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Journal of Air Transport Management ■ (■■■■) ■■■-■■■

Journal of

**AIR TRANSPORT
MANAGEMENT**

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Domestic codesharing practices in the US airline industry

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Abstract

This paper documents some stylized facts about domestic codesharing practices in the US airline industry. It is demonstrated that unlike international codesharing, the majority of domestic codeshare tickets do not combine the networks of two carriers. Rather, most codeshare tickets between major US carriers are virtual in nature, whereby one carrier sells tickets on flights operated entirely by another carrier. Moreover, we show that the price of these virtual tickets are, on average, less than those operated and marketed by a single carrier.

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Keywords: Codesharing; Alliances; Virtual carrier

1. Introduction

Few topics in aviation economics have received more attention over the past few years than the impact of international alliances and codesharing on airfares and competition (Brueckner, 2003a, b; Park and Zhang, 2000). While codesharing between large carriers has primarily been thought of as an international practice, codeshare agreements among major domestic carriers has also become a widespread phenomenon in the US airline industry.¹ Over the past few years, virtually all of the largest US hub and spoke carriers have entered into broad domestic codesharing partnerships, including the United/US Airways alliance that began in January 2003, and even more recently, the three-way alliance between Northwest, Continental and Delta initiated in June 2003. In light of this recent trend towards increased

codesharing and the fact that carriers comprising the three largest US alliances (Continental/Northwest/Delta, United/US Airways and American/Alaska) account for nearly two-thirds of all domestic origin and destination (O&D) passenger traffic, there are legitimate policy concerns regarding the impact of these cooperative marketing agreements on fares and service levels. Indeed, numerous reports (i.e., US General Accounting Office, 1998, 1999, Transportation Research Board, 1999) have raised significant questions regarding the potential negative effects of domestic codeshare agreements. For example, one report concluded that “Unlike international alliances, which largely extend domestic airlines’ route networks into areas that they could not enter by themselves, the networks of the domestic airlines generally overlap to a much greater extent, and therefore the proposed alliances pose a greater threat to competition” (US General Accounting Office, 1998).

In international aviation, the popularity of cooperative marketing agreements arises because they enable airlines to extend the scope of their networks by offering relatively seamless travel to destinations they otherwise would be unable to serve, either due to cost or regulatory (i.e., route authority, cabotage) factors. For

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¹Codesharing between mainline and regional carriers (i.e., Continental/Express Jet, Northwest/Pinnacle, Delta/Atlantic Southeast, etc.) has been an integral part of the US airline industry for several decades.

example, while no carrier currently carries passengers between Albuquerque, New Mexico and Cape Town, South Africa solely on its own network, numerous US carriers and their international alliance partners such as Delta/Air France, American/British Airways, United/Lufthansa and Northwest/KLM are able to offer passengers convenient, well integrated, connecting service in this market. Consequently, most government and academic studies have concluded that cooperation among international carriers has resulted in lower fares and higher traffic in literally thousands of international aviation markets (US Department of Transportation, 2000; Park and Zhang, 2000; Brueckner and Whalen, 2000; Brueckner, 2003b).

Since domestic codesharing is a relatively new phenomenon, it has received only limited attention in the literature. Bamberger et al. (1999) study the change in average fares in markets before and after the introduction of codesharing by Northwest/Alaska and Continental/America West. Two other papers (Whalen, 1999; Armantier and Richard, 2003) attempt to measure the change in consumer welfare arising from the Continental/Northwest, United/Delta and US Airways/American agreements. More recently, Ito and Lee (2004) demonstrate that most domestic codesharing is in fact virtual in nature (the authors define virtual codesharing as the practice whereby one carrier markets tickets on flights operated solely by other carriers).

