250-500	49.6	43.6	68.2	44.9	7.1	-5.8	47.3	11.8	3.3	17.0
500-750	53.8	52.3	61.7	36.5	26.3	22.8	44.8	12.5	4.0	31.6
750-1000	60.3	38.0	54.7	46.5	32.8	-16.3	20.5	18.3	12.1	21.8
1000-1250	53.9	38.3	44.1	33.7	54.9	10.1	26.7	16.6	46.2	7.1
1250-1500	52.5	44.9	30.3	32.7	59.6	36.5	-7.9	18.4	4.7	2.0
1500-1750	46.7	40.6	45.2	26.8	74.9	52.1	69.3	5.4	0.9	6.0
1750-2000	–	35.3	50.9	28.0	17.6	29.3	86.4	0.0	0.4	3.1
2000+	24.6	36.2	18.9	33.9	-26.3	8.4	-43.4	0.5	10.8	0.7
Average					27.5%	2.4%	34.7%			

Continental	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	CLE	EWR	IAH	Remainder	CLE	EWR	IAH	CLE	EWR	IAH
< 250	181.2	120.6	139.7	119.6	46.8	-2.3	13.2	9.6	41.6	7.6
250-500	106.0	109.6	92.4	93.6	13.9	17.7	-0.8	57.9	17.4	9.4
500-750	78.3	81.7	73.9	75.0	5.0	9.5	-0.9	17.7	11.4	3.1
750-1000	59.8	61.9	69.1	64.8	-6.9	-3.6	7.6	1.8	3.5	20.9
1000-1250	63.4	60.3	62.2	58.8	9.1	3.8	7.1	7.0	7.6	17.2
1250-1500	55.5	66.6	65.3	53.8	3.2	23.8	21.4	0.3	5.2	27.0
1500-1750	49.0	51.9	58.7	47.0	2.3	8.4	22.5	0.5	3.2	11.8
1750-2000	47.2	49.9	50.8	33.1	33.7	41.4	43.9	0.7	0.2	2.0
2000+	48.2	47.4	32.0	36.5	33.5	31.3	-11.4	4.5	9.8	1.0
Average					15.7%	8.1%	12.9%			

Delta	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	ATL	CVG	SLC	Remainder	ATL	CVG	SLC	ATL	CVG	SLC
< 250	159.6	153.5	60.1	70.6	115.4	107.2	-18.9	12.3	10.1	0.5
250-500	98.6	109.7	74.5	88.2	9.0	21.2	-17.7	30.9	34.1	8.7
500-750	67.4	76.4	44.7	67.5	-0.9	12.4	-34.3	27.4	29.2	26.1
750-1000	60.5	57.7	57.2	52.2	13.3	8.1	7.1	17.3	15.7	9.8
1000-1250	50.4	56.9	53.4	46.4	6.6	20.3	12.9	1.4	2.3	7.2
1250-1500	48.6	51.4	50.5	44.1	1.5	7.3	5.4	0.3	0.8	7.2
1500-1750	43.0	44.6	47.5	39.0	-1.1	2.5	9.2	2.7	1.4	9.3
1750-2000	45.8	43.4	45.6	34.8	14.2	8.2	13.7	3.3	4.1	25.6
2000+	41	42.6	39	30.4	17.8	22.4	12.1	4.5	2.2	5.8
Average					20.3%	24.3%	-3.5%			

Northwest	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	DTW	MEM	MSP	Remainder	DTW	MEM	MSP	DTW	MEM	MSP
< 250	154.7	126.5	128.8	140.5	10.1	-10.0	-8.3	18.8	7.1	8.4
250-500	99.1	90.8	100.3	96.4	2.8	-5.8	4.0	27.7	34.7	23.1
500-750	83.0	71.2	78.4	73.0	13.7	-2.5	7.4	32.8	24.5	17.3
750-1000	57.6	59.8	60.5	62.6	-8.0	-4.5	-3.4	5.7	20.8	17.2
1000-1250	57.2	56.3	62.3	57.1	0.2	-1.4	9.1	3.4	3.0	18.6
1250-1500	50.9	45.0	52.0	52.3	-2.7	-14.0	-0.6	0.1	1.9	6.0
1500-1750	44.9	44.4	52.3	47.5	-5.5	-6.5	10.1	1.2	3.9	9.2
1750-2000	43.3	40.0	–	42.9	0.9	-6.8	0.0	6.8	3.6	0.0
2000+	41.5	25.6	25.2	34.1	21.7	-24.9	-26.1	3.4	0.5	0.3
Average					7.5%	-5.2%	3.4%			

Table 5 (Cont.)

US Airways	Price per Mile (cents)				% Difference from System Remainder			% of Passengers in Mileage Band		
Mileage	CLT	PHL	PIT	Remainder	CLT	PHL	PIT	CLT	PHL	PIT
< 250	145.9	150.5	149.2	91.7	51.5	56.3	54.9	8.4	17.4	18.9
250-500	97.0	92.8	94.5	73.0	28.3	22.8	25.0	42.7	45.4	60.7
500-750	68.2	59.7	63.9	51.0	29.7	13.5	21.5	39.5	16.3	5.1
750-1000	56.4	43.9	47.5	33.9	58.4	23.3	33.4	4.2	7.8	5.9
1000-1250	47.6	41.4	56.0	28.2	63.0	41.8	91.8	0.0	3.7	2.8
1250-1500	48.3	48.8	47.3	29.4	60.5	62.1	57.1	0.9	2.1	1.0
1500-1750	24.1	30.5	25.5	28.3	-12.4	10.9	-7.3	0.02	1.6	0.2
1750-2000	39.3	—	33.4	22.7	73.1	0.0	47.1	0.8	0.0	1.1
2000+	37.1	29.3	35.1	19.9	80.1	42.2	70.4	3.6	5.7	4.5
Average					34.5%	29.6%	35.4%			