The paper documents some stylized facts regarding domestic codesharing practices in the US airline industry. We discuss how the analysis of domestic codesharing needs to take account of differences that exist between domestic and international codesharing practices. In particular, while the analysis of international codesharing has typically focused on examining the benefits of combining the networks of two different operating carrier—a practice we refer to as traditional codesharing—the overwhelming majority of domestic codesharing tickets involve a single operating carrier—a practice we refer to as virtual codesharing. The analysis demonstrates that the distinction between traditional and virtual codesharing is critical to understanding the effects of domestic codesharing because the economic incentives, as well as the implications on airfares, behind these practices may differ substantially from those documented in the international codesharing literature.

2. Codesharing in the US airline industry

To understand the implications of domestic codesharing, it is important to distinguish between three related, albeit different, concepts in airline marketing: codesharing, interlining and alliances. A flight is said to be codeshared when the operating and marketing carrier for that flight can differ. For example, Alaska Airlines

operates non-stop flights between Seattle and Boston. However, the Seattle–Boston flights operated by Alaska are listed in computer reservation systems (CRSs) and flight schedules of both Alaska Airlines and American Airlines. An airline itinerary or ticket is said to be online when the operating carrier for each flight coupon of the itinerary remains the same.² In contrast, an itinerary is said to be interline when there are two or more operating carriers. Finally, carriers can form cooperative marketing alliances that may cover a wide array of joint activities, up to, but not necessarily including, codesharing. Generally speaking, a typical domestic alliance may include costs reduction initiatives (i.e., sharing or consolidating airport facilities such as gates, lounges, etc.), schedule and gate coordination to provide more convenient connections between flights of alliance partners, and frequently flyer program and/or airport lounge reciprocity. Unlike many international alliances, no domestic alliance currently has antitrust immunity that would allow them to jointly determine pricing on interline or codeshare flights.

Table 1 summarizes the current domestic alliances and codesharing agreements in the US As of the third quarter of 2003, the three-way alliance between Continental, Delta and Northwest was the largest domestic alliance, accounting for slightly more than 30% of domestic O&D passengers. The next largest alliance was United/US Airways, accounting for 17.6% of domestic O&D passengers. Note that many airlines do not form exclusive partnerships. For example, both Alaska Airlines and Hawaiian Airlines have bilateral alliances with three different partners. This should come as no surprise, since both of these carriers' networks are fairly concentrated geographically.

From an institutional standpoint, all domestic codesharing agreements in the US use the free-sale model. Under a free-sale agreement, the operating carrier maintains and controls the seat inventory, but allows its codeshare partners to market and sell seats on designated codeshare flights under their own marketing code. Hence, both the operating and codeshare carriers sell seats out of the same general inventory, and the operating carrier receives all of the ticket revenue, regardless of which carrier actually sells the seat. In return for selling a seat on a codeshare flight, the operating carrier usually pays the marketing carrier a nominal commission to cover certain costs, such as the cost to the marketing carrier of issuing its frequent flyer miles. Since virtually all of the revenue from a codeshare flight accrues to the operating carrier, codeshare agreements are carefully negotiated so that they are balanced in the sense that partners exchange their

²It is assumed throughout, as is standard in the industry, that connections between mainline and affiliated regional carriers are also online.

1 Table 1 57

2 Current domestic alliances/codeshare agreements

3 Carriers	4 Combined domestic share (%)	5 Notes	6
7 Continental/Delta/Northwest	8 30.4	9 Three-way codesharing began in June 2003. Excludes local hub markets. Northwest and Continental entered into a bilateral codeshare agreement in December 1999.	10 61
11 United/US Airways	12 17.6	13 Commenced January 2003.	14 63
15 American/Alaska	16 16.2	17 Commenced 1999. Codeshare on select flights to/from Los Angeles/Portland/San Francisco/Seattle. Excludes reciprocal lounge access.	18 65
19 American/Hawaiian	20 13.9	21 Commenced March 1998. American codeshares on Hawaiian Airlines services within Hawaii. Hawaiian codeshares on American Eagle services at Los Angeles.	22 67
23 Northwest/Alaska	24 11.4	25 Commenced August 1999. Systemwide codeshare except select flights to/from Mexico and transcontinental flights. Excludes reciprocal lounge access.	26 71
27 Continental/Alaska	28 10.5	29 Commenced March 1999.	30 73
31 Northwest/Hawaiian	32 9.2	33 Commenced 1995. Codeshare on intra-Hawaii flights and Trans-Pacific flights. Excludes reciprocal lounge access.	34 75
35 Continental/Hawaiian	36 8.3	37 Commenced August 1999. Codeshare on inter-island flights. Excludes reciprocal lounge access.	38 77
39 American West/Hawaiian	40 5.2	41 Commenced October 2002.	42 79
43 Alaska/Hawaiian	44 5.0	45 Commenced October 2001.	46 81

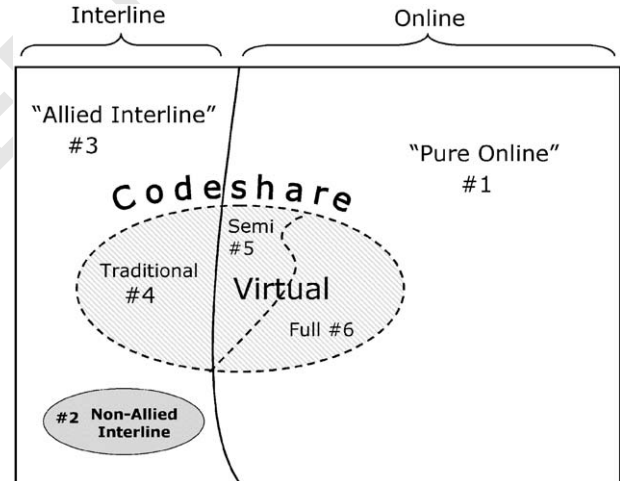
47 Notes and sources: Share is of domestic O&D passengers for the third quarter of 2003 based on US DOT OD1A database. Effective dates from "Airline alliance survey 2003", *Airline Business*, July 2003. Airline lounge reciprocity information from carrier websites.

48 operating/marketing roles across different routes so as to roughly equalize the benefits from the agreement.

49 A less common type of institutional agreement (and one that is not currently used among any of the large domestic codeshare alliances in the US) is the block-space agreement. Under this form of codeshare arrangement, the operating carrier sells a block of its seats on a given flight to another carrier (the codeshare partner) which then assumes the sole responsibility for marketing and selling the inventory of seats it has purchased, which it does under its own marketing code. Since the codeshare carrier purchases the inventory from the operating carrier, it keeps all of the revenue associated with the codeshare seats it sells.

50 2.1. A taxonomy of cooperation/integration

51 Fig. 1 summarizes how the concepts of codesharing, interlining and alliances are related to one another and further divides airline tickets into six mutually exclusive categories, based on their degree of cooperation and integration. In the examples that follow, we use the convention operating carrier code/marketing carrier code, and denote a codeshare carrier with an asterisk. Moreover, a connection between two flights is denoted with the symbol →. For example, NW/CO*→CO/CO denotes a connecting itinerary where the first segment is operated by Northwest, but is marketed by Continental as a codeshare flight, and the second segment is both operated and marketed by Continental. For clarity of



52 Fig. 1. Taxonomy of airline cooperative agreements. 99

53 explanation all example itineraries are comprised of either one or two coupons per directional leg. 103

- 54 #1. *Pure online*: An itinerary is pure online if it is both 105
 55 online and has no codeshare segments. Examples: a 107
 56 two segment ticket with both segments operated and 109
 57 marketed by Continental Airlines (CO/CO→CO/CO) or a single coupon ticket operated and 111
 58 marketed by Southwest Airlines (WN/WN).
- 59 #2. *Non-allied interline*: A non-allied interline itinerary 111
 60 is a connecting ticket between two carriers that are

not part of an alliance. Examples: connecting itineraries between Delta and American (DL/DL→AA/AA) or Alaska and United (AS/AS→UA/UA).

Categories #1 and #2 are the two extreme cases on the spectrum of integration/cooperation. While case #1 represents a fully integrated (and presumably most desirable from the point of view of the traveler) itinerary, case #2 is the least integrated, potentially most inconvenient and the most costly type of itinerary to provide. Next, two commonly studied types of cooperative itineraries are considered.