United	Price per Mile (cents)					% Difference from System Remainder				% of Passengers in Mileage Band			
Mileage	DEN	IAD	ORD	SFO	Rem.	DEN	IAD	ORD	SFO	DEN	IAD	ORD	SFO
< 250	136.4	80.1	117.9	57.5	74.4	83.3	7.7	58.5	-22.7	3.2	14.8	9.2	1.6
250-500	86.3	67.2	71.2	39.6	37.3	131.4	80.2	90.9	6.2	10.0	10.3	23.8	51.1
500-750	66.9	73.7	67.5	26.0	50.3	33.0	46.5	34.2	-48.3	17.0	15.2	28.4	16.8
750-1000	67.1	47.1	53.1	63.9	37.4	79.4	25.9	42.0	70.9	39.2	7.3	16.1	3.0
1000-1250	56.6	56.1	53.1	46.3	37.7	50.1	48.8	40.8	22.8	8.9	1.3	4.8	0.0
1250-1500	50.7	53.6	41.2	40.7	34.4	47.4	55.8	19.8	18.3	6.0	7.9	1.4	1.3
1500-1750	49.7	36.5	48.0	49.4	35.2	41.2	3.7	36.4	40.3	12.8	1.5	8.4	0.5
1750-2000	45.8	45.6	53.3	51.4	34.2	33.9	33.3	55.8	50.3	2.3	2.0	7.5	5.1
2000+	28.0	46.2	24.5	41.9	33.4	-16.2	38.3	-26.6	25.4	0.6	39.8	0.5	20.6
Average						65.7%	39.3%	52.8%	5.0%				

Notes: Unrestricted Coach, Business and First Class domestic itineraries excluding interline, zero fare, bulk fare and frequent flyer tickets.
Source: U.S. DOT DB1A Database, 2000.

Table 6: IV and OLS Results for American and Continental

	American						Continental					
	IV			OLS			IV			OLS		
	All	Coach	Prem.	All	Coach	Prem.	All	Coach	Prem.	All	Coach	Prem.
rshare	0.061*	0.052*	-0.010	0.048*	0.061*	0.053*	0.066*	0.034*	-0.012	0.070*	0.046*	-0.015
	(0.016)	(0.014)	(0.025)	(0.014)	(0.012)	(0.013)	(0.019)	(0.017)	(0.024)	(0.018)	(0.016)	(0.022)
lowfare	-0.154*	-0.165*	-0.080*	-0.154*	-0.155*	-0.165*	-0.143*	-0.124*	-0.021	-0.143*	-0.123*	-0.021
	(0.008)	(0.007)	(0.013)	(0.008)	(0.007)	(0.007)	(0.009)	(0.008)	(0.011)	(0.009)	(0.008)	(0.011)
lnmiles	-0.613*	-0.617*	-0.509*	-0.613*	-0.595*	-0.617*	-0.670*	-0.675*	-0.477*	-0.670*	-0.674*	-0.477*
	(0.005)	(0.004)	(0.008)	(0.005)	(0.005)	(0.004)	(0.006)	(0.005)	(0.007)	(0.006)	(0.005)	(0.007)
lnmktpax	-0.021*	-0.027*	-0.007	-0.023*	-0.029*	-0.027*	-0.036*	-0.039*	-0.001	-0.035*	-0.038*	-0.001
	(0.003)	(0.002)	(0.004)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
owprop	1.144*	-0.889*	0.524*	1.148*	0.953*	-0.889*	1.022*	0.714*	0.195*	1.022*	0.713*	0.195*
	(0.045)	(0.046)	(0.024)	(0.045)	(0.041)	(0.046)	(0.051)	(0.046)	(0.015)	(0.051)	(0.046)	(0.015)
JFK	0.021	0.026	0.119*	0.023	0.011	0.026	-0.133*	-0.137*	0.116	-0.133*	-0.136*	0.116
	(0.028)	(0.025)	(0.044)	(0.028)	(0.025)	(0.025)	(0.047)	(0.042)	(0.072)	(0.047)	(0.042)	(0.072)
LGA	0.159*	0.094*	0.239*	0.160*	0.081*	0.094*	0.141*	0.069*	0.224*	0.141*	0.068*	0.225*
	(0.020)	(0.018)	(0.032)	(0.020)	(0.018)	(0.018)	(0.023)	(0.020)	(0.028)	(0.023)	(0.020)	(0.028)
DCA	0.000	-0.015	0.176*	0.001	-0.007	-0.015	0.039	0.004	0.128*	0.039	0.004	0.128*
	(0.021)	(0.019)	(0.033)	(0.021)	(0.019)	(0.019)	(0.023)	(0.020)	(0.027)	(0.023)	(0.020)	(0.027)
ORD							0.000	0.017	0.130*	0.000	0.016	0.130*
							(0.025)	(0.022)	(0.031)	(0.025)	(0.022)	(0.031)
hub1	0.169*	0.083*	0.189*	0.175*	0.086*	0.083*	0.298*	0.246*	0.155*	0.296*	0.243*	0.156*
	(0.020)	(0.018)	(0.031)	(0.019)	(0.017)	(0.018)	(0.021)	(0.019)	(0.025)	(0.021)	(0.019)	(0.025)
hub2	-0.074*	-0.071*	-0.006	-0.073*	-0.071*	-0.071*	0.395*	0.314*	0.180*	0.394*	0.309	0.181*
	(0.019)	(0.018)	(0.031)	(0.019)	(0.017)	(0.018)	(0.021)	(0.018)	(0.025)	(0.021)	(0.018)	(0.025)
hub3	0.095*	0.033	0.150*	0.099*	0.030	0.032	0.185*	0.131*	0.116*	0.183*	0.126*	0.117*
	(0.019)	(0.018)	(0.031)	(0.019)	(0.017)	(0.018)	(0.021)	(0.019)	(0.025)	(0.021)	(0.018)	(0.025)
$\bar{R}^2$	0.801	0.820	0.513	0.802	0.82	0.513	0.825	0.849	0.598	0.825	0.849	0.598
Obs	5,429	5,429	5,350	5,429	5,429	5,350	3,729	3,729	3,349	3,729	3,729	3,349