#3. *Allied interline*: An itinerary is allied interline if it consists of an interline transfer between two carriers that are alliance partners. Example: a two segment ticket between United and US Airways, with each segment marketed by the operating carrier (US/US→UA/UA). Other examples include NW/NW→DL/DL and AS/AS→AA/AA.

#4. *Traditional codeshare*: We define an itinerary as a traditional codeshare itinerary when it; has two segments, is interline, and has one codeshare segment. Examples: a connecting itinerary between Continental and Northwest, marketed solely by Northwest (CO/NW*→NW/NW) or a connecting itinerary between United and US Airways, marketed solely by United (UA/UA→US/UA*).

Traditional codesharing involves two distinct operating carriers. Finally, two additional types of virtual codesharing are considered:

#5. *Semi virtual codeshare*: A semi virtual codeshare itinerary is defined as a multi coupon itinerary that: (a) has the same operating carrier throughout, and (b) has one codeshare segment. Examples: A connecting itinerary operated solely by Northwest, but marketed partly by Continental and partly by Northwest (NW/NW→NW/CO*).

#6. *Fully Virtual Codeshare*: Finally, a fully virtual codeshare itinerary is defined as an itinerary that; has the same marketing carrier throughout, is online, and is codeshared on all of its segments. Examples: A connecting itinerary operated entirely by United, but marketed solely by US Airways (UA/US*→UA/US*) or a non-stop itinerary operated by Alaska, but marketed by American (AS/AA*).

The key distinction between traditional (case #4) and virtual (cases #5 and #6) codesharing is that in the virtual cases, the operating carrier remains the same across all coupons of the ticket. Thus, codesharing of this type creates an additional virtual competitor in the market. Put differently, virtual codesharing arrangements are interesting from a competition policy standpoint because the operating carrier will always offer

(and in many cases the marketing carrier as well) their own pure online service in the same market. Moreover, in some markets, seats on the same flights may be marketed as pure online (case #1, i.e., NW/NW→NW/NW), semi virtual codeshare (case #5, i.e., NW/NW→NW/CO*) and fully virtual codeshare (case #6, i.e., NW/CO*→NW/CO*), potentially all at different fares.

3. Empirical analysis

Data for the empirical analysis were drawn from the US Department of Transportation's (DOT) domestic origin and destination Databank 1A for the third quarter of 2003. We restrict our analysis to passengers purchasing round-trip, coach class (both restricted and unrestricted) tickets and exclude open jaw tickets. Likewise, the analysis is limited to tickets with three or fewer coupons per directional trip leg and tickets with reported one-way fares less than \$25 or greater than \$1500 are excluded, since these might represent incorrectly coded non-revenue tickets or first/business class tickets. Finally, since we are ultimately interested in studying the effect of codeshare agreements on fares in city-pair markets, itineraries with originating and terminating airports in the same metropolitan area are grouped.³

Table 2 summarizes the data by categorizing it into the six classifications.

As expected, the overwhelming majority of passengers (over 98%) travel on pure online (case #1) itineraries. In contrast, only a small fraction of passengers (.23%) use non-allied interline itineraries. The fact that allied interline (case #3) itineraries are the least frequent type reflects that codesharing among alliance partners has become the preferred type of cooperative marketing arrangement.

The key observation from Table 2 is that among codesharing itineraries, virtual codesharing (cases #5 and #6) is more than three times as common as traditional codesharing (case #4). Among the two types of virtual codesharing, fully virtual is more prevalent than semi virtual.

The previous literature on international codesharing has typically focussed on studying the impact of traditional codesharing (case #4) or alliance itineraries (case #3) on airfares. This is because the ability to offer highly coordinated service in international markets is considered to be the primary benefit of international alliances and codesharing. As demonstrated by Table 2,

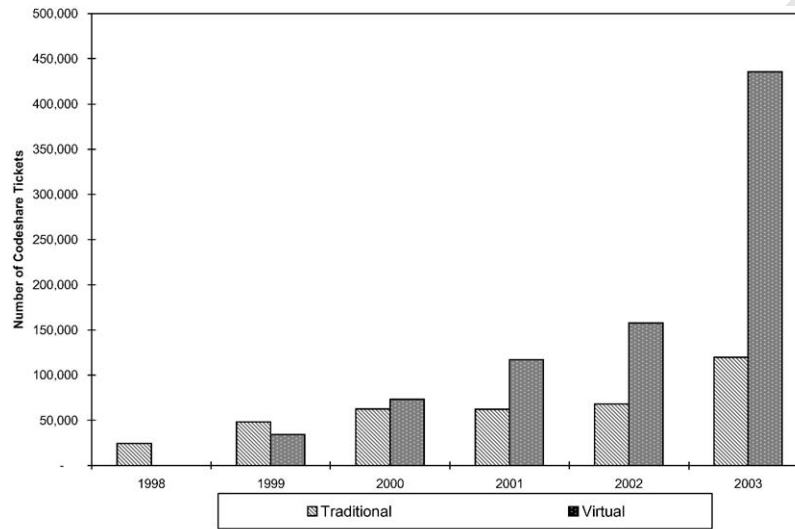
³The airports are grouped in the following metropolitan area: Washington, D.C. (BWI, DCA, IAD), San Francisco Bay Area (SFO, SJC, OAK), Los Angeles (LAX, BUR, LGB, SNA, ONT), Houston (IAH, HOU), Dallas (DAL, DFW), Chicago (ORD, MDW), New York City (LGA, JFK, EWR, HPN) and Miami (MIA, FLL).

Table 2
Classification of cooperative agreements in dataset

Case	Example	Passengers		
		Freq.	Percent	
#1	Pure online	AA/AA → AA/AA	37,532,890	98.19
#2	Non-allied interline	AA/AA → CO/CO	86,480	0.23
#3	Allied interline	NW/NW → CO/CO	51,280	0.13
#4	Traditional codeshare	NW/NW → CO/NW ^a	1,19,600	0.31
#5	Semi-virtual codeshare	DL/DL → DL/NW ^a	1,75,190	0.46
#6	Fully virtual codeshare	UA/US ^a → UA/US ^a	2,60,360	0.68
Total			38,225,800	100.00

Notes and sources: Data is from the third quarter of 2003, US DOT OD1A domestic database. Includes roundtrip, coach class tickets with three or fewer coupons per directional trip leg. Examples represent connecting itineraries between.

^aoperating carrier/marketing carrier flight segments with codeshare segments denoted by.



Notes: Virtual includes semi and fully virtual. Domestic roundtrip tickets. Data from the third quarter of each year. Excludes codeshare tickets between mainline and affiliated regional carriers. Source: U.S. DOT OD1A Database.

Fig. 2. Frequency of domestic codeshare tickets, 1998–2003.

however, the overwhelming majority of domestic passengers already have access to pure online service. Consequently, numerous government reports have expressed skepticism regarding both the motives and the likely competitive effects of domestic codesharing (i.e., US General Accounting Office, 1998, 1999; Transportation Research Board, 1999; Klein, 1999).

Fig. 2 demonstrates the considerable growth in codesharing amongst the major US carriers between 1998 and 2003 using data from the third quarter of each year and shows the increased proclivity among carriers to engage in virtual, rather than traditional codesharing. While domestic codeshare passengers are still somewhat rare relative to all pure online passengers, their frequency has increased significantly, from .07% of all tickets in 1998 to 1.47% of all tickets in 2003 with approximately 40% of markets having at least one codeshare itinerary. Thus, while the actual number of

codeshare passengers is still quite small, the practice of codesharing is widespread.

Table 3 reports the number of codeshare tickets by type sold during the third quarter of 2003 by each of the major domestic codeshare alliances. It shows that among the two largest alliances (Northwest/Continental/Delta and United/US Airways), roughly 80–85% of codeshare tickets are virtual. Although virtual codesharing is not as common among the remaining alliances, these alliances tend to be smaller. Consequently, 78.5% of codeshare passengers in our sample use virtual tickets.