Notes:*Significant at the 5% Level. *hub1, hub2* and *hub3* for American are DFW, MIA and ORD respectively.
hub1, hub2 and *hub3* for Continental are CLE, EWR and IAH respectively.
Coach includes restricted coach passengers. Premium includes unrestricted coach, business and first class passengers.

TABLE 7: IV AND OLS RESULTS FOR DELTA AND NORTHWEST

	Delta						Northwest					
	IV			OLS			IV			OLS		
	All	Coach	Prem.	All	Coach	Prem.	All	Coach	Prem.	All	Coach	Prem.
rshare	-0.037*	0.010	0.054*	-0.030*	0.002	0.050*	0.118*	0.118*	0.058*	0.093*	0.096*	0.044*
	(0.013)	(0.011)	(0.016)	(0.011)	(0.009)	(0.014)	(0.014)	(0.012)	(0.014)	(0.013)	(0.011)	(0.013)
lowfare	-0.206*	-0.159*	-0.042*	-0.206*	-0.160*	-0.042*	-0.157*	-0.133*	0.009	-0.157*	-0.133*	0.009
	(0.008)	(0.007)	(0.009)	(0.008)	(0.007)	(0.009)	(0.009)	(0.008)	(0.009)	(0.009)	(0.008)	(0.009)
lnmiles	-0.750*	-0.710*	-0.547*	-0.750*	-0.710*	-0.547*	-0.745*	-0.725*	-0.522*	-0.746*	-0.725*	-0.523*
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
lnmktpax	-0.059*	-0.047*	-0.027*	-0.059*	-0.048*	-0.027*	-0.033*	-0.033*	0.009*	-0.037*	-0.037*	0.007*
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
owprop	0.861*	0.595*	0.146*	0.865*	0.594*	0.145*	1.217*	0.751*	0.162*	1.212*	0.752*	0.160*
	(0.039)	(0.032)	(0.014)	(0.039)	(0.032)	(0.014)	(0.042)	(0.037)	(0.011)	(0.042)	(0.037)	(0.010)
JFK	-0.118*	-0.101*	0.021	-0.119*	-0.100*	0.021	-0.222*	-0.136*	-0.121*	-0.222*	-0.136*	-0.120*
	(0.023)	(0.019)	(0.028)	(0.023)	(0.019)	(0.028)	(0.032)	(0.027)	(0.032)	(0.032)	(0.027)	(0.032)
LGA	0.072*	0.031	0.095*	0.072*	0.031	0.096*	0.070*	0.033	0.123*	0.072*	0.035*	0.124*
	(0.021)	(0.018)	(0.025)	(0.021)	(0.018)	(0.025)	(0.020)	(0.017)	(0.020)	(0.020)	(0.017)	(0.020)
DCA	0.080*	0.055*	0.085*	0.080*	0.055*	0.085*	0.022	0.021	0.037	0.024	0.023	0.038
	(0.022)	(0.018)	(0.026)	(0.022)	(0.018)	(0.026)	(0.020)	(0.017)	(0.020)	(0.020)	(0.017)	(0.020)
ORD	0.038	0.022	0.141*	0.038	0.022	0.141*	0.007	0.030	0.066*	0.010	0.032	0.068*
	(0.021)	(0.017)	(0.025)	-0.021	(0.017)	(0.025)	(0.020)	(0.017)	(0.020)	(0.020)	(0.017)	(0.020)
hub1	0.247*	0.138*	0.151*	0.245*	0.141*	0.152*	0.118*	0.062*	-0.027	0.128*	0.070*	-0.022
	(0.019)	(0.016)	(0.023)	(0.019)	(0.016)	(0.023)	(0.018)	(0.015)	(0.018)	(0.018)	(0.015)	(0.018)
hub2	0.249*	0.110*	0.117*	0.246*	0.113	0.118*	0.085*	0.000	-0.109*	0.089*	0.004	-0.107*
	(0.020)	(0.017)	(0.023)	(0.020)	(0.016)	(0.023)	(0.020)	(0.017)	(0.019)	(0.020)	(0.017)	(0.019)
hub3	0.060*	0.037*	0.022	0.058*	0.039*	0.023	0.246*	0.130*	0.030	0.255*	0.138*	0.034*
	(0.020)	(0.016)	(0.023)	(0.020)	(0.016)	(0.023)	(0.018)	(0.015)	(0.017)	(0.018)	(0.015)	(0.017)
$\bar{R}^2$	0.825	0.850	0.621	0.825	0.850	0.621	0.840	0.862	0.693	0.840	0.862	0.693
Obs	8,349	8,349	8,047	8,349	8,349	8,047	6,302	6,302	5,839	6,302	6,302	5,839

Notes:*Significant at the 5% Level. *hub1, hub2* and *hub3* for Delta are ATL, CVG and SLC respectively.
hub1, hub2 and *hub3* for Northwest are DTW, MEM and MSP respectively.
Coach includes restricted coach passengers. Premium includes unrestricted coach, business and first class passengers.