In many markets where an operating carrier permits the sale of virtual tickets on its network, the virtual codesharing (i.e., marketing) carrier may also offer its own pure online service as well. For example, the codeshare agreement between United and US Airways permits US Airways to sell UA/US* virtual tickets on

Table 3
Frequency of codesharing passengers

Alliance	Number of passengers			Percent virtual
	Traditional	Virtual	Total	
Alaska/Hawaiian	540	60	600	10.0
America West/Hawaiian	490	100	590	16.9
America/Hawaiian	7380	340	7720	4.4
American/Alaska	5330	6570	11,900	55.2
Continental/Alaska	3660	710	4370	16.2
Continental/Hawaiian	2520	0	2520	0.0
Continental/Northwest/Delta	31,890	1,20,790	1,52,680	79.1
Northwest/Alaska	6540	530	11,840	44.8
Northwest/Hawaiian	6980	30	7010	0.4
United/US Airways	54,270	3,01,650	3,55,920	84.8
Total	1,19,600	4,35,550	5,55,150	78.5

Notes and sources: Data is from the third quarter of 2003, US DOT ODIA domestic database. Includes roundtrip, coach class tickets with three or fewer coupons per directional trip leg.

Table 4
Proportion of markets where virtual partner offers pure online service

Operating carrier	Number of virtual codeshare markets	% of markets where virtual partner offers pure online
American	32	43.8
Alaska	35	17.1
Continental	1075	87.6
Hawaiian	12	0.0
Northwest	2940	72.2
United	1298	46.5
US Airways	1678	62.0
Total	7070	66.9

Notes and sources: Virtual passengers include both fully-virtual and semi-virtual. Data is from the third quarter of 2003, US DOT ODIA domestic database. Includes roundtrip, coach class tickets with three or fewer coupons per directional trip leg.

United's flights from Boston to San Francisco. In this market however, US Airways also provides pure online connecting service (i.e., US/US → US/US). Table 4 summarizes the proportion of markets, by operating carrier, where the operating carrier's virtual partner also offers its own pure online service. The percentage is lowest when Alaska and Hawaiian are the operating carriers, indicative of the fact that these two carrier's networks are typically complementary to those of their codeshare partners. In contrast, the markets where Continental and Northwest codeshare tend to overlap significantly. In total, in approximately two thirds of virtual codeshare markets, virtual partners overlap.

Using a fixed-effects econometric analysis, Ito and Lee (2004) document the surprising fact that virtual codeshare tickets are 5–6% less expensive than other-wise similar pure online tickets sold in the same markets. Table 5 extends their results by detailing some of the

differences in virtual versus pure online fares among specific carriers. In particular, for each operating carrier, we first identified all of the markets where one of its codeshare partners sold virtual tickets (either semi or full) using its network. For each market, we then computed the percentage difference between the average virtual fare and the average pure online fare for that operating carrier, as well as all other operating carriers serving that market. Since the distribution of the fare differentials tend to vary widely across markets, Table 5 reports the passenger-weighted medians of these fare differentials.

Focussing on the four carriers comprising the overwhelming majority of domestic codeshare tickets (Continental, Northwest, United and US Airways), Table 5 demonstrates that virtual codeshare tickets are priced 4.6–14.8% (at the median market) lower than the pure online ticket prices of the same operating carrier in the same markets. The fare differential is the largest for Continental, at –14.8%. This implies that among the 1075 markets where virtual codeshare tickets on Continental's network were sold, the median fare discount for virtual tickets (i.e. CO/NW*) relative to Continental's own branded tickets (i.e. CO/CO) was 14.8%. Relative to the average pure online fare of all operating carriers, the median discount was 19.8%. Overall, the median discount for virtual tickets relative to pure online tickets on the same operating carrier was 7.2%. Relative to all pure online tickets, the median discount was 9.5%.

4. Domestic codesharing incentives

We now turn our attention to carriers' potential incentives to engage in different types of domestic

Table 5
Average fare differentials in markets with virtual codesharing

Operating carrier	Number of virtual codeshare markets	Median % fare differential of virtual tickets	
		vs. own pure online	vs. all pure online
American	32	5.9	9.2
Alaska	35	-10.6	-11.4
Continental	1075	-14.8	-19.8
Hawaiian	12	-17.9	-17.7
Northwest	2940	-4.6	-14.7
United	1298	-9.3	-3.1
US Airways	1678	-7.3	-8.2
Total	7070	-7.2	-9.5

Notes and sources: Fare differentials are computed as the percentage difference between the passenger-weighted mean fares for the pure online and virtual tickets. Virtual passengers include both fully virtual and semi-virtual. Data is from the third quarter of 2003, US DOT OD1A domestic database. Includes roundtrip, coach class tickets with three or fewer coupons per directional trip leg.

codesharing and explore their pricing implications. Our primary interest is to provide some insight into the somewhat surprising result that virtual codeshare tickets are less expensive than their pure online counterparts.

4.1. Double marginalization

In the context of international aviation, it has been well documented that interline itineraries are more expensive than otherwise comparable online itineraries because of the double marginalization problem (Brueckner and Whalen, 2000; Brueckner, 2003b). Double marginalization on non-allied interline tickets occurs because each carrier tries to maximize the profit from its own segment independently from the other carrier. Consequently, interlining carriers typically charge segment fares higher than a single decision maker controlling prices over the joint itinerary would. While the reduction in double marginalization, however, explains why alliance and traditional codeshare fares tend to be lower than non-allied interline fares, it does not explain why virtual codeshare tickets are less expensive than otherwise comparable pure online tickets, since the latter set of tickets do not suffer from the double marginalization problem (i.e., a single decision maker sets the fare).

4.2. Crowding out

Since codeshare flights appear multiple times in CRSs, they can potentially crowd out itineraries of other carriers on the computer screen of travel agents or travelers trying to book tickets (US General Accounting Office, 1998; Transportation Research Board, 1999). This has led to a concern that codeshare partners may generate an unfair advantage relative to non-codesharing carriers, potentially resulting in less competition and

higher fares.⁴ Likewise, if alliance partners chose to compete less vigorously on overlapping markets but for the cooperative agreement, fares offered by codeshare partners in these markets could increase (Whalen, 1999; Transportation Research Board, 1999). If CRS crowding out were the primary motive behind virtual codesharing, however, one would expect to see higher—not lower—prices for virtual codesharing itineraries. Thus, crowding out does not appear to be the primary motivation for virtual codesharing.

4.3. Network expansion

To understand virtual codesharing incentives, it is important to emphasize that while the virtual marketing partner does not realize any ticket revenue (other than a nominal commission) for the virtual codesharing tickets it sells, it does benefit from expanded network scope. For example, while US Airways does not operate non-stop service between Boston and San Francisco, it can sell non-stop service in this market to its Boston based customers (where it has a substantial base of frequent flyers) via its codeshare partnership with United. US Airways customers purchasing the non-stop UA/US* virtual ticket from Boston to San Francisco still receive frequent flyer mileage and other benefits, such as access to United's lounges. Thus, virtual codesharing enables US Airways to develop additional market presence and compete more effectively for local customers in Boston, many of whom will value the larger virtual network. Despite the fact that US Airways does not receive any revenue on the virtual tickets it sells, codeshare

⁴The proliferation of Internet booking channels such as Orbitz and Expedia that allow consumers to easily rank potential itineraries by price have likely made CRS crowding out less of a competitive concern.

agreements between major carriers are carefully negotiated so that they are balanced in the sense that the sets of markets where partners offer virtual codesharing on each others networks are more or less equivalent. Thus, while US Airways does not realize any revenue for a Boston based passenger purchasing a UA/US* virtual codeshare ticket from Boston to San Francisco, United reciprocates by selling virtual tickets (i.e., US/UA*) on US Airways' network in markets where it does not offer service (or does so with less convenient schedules and routings) such as the Northeast shuttle markets connecting New York's LaGuardia airport, Washington's National airport, and Boston.