Table 8: IV and OLS Results for US Airways and United

	US Airways						United					
	IV			OLS			IV			OLS		
	All	Coach	Prem.	All	Coach	Prem.	All	Coach	Prem.	All	Coach	Prem.
rshare	0.106*	-0.036*	0.164*	0.072*	-0.014	0.089*	0.006	0.024	-0.102*	-0.031*	-0.009	-0.144*
	(0.017)	(0.016)	(0.020)	(0.015)	(0.013)	(0.017)	(0.015)	(0.013)	(0.023)	(0.013)	(0.011)	(0.020)
lowfare	-0.169*	-0.150*	-0.051*	-0.171*	-0.149*	-0.053*	-0.160*	-0.139*	-0.143*	-0.160*	-0.139*	-0.143*
	(0.011)	(0.010)	(0.013)	(0.011)	(0.010)	(0.013)	(0.009)	(0.008)	(0.014)	(0.009)	(0.008)	(0.014)
lnmiles	-0.836*	-0.786*	-0.729*	-0.840*	-0.783*	-0.737*	-0.589*	-0.590*	-0.410*	-0.591*	-0.591*	-0.411*
	(0.006)	(0.005)	(0.007)	(0.006)	(0.005)	(0.007)	(0.005)	(0.004)	(0.007)	(0.005)	(0.004)	(0.007)
lnmktpax	-0.052*	-0.058*	-0.017*	-0.056*	-0.055*	-0.027*	-0.041*	-0.044*	-0.042*	-0.045*	-0.048*	-0.048*
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.002)	(0.004)	(0.003)	(0.002)	(0.004)
owprop	1.373*	1.009*	0.662*	1.360*	1.014*	0.641*	0.784*	0.495*	0.319*	0.775*	0.493*	0.312*
	(0.055)	(0.055)	(0.029)	(0.055)	(0.055)	(0.029)	(0.046)	(0.042)	(0.020)	(0.046)	(0.042)	(0.020)
JFK							0.209*	0.147*	0.183*	0.214*	0.151*	0.189*
							(0.034)	(0.030)	(0.050)	(0.034)	(0.030)	(0.050)
LGA	0.057*	0.062*	0.051	0.063*	0.058*	0.065*	0.182*	0.177*	0.246*	0.184*	0.178*	0.249*
	(0.023)	(0.020)	(0.026)	(0.022)	(0.020)	(0.026)	(0.021)	(0.018)	(0.032)	(0.021)	(0.018)	(0.032)
DCA	0.048*	0.034	-0.042	0.054*	0.030	-0.029	0.051	0.062*	0.290*	0.049	0.061*	0.288*
	(0.022)	(0.020)	(0.026)	(0.022)	(0.020)	(0.026)	(0.027)	(0.023)	(0.041)	(0.027)	(0.023)	(0.041)
ORD	0.025	-0.002	0.179*	0.027	-0.003	0.185*						
	(0.025)	(0.023)	(0.029)	(0.025)	(0.023)	(0.029)						
hub1	0.195*	0.067*	0.145*	0.204*	0.062*	0.164*	0.276*	0.258*	0.340*	0.288*	0.269*	0.353*
	(0.022)	(0.020)	(0.025)	(0.022)	(0.020)	(0.025)	(0.019)	(0.016)	(0.028)	(0.019)	(0.016)	(0.028)
hub2	0.241*	0.184*	0.130*	0.249*	0.179	0.148*	0.166*	0.149*	0.214*	0.175*	0.157*	0.223*
	(0.021)	(0.019)	(0.025)	(0.021)	(0.019)	(0.024)	(0.021)	(0.018)	(0.031)	(0.021)	(0.018)	(0.031)
hub3	0.214*	0.056*	0.168*	0.224*	0.049*	0.189*	0.211*	0.114*	0.282*	0.224*	0.125	0.296*
	(0.023)	(0.021)	(0.026)	(0.023)	(0.020)	(0.026)	(0.019)	(0.017)	(0.028)	(0.019)	(0.016)	(0.028)
hub4							0.085*	0.022	0.104*	0.093*	0.030	0.113*
							(0.018)	(0.016)	(0.028)	(0.018)	(0.016)	(0.028)
$\bar{R}^2$	0.880	0.873	0.783	0.882	0.873	0.784	0.766	0.804	0.452	0.766	0.804	0.452
Obs	4,750	4,750	4,723	4,750	4,750	4,723	5,642	5,642	5,541	5,642	5,642	5,541

Notes:*Significant at the 5% Level. *hub1, hub2* and *hub3* for US Airways are CLT, PHL and PIT respectively.
hub1, hub2, hub3 and *hub4* for United are DEN, IAD, ORD and SFO respectively.
Coach includes restricted coach passengers. Premium includes unrestricted coach, business and first class passengers.

Table 9: Pooled IV and OLS Results for Network Carriers

	IV			OLS		
	All	Coach	Prem.	All	Coach	Prem.
rshare	0.061*	0.047*	0.042*	0.049*	0.040*	0.026*
	(0.006)	(0.006)	(0.008)	(0.006)	(0.005)	(0.007)
lowfare	-0.164*	-0.144*	-0.056*	-0.164*	-0.144*	-0.056*
	(0.004)	(0.003)	(0.005)	(0.004)	(0.003)	(0.005)
lnmiles	-0.705*	-0.684*	-0.534*	-0.706*	-0.684*	-0.535*
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
lnmktpax	-0.044*	-0.043*	-0.018*	-0.045*	-0.044*	-0.020*
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
owprop	1.066*	0.710*	0.269*	1.064*	0.710*	0.266*
	(0.019)	(0.017)	(0.007)	(0.019)	(0.017)	(0.007)
JFK	-0.049*	-0.035*	0.063*	-0.048*	-0.034*	0.065*
	(0.014)	(0.012)	(0.018)	(0.014)	(0.012)	(0.018)
LGA	0.120*	0.081*	0.175*	0.121*	0.082*	0.177*
	(0.009)	(0.008)	(0.012)	(0.009)	(0.008)	(0.012)
DCA	0.056*	0.035*	0.113*	0.057*	0.036*	0.114*
	(0.009)	(0.008)	(0.012)	(0.009)	(0.008)	(0.012)
ORD	0.032*	0.029*	0.128*	0.033*	0.030*	0.129*
	(0.011)	(0.010)	(0.015)	(0.011)	(0.010)	(0.015)
AA hub1 (DFW)	0.170*	0.085*	0.162*	0.176*	0.088*	0.169*
	(0.020)	(0.017)	(0.025)	(0.020)	(0.017)	(0.025)
AA hub2 (MIA)	-0.058*	-0.049*	0.011	-0.056*	-0.048*	0.014
	(0.021)	(0.018)	(0.027)	(0.021)	(0.018)	(0.027)
AA hub3 (ORD)	0.061*	0.010	0.023	0.064*	0.012	0.028
	(0.023)	(0.020)	(0.029)	(0.023)	(0.020)	(0.029)
CO hub1 (CLE)	0.286*	0.241*	0.131*	0.289*	0.243*	0.136*
	(0.022)	(0.019)	(0.028)	(0.022)	(0.019)	(0.028)
CO hub2 (EWR)	0.395*	0.311*	0.179*	0.399*	0.313*	0.184*
	(0.021)	(0.018)	(0.027)	(0.021)	(0.018)	(0.027)
CO hub3 (IAH)	0.176*	0.121*	0.095*	0.181*	0.124*	0.102*
	(0.021)	(0.018)	(0.026)	(0.021)	(0.018)	(0.026)
DL hub1 (ATL)	0.213*	0.132*	0.158*	0.218*	0.135*	0.165*
	(0.019)	(0.016)	(0.023)	(0.019)	(0.016)	(0.023)
DL hub2 (CVG)	0.235*	0.106*	0.139*	0.239*	0.109*	0.145*
	(0.020)	(0.017)	(0.024)	(0.019)	(0.017)	(0.024)
DL hub3 (SLC)	0.021	0.018	0.038	0.024	0.019	0.042
	(0.020)	(0.017)	(0.025)	(0.020)	(0.017)	(0.025)
NW hub1 (DTW)	0.164*	0.109*	0.022	0.168*	0.111*	0.027
	(0.018)	(0.015)	(0.023)	(0.018)	(0.015)	(0.023)
NW hub2 (MEM)	0.118*	0.030	-0.093*	0.120*	0.031	-0.091*
	(0.021)	(0.018)	(0.026)	(0.021)	(0.018)	(0.026)
NW hub3 (MSP)	0.289*	0.173*	0.083*	0.293*	0.175*	0.088*
	(0.017)	(0.015)	(0.022)	(0.017)	(0.015)	(0.022)
US hub1 (CLT)	0.271*	0.091*	0.252*	0.274*	0.093*	0.257*
	(0.021)	(0.018)	(0.026)	(0.021)	(0.018)	(0.026)
US hub1 (PHL)	0.299*	0.200*	0.215*	0.302*	0.202*	0.219*
	(0.021)	(0.018)	(0.026)	(0.020)	(0.018)	(0.026)
US hub1 (PIT)	0.283*	0.074*	0.265*	0.287*	0.076*	0.270*
	(0.022)	(0.019)	(0.027)	(0.022)	(0.019)	(0.027)
UA hub1 (DEN)	0.238*	0.225*	0.243*	0.242*	0.227*	0.249*
	(0.019)	(0.016)	(0.024)	(0.019)	(0.016)	(0.024)
UA hub2 (IAD)	0.151*	0.135*	0.178*	0.154*	0.137*	0.182*
	(0.021)	(0.018)	(0.027)	(0.021)	(0.018)	(0.027)
UA hub3 (ORD)	0.117*	0.031	0.051	0.120*	0.033	0.056
	(0.022)	(0.019)	(0.028)	(0.022)	(0.019)	(0.028)
UA hub4 (SFO)	0.091*	0.024	0.064*	0.094*	0.026	0.068*
	(0.019)	(0.016)	(0.024)	(0.019)	(0.016)	(0.024)
$\bar{R}^2$	0.827	0.845	0.629	0.827	0.845	0.629
Obs	34,057	34,057	32,620	34,057	34,057	32,620

Notes:*Significant at the 5% Level. Coach includes restricted coach passengers. Premium includes unrestricted coach, business and first class passengers.