Since virtual codesharing allows carriers to expand their network by offering service in markets they might otherwise not serve (or serve, but with less a convenient schedule), it makes their network more attractive to their customers, especially frequent flyers. If expanded network scope in turn leads to a higher share of passengers at key airports, this should lead to higher fares on flights to and from those airports (Evans and Kessides, 1993). Nevertheless, while network expansion may be an important incentive behind the virtual codesharing, it does not explain why virtual codeshare fares are systematically lower than pure online fares.

4.4. Service quality and product differentiation

There are small—but often significant—differences in the benefits offered to elite frequent flyers (those who fly a specified number of miles each year) purchasing virtual codeshare tickets compared to pure online tickets. For example, while Northwest's elite frequent flyers are eligible for complimentary upgrade to first-class on flights operated and marketed by Northwest, they are not eligible for these upgrades either when purchasing virtual tickets operated by Delta (i.e., DL/NW* → DL/NW*) or virtual tickets operated by Northwest but marketed by Delta (i.e., NW/DL* → NW/DL*).⁵ Consequently, a virtual online ticket operated by Northwest but sold by Delta (i.e., NW/DL* → NW/DL*) is likely to be perceived by some passengers—in particular, Northwest's elite frequent flyers—as an imperfect substitute. One should expect therefore, that in markets where Northwest offers both pure online service and virtual online service, its virtual online service will be sold at a discount to its pure online service.

Thus, it is possible that beyond expanding network scope, virtual codesharing can be used as a customer-segmentation device by airlines. It is well known that airlines have long used various ticket restrictions (i.e.

⁵Likewise, while American's elite frequent flyers are eligible to receive free upgrades on flights operated by American, they do not qualify for upgrades on virtual tickets operated by Alaska (i.e., AS/AA* → AS/AA*).

Saturday night stay requirements, refundability, change fees, etc.) to differentiate between business and leisure passengers (Borenstein and Rose, 1994). Virtual codesharing may provide yet another mechanism carriers can use to further differentiate between passengers that value all of the product characteristics that are bundled with the pure online product (i.e., upgradeability) and those passengers who may not. In some sense, the pure online service represents a carrier's brand-name premium product, whereas the virtual codeshare service represents its generic product.

To summarize, there appear to be at least four possible incentives for carriers to engage in domestic codesharing: to internalize the externality associated with double marginalization, to increase the number of listings in the CRS (i.e., crowding out), to expand network scope, and greater product differentiation. Among these competing motives, only the product differentiation hypothesis provides an explanation to why virtual codeshare fares should be lower than the pure online fares in the same market and on the same operating carrier.

5. Conclusions

The practice of domestic codesharing in the US has grown tremendously over the past 5 years and recently initiated codeshare agreements among the largest US carriers all but guarantees that this trend will continue. This paper documents some stylized facts regarding domestic codesharing practices. We show that the overwhelming majority of domestic codeshare passengers in the US travel on virtual codeshare tickets, whereby one carrier markets and sells service on flights operated solely by other carriers. This practice of virtual codesharing differs significantly from the traditional use of codesharing from international aviation whereby the networks of two carriers are joined together. The fact that virtual codeshare tickets are, on average, priced lower than pure online tickets, both of the same operating carrier as well as other carriers operating in the same market. While the common explanation of double marginalization explains why traditional codesharing results in lower fares relative to interline fares, it does not explain why virtual codeshare itineraries are priced significantly lower than the online itineraries offered by a single carrier. It is suggested that increased product differentiation is the hypothesis most consistent with our empirical findings. Under this hypothesis, a carrier uses virtual codesharing as a generic or qualitatively inferior product, to further segment its customers between those who are willing to purchase the branded, premium product (i.e., pure online) and those passengers who are not. Thus, despite the fact that many policymakers have been highly skeptical of domestic

1 codesharing, there is evidence that these practices may in
3 fact lead to lower fares, at least for some travelers.

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