Table 10: Variable Definitions and Descriptive Statistics For Largest 1,000 Routes

Variable Name	Definition	Mean (Std. Dev)
fare_{ij}	Average one-way fare per for airline i on route j	186.39 (75.69)
ppm_{ij}	Average price per O&D mile for airline i on route j	.186 (.119)
density_j	Average number of O&D passengers on route j in 1999	229,296 (213,517)
nsprop_{ij}	Proportion of passengers for airline i on route j traveling non-stop	.313 (.445)
owprop_{ij}	Proportion of passengers for airline i on route j using one-way tickets	.111 (.094)
miles_j	One-way non-stop distance between airports on route j	1,272.6 (703.9)
rshare_{ij}	Market share of airline i on route j	.208 (.262)
endptms_{ij}	Simple average of airline i's market share of O&D passengers at endpoint airports of route j	.147 (.122)
DCA_j	Dummy variable taking value 1 if either endpoint of route j is DCA and 0 otherwise	.038 (.019)
JFK_j	Dummy variable taking value 1 if either endpoint of route j is JFK and 0 otherwise	.015 (.012)
LGA_j	Dummy variable taking value 1 if either endpoint of route j is LGA and 0 otherwise	.051 (.022)
ORD_j	Dummy variable taking value 1 if either endpoint of route j is ORD and 0 otherwise	.059 (.024)
lowfare_j	Dummy variable taking value 1 if low fare carriers collectively greater than a 1% share of O&D passengers on route j, 0 otherwise	.697 (.459)
hub_j	Dummy variable taking value 1 if either endpoint of route j is a hub for carrier i, 0 otherwise	.144 (.351)
Firms	Number of firms in sample	22
Routes	Number of routes in sample	1,000
N	Number of observations	4,703

Table 11: IV, OLS, and Fixed Effect Results (All Passengers)

	Model 1				Model 2			
	IV	OLS	FE	FE-IV	IV	OLS	FE	FE-IV
rshare	0.096*	0.078*	0.195*	0.225*	0.069*	0.022*	-0.007	0.022
	(0.019)	(0.018)	(0.015)	(0.016)	(0.033)	(0.030)	(0.022)	(0.024)
lowfare	-0.174*	-0.174*			-0.194*	-0.194*		
	(0.008)	(0.008)			(0.008)	(0.008)		
endptms					0.810*	0.869*	1.130*	1.095*
					(0.062)	(0.060)	(0.044)	(0.045)
lnmiles	-0.569*	-0.571*			-0.551*	-0.551*		
	(0.006)	(0.006)			(0.006)	(0.006)		
density	-0.067*	-0.067*			-0.061*	-0.063*		
	(0.005)	(0.005)			(0.006)	(0.006)		
nsprop					0.005	0.018*	0.025*	0.016
					(0.015)	(0.014)	(0.011)	(0.012)
rtprop	0.923*	0.915*	1.241*	1.266*	-0.889*	-0.871*	-1.206*	-1.221*
	(0.055)	(0.054)	(0.052)	(0.053)	(0.057)	(0.057)	(0.050)	(0.051)
JFK	0.073*	0.075*			0.026	0.024*		
	(0.027)	(0.027)			(0.029)	(0.029)		
LGA	0.169*	0.170*			0.143*	0.144*		
	(0.015)	(0.015)			(0.016)	(0.016)		
DCA	0.091*	0.092*			0.066*	0.067*		
	(0.017)	(0.017)			(0.018)	(0.018)		
ORD	0.011	0.010			-0.005	-0.006		
	(0.019)	(0.019)			(0.015)	(0.015)		
AA hub1 (DFW)	0.304*	0.312*	0.149*	0.134*				
	(0.031)	(0.031)	(0.024)	(0.024)				
AA hub2 (MIA)	-0.004	0.002	0.067	0.059				
	(0.048)	(0.048)	(0.038)	(0.038)				
AA hub3 (ORD)	0.088*	0.092*	0.016	0.007				
	(0.036)	(0.036)	(0.025)	(0.025)				
CO hub1 (CLE)	0.208*	0.216*	0.141*	0.126*				
	(0.044)	(0.044)	(0.034)	(0.034)				
CO hub2 (EWR)	0.395*	0.404*	0.240*	0.223*				
	(0.036)	(0.035)	(0.028)	(0.028)				
CO hub3 (IAH)	0.156*	0.167*	0.218*	0.198*				
	(0.039)	(0.039)	(0.032)	(0.032)				
DL hub1 (ATL)	0.304*	0.312*	0.267*	0.253*				
	(0.031)	(0.031)	(0.026)	(0.026)				
DL hub2 (CVG)	0.366*	0.376*	0.378*	0.356*				
	(0.059)	(0.058)	(0.046)	(0.047)				
DL hub3 (SLC)	0.007	0.014	0.112*	0.098*				
	(0.044)	(0.044)	(0.035)	(0.035)				
NW hub1 (DTW)	0.264*	0.273*	0.219*	0.201*				
	(0.040)	(0.040)	(0.032)	(0.032)				
NW hub2 (MEM)	0.234*	0.243*	0.151*	0.133*				
	(0.071)	(0.071)	(0.055)	(0.055)				
NW hub3 (MSP)	0.377*	0.386*	0.257*	0.239*				
	(0.039)	(0.039)	(0.031)	(0.031)				
US hub1 (CLT)	0.511*	0.520*	0.276*	0.258*				
	(0.055)	(0.055)	(0.048)	(0.048)				
US hub2 (PHL)	0.454*	0.461*	0.242*	0.229*				
	(0.038)	(0.038)	(0.031)	(0.031)				
US hub3 (PIT)	0.352*	0.361*	0.216*	0.198*				
	(0.051)	(0.051)	(0.044)	(0.044)				
UA hub1 (DEN)	0.348*	0.355*	0.197*	0.184*				
	(0.035)	(0.035)	(0.027)	(0.027)				
UA hub2 (IAD)	0.213*	0.220*	0.152*	0.140*				
	(0.053)	(0.053)	(0.043)	(0.043)				
UA hub3 (ORD)	0.115*	0.123*	0.021	0.007				
	(0.036)	(0.035)	(0.025)	(0.026)				
UA hub4 (SFO)	0.171*	0.177*	0.179*	0.169*				
	(0.033)	(0.033)	(0.026)	(0.026)				
$\bar{R}^2$	0.808	0.808	0.931	0.930	0.792	0.792	0.935	0.934
R^2 within			0.498	0.498			0.529	0.529
N	4,703	4,703	4,703	4,703	4,703	4,703	4,703	4,703

Notes:*Significant at the 5% Level.

Table 12: IV, OLS, and Fixed Effect Results (Restricted Coach Passengers)

	Model 1				Model 2			
	IV	OLS	FE	FE-IV	IV	OLS	FE	FE-IV
rshare	0.044*	0.036*	0.126*	0.149*	0.025	0.004*	-0.015	-0.003
	(0.017)	(0.016)	(0.014)	(0.015)	(0.028)	(0.025)	(0.020)	(0.022)
lowfare	-0.154*	-0.154*			-0.167*	-0.167*		
	(0.007)	(0.007)			(0.007)	(0.007)		
endptms					0.602*	0.628*	0.864*	0.847*
					(0.053)	(0.051)	(0.041)	(0.048)
lnmiles	-0.582*	-0.583*			-0.570*	-0.570*		
	(0.005)	(0.005)			(0.005)	(0.005)		
density	-0.059*	-0.059*			-0.050*	-0.051*		
	(0.004)	(0.004)			(0.005)	(0.005)		
nsprop					-0.011	-0.005*	-0.011	-0.015
					(0.013)	(0.012)	(0.011)	(0.011)
rtprop	0.686*	0.683*	1.064*	1.081*	-0.659*	-0.652*	-1.055*	-1.061*
	(0.049)	(0.049)	(0.050)	(0.050)	(0.050)	(0.050)	(0.048)	(0.048)
JFK	0.057*	0.057*			0.025	0.024*		
	(0.024)	(0.024)			(0.025)	(0.024)		
LGA	0.104*	0.104*			0.083*	0.083*		
	(0.013)	(0.013)			(0.013)	(0.013)		
DCA	0.049*	0.049*			0.030*	0.030*		
	(0.015)	(0.015)			(0.015)	(0.015)		
ORD	-0.005	-0.006			-0.044*	-0.044*		
	(0.017)	(0.017)			(0.013)	(0.013)		
AA hub1 (DFW)	0.199*	0.203*	0.073*	0.062*				
	(0.027)	(0.027)	(0.023)	(0.023)				
AA hub2 (MIA)	-0.023	-0.021	0.005	-0.001				
	(0.042)	(0.042)	(0.035)	(0.035)				
AA hub3 (ORD)	0.022	0.024	-0.026	-0.033				
	(0.031)	(0.031)	(0.024)	(0.024)				
CO hub1 (CLE)	0.177*	0.180*	0.131*	0.119*				
	(0.038)	(0.038)	(0.032)	(0.032)				
CO hub2 (EWR)	0.343*	0.347*	0.237*	0.224*				
	(0.031)	(0.031)	(0.026)	(0.026)				
CO hub3 (IAH)	0.124*	0.129*	0.176*	0.161*				
	(0.034)	(0.034)	(0.030)	(0.030)				
DL hub1 (ATL)	0.234*	0.238*	0.175*	0.165*				
	(0.027)	(0.027)	(0.024)	(0.024)				
DL hub2 (CVG)	0.140*	0.144*	0.191*	0.175*				
	(0.051)	(0.051)	(0.043)	(0.043)				
DL hub3 (SLC)	0.022	0.025	0.097*	0.086*				
	(0.038)	(0.038)	(0.032)	(0.033)				
NW hub1 (DTW)	0.226*	0.230*	0.175*	0.161*				
	(0.034)	(0.034)	(0.029)	(0.030)				
NW hub2 (MEM)	0.080	0.084	0.024	0.011				
	(0.062)	(0.062)	(0.051)	(0.051)				
NW hub3 (MSP)	0.228*	0.232*	0.138*	0.124*				
	(0.034)	(0.034)	(0.029)	(0.029)				
US hub1 (CLT)	0.240*	0.244*	0.093*	0.079				
	(0.048)	(0.048)	(0.044)	(0.044)				
US hub2 (PHL)	0.284*	0.287*	0.101*	0.092*				
	(0.033)	(0.033)	(0.028)	(0.029)				
US hub3 (PIT)	0.187*	0.191*	0.081	0.068				
	(0.044)	(0.044)	(0.041)	(0.041)				
UA hub1 (DEN)	0.332*	0.335*	0.163*	0.153*				
	(0.030)	(0.030)	(0.025)	(0.025)				
UA hub2 (IAD)	0.184*	0.187*	0.129*	0.120*				
	(0.046)	(0.046)	(0.040)	(0.040)				
UA hub3 (ORD)	0.000	0.003	-0.068*	-0.078*				
	(0.031)	(0.031)	(0.024)	(0.024)				
UA hub4 (SFO)	0.078*	0.081*	0.115*	0.108*				
	(0.028)	(0.028)	(0.024)	(0.024)				
$\bar{R}^2$	0.828	0.828	0.928	0.928	0.818	0.818	0.931	0.931
R^2 within			0.410	0.409			0.434	0.434
N	4,703	4,703	4,703	4,703	4,703	4,703	4,703	4,703

Notes:*Significant at the 5% Level.

Table 13: IV, OLS, and Fixed Effect Results (Premium Passengers)

	Model 1				Model 2			
	IV	OLS	FE	FE-IV	IV	OLS	FE	FE-IV
rshare	-0.021	-0.03	0.133*	0.148*	-0.042	-0.074	-0.073*	-0.067
	(0.026)	(0.025)	(0.023)	(0.025)	(0.042)	(0.038)	(0.034)	(0.038)
lowfare	-0.107*	-0.107*			-0.126*	-0.126*		
	(0.010)	(0.010)			(0.010)	(0.010)		
endptms					0.742*	0.780*	0.888*	0.882*
					(0.080)	(0.076)	(0.069)	(0.072)
lnmiles	-0.392*	-0.393*			-0.371*	-0.371*		
	(0.007)	(0.007)			(0.008)	(0.008)		
density	-0.050*	-0.050*			-0.046*	-0.047*		
	(0.007)	(0.007)			(0.007)	(0.007)		
nsprop					0.016	0.025	0.033	0.031
					(0.020)	(0.019)	(0.018)	(0.019)
rtprop	0.507*	0.504*	0.566*	0.570*	-0.505*	-0.501*	-0.596*	-0.597*
	(0.027)	(0.027)	(0.025)	(0.025)	(0.027)	(0.027)	(0.024)	(0.024)
JFK	0.081*	0.082*			0.023	0.021*		
	(0.036)	(0.036)			(0.037)	(0.037)		
LGA	0.243*	0.244*			0.213*	0.213*		
	(0.020)	(0.020)			(0.020)	(0.020)		
DCA	0.143*	0.143*			0.118*	0.119*		
	(0.022)	(0.022)			(0.022)	(0.022)		
ORD	0.105*	0.104*			0.091*	0.090*		
	(0.024)	(0.024)			(0.019)	(0.019)		
AA hub1 (DFW)	0.337*	0.340*	0.137*	0.130*				
	(0.040)	(0.040)	(0.037)	(0.037)				
AA hub2 (MIA)	0.070	0.073	0.109	0.105				
	(0.061)	(0.061)	(0.057)	(0.057)				
AA hub3 (ORD)	0.073	0.075	-0.012	-0.016				
	(0.045)	(0.045)	(0.038)	(0.038)				
CO hub1 (CLE)	0.130*	0.134*	0.072	0.065				
	(0.056)	(0.056)	(0.051)	(0.051)				
CO hub2 (EWR)	0.236*	0.240*	0.078	0.070				
	(0.045)	(0.045)	(0.042)	(0.042)				
CO hub3 (IAH)	0.176*	0.181*	0.122*	0.113*				
	(0.050)	(0.050)	(0.048)	(0.048)				
DL hub1 (ATL)	0.347*	0.351*	0.124*	0.117*				
	(0.039)	(0.039)	(0.039)	(0.039)				
DL hub2 (CVG)	0.319*	0.324*	0.111	0.101				
	(0.074)	(0.074)	(0.070)	(0.070)				
DL hub3 (SLC)	0.090	0.093	0.167*	0.161*				
	(0.056)	(0.056)	(0.053)	(0.053)				
NW hub1 (DTW)	0.207*	0.211*	0.028	0.020				
	(0.051)	(0.051)	(0.048)	(0.049)				
NW hub2 (MEM)	-0.003	0.001	-0.126	-0.134				
	(0.090)	(0.090)	(0.083)	(0.083)				
NW hub3 (MSP)	0.255*	0.259*	-0.001	-0.009				
	(0.050)	(0.050)	(0.048)	(0.048)				
US hub1 (CLT)	0.473*	0.478*	0.227*	0.219*				
	(0.070)	(0.070)	(0.071)	(0.071)				
US hub2 (PHL)	0.360*	0.364*	0.174*	0.168*				
	(0.049)	(0.049)	(0.046)	(0.046)				
US hub3 (PIT)	0.388*	0.392*	0.224*	0.215*				
	(0.065)	(0.065)	(0.066)	(0.066)				
UA hub1 (DEN)	0.464*	0.467*	0.311*	0.305*				
	(0.045)	(0.045)	(0.042)	(0.042)				
UA hub2 (IAD)	0.275*	0.278*	0.099	0.094				
	(0.068)	(0.067)	(0.065)	(0.065)				
UA hub3 (ORD)	0.145*	0.149*	0.018	0.012				
	(0.045)	(0.045)	(0.038)	(0.039)				
UA hub4 (SFO)	0.175*	0.178*	0.162*	0.158*				
	(0.042)	(0.042)	(0.039)	(0.039)				
$\bar{R}^2$	0.680	0.680	0.839	0.838	0.662	0.662	0.841	0.840
R^2 within			0.640	0.640			0.644	0.643
N	4,499	4,499	4,499	4,499	4,499	4,499	4,499	4,499

Notes:*Significant at the 5% Level. Premium passengers include First, Business and Unrestricted Coach.

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