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Airline strategic alliances in overlapping markets: Should policymakers be concerned?

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ABSTRACT

When there is significant overlap in potential partner airlines' route networks, policymakers have expressed concern that an alliance between such airlines may facilitate collusion on price and/or service levels in the partners' overlapping markets. The contribution of our paper is to put together a structural econometric model that is able to explicitly disentangle the demand and supply effects associated with an alliance between such airlines. The estimates from our structural econometric model do identify demand-increasing effects associated with the Delta/Continental/Northwest alliance, but statistically reject collusive behavior between the partners.

1. Introduction

Policymakers have expressed skepticism when reviewing airlines' application to form a codeshare alliance in the event that such an alliance involves potential partners that have significant overlap in their route networks. The heart of the concern is that these potential partners are direct competitors in the segments of their networks that overlap, and an alliance between them, which often requires broad discussions between partners to make their interline[1] service seamless, could facilitate collusion on prices and/or service levels in the partners' overlapping markets. Before ultimately approving the Delta/Continental/Northwest alliance, which was formed in June 2003, the U.S. Department of Transportation (DOT) expressed these concerns.[2] The DOT's review of this proposed alliance points out that the three airlines' service overlap in 3214 markets accounting for approximately 58 million annual passengers, which is in contrast to the next largest alliance between United Airlines and US Airways with overlapping service in only 543 markets accounting for 15.1 million annual passengers. So unlike much of the literature that focuses on international airline alliances (Brueckner et al., 2011; Brueckner and Proost, 2010; Brueckner, 2003; Brueckner and Whalen, 2000; Bilotkach, 2007; Lederman, 2007, among others), we focus on a U.S. domestic alliance (Ito and Lee, 2007; Bamberger et al., 2004; Gayle, 2008).

Using a reduced-form econometric model similar to that in Bamberger et al. (2004), Gayle (2008) has shed some light on price effects associated with the Delta/Continental/Northwest codeshare alliance. In particular, Gayle (2008) finds that the alliance is associated with a marginal price increase, which by itself points to possible collusive effects. But a marginal price increase is also consistent with increased demand and there is good reason to believe that an alliance has a demand-increasing effect associated with it. For example, passengers that are members of an airline's frequent-flyer program may cumulatively earn and redeem frequent-flyer miles across any partner in the alliance. The new opportunities for passengers to earn and redeem miles will likely increase demand for the alliance partners' products. In the case of enhancements to international frequent-flyer partnerships, Lederman (2007) provides reduced-form econometric evidence suggesting that enhancements to international frequent-flyer partnerships are associated with increases in domestic airline demand.

To better understand the market effects associated with an alliance, both from the demand and supply sides of a market, it is important to go beyond the reduced-form analyses that currently exist in the literature. As such, the main contribution of our present paper is to specify and estimate a structural econometric model that allows us to disentangle demand changes from possible changes in airline pricing behavior that are associated with a codeshare alliance.

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[1] Interline means that at some point in the trip when passengers change planes they also change airlines.

[2] See "Termination of review under 49U.S.C. Section 41720 of Delta/Northwest/Continental Agreements," published by *Office of the Secretary, Department of Transportation*, January 2003.

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The empirical separation of demand changes from airline pricing behavior changes allows us to (1) statistically test whether a codeshare alliance is associated with a demand-increasing effect; and (2) statistically test whether a codeshare alliance is associated with collusive pricing behavior in the partners' overlapping markets, as feared by policymakers.

Our key findings are as follows: First, the econometric estimates for the air travel demand equation suggest that the Delta/Continental/Northwest codeshare alliance has a demand-increasing effect associated with it. Importantly, the demand-increasing effect is only evident in markets that the partners have a substantial joint passenger share (greater than 49%) prior to implementation of the alliance. Since a relatively larger proportion of passengers in a market are more likely to have frequent-flyer membership with at least one of the three carriers in markets that the carriers jointly dominate prior to the alliance, this finding is consistent with the argument that these frequent-flyer passengers will increase their demand for the alliance partners' products given that the alliance creates new opportunities for passengers to accumulate and redeem frequent-flyer points across partner carriers.

Second, a statistical non-nested test applied to air travel supply model selection suggests that Bertrand Nash pricing behavior, rather than collusive pricing behavior, between the three airlines better fit the data in markets where the three airlines codeshare together. To the best of our knowledge, this is the first paper to explicitly test and statistically reject that collusive pricing behavior is associated with a codeshare alliance.

The rest of the paper is organized as follows: In the next section we make some key definitions which build the foundation for important issues we subsequently model, analyze, and discuss. In Section 3 we discuss characteristics of our data. We present the structural econometric model in Section 4, while estimation strategy is discussed in Section 5. Results are presented and discussed in Section 6. Concluding remarks are offered in Section 7.

2. Definitions

A *market* is defined as directional round-trip air travel between an origin and a destination airport during a particular period. The assumption that markets are directional implies that a round-trip air travel from Atlanta to Detroit is a distinct market than round-trip air travel from Detroit to Atlanta. Furthermore, this directional assumption allows for the possibility that origin city characteristics may influence market demand (see Gayle, 2007a,b, 2013; Berry et al., 2006].

A flight *itinerary* is defined as a specific sequence of airport stops in traveling from the origin to destination airport. An air travel *product* is defined as a unique combination of airline(s) and flight itinerary. Following Ito and Lee (2007), a *pure online product* means that the same airline markets and operates all segments of a round-trip. For example, three separate pure online products are (1) a non-stop round-trip from Atlanta to Detroit marketed and operated by Delta Air Lines; (2) a round-trip from Atlanta to Detroit with one stop in Minneapolis marketed and operated by Delta Air Lines; and (3) a non-stop round-trip from Atlanta to Detroit marketed and operated by Northwest Air Lines. Note that all three products are in the same market – Atlanta to Detroit.

A *codeshare agreement* effectively allows one carrier (called the "*ticketing carrier*" or "*marketing carrier*") to sell seats on its partners' plane as if these seats are owned by the carrier selling the seats. The carrier whose plane that actually transports the passenger is referred to as the "*operating carrier*". For example, Northwest may sell tickets for a subset of seats on a Delta operated flight between Atlanta and Detroit as if the plane were owned by Northwest. Thus, a passenger that uses a codeshare itinerary may have bought the round-trip ticket from Northwest, but actually flies on a plane operated by Delta.

The literature on domestic airline alliances has identified two main types of codeshare itineraries: (1) *traditional* codeshare; and (2) *virtual* codeshare.[3] *Traditional* codeshare itineraries combine interline operating services of partner carriers on a given route, where one of these operating carriers is the sole ticketing carrier for the entire trip. An example of a traditional codeshare product is a trip from Atlanta to Detroit with one stop in Minneapolis, where the Atlanta to Minneapolis segment of the trip is operated by Delta, the Minneapolis to Detroit segment of the trip is operated by Northwest, but the ticket for the entire trip is marketed by Northwest. Brueckner and Whalen (2000), Brueckner (2003), Ito and Lee (2007) and Gayle (2008) find evidence that traditional codesharing tends to lower rather than raise prices. An often cited reason for this price-decreasing effect of traditional codesharing is that this type of codesharing eliminates double markup that would otherwise persist when carriers are unaffiliated.[4]

Owing to the existing robust empirical evidence of a price-decreasing effect associated with traditional codesharing, this type of codesharing is not the focus of our present analysis. The type of codesharing we focus on in this research is referred to as *virtual* codeshare. A passenger using a virtual codeshare itinerary remains on a single operating carrier's plane(s) for the entire round-trip, but the ticket for the trip was marketed and sold by a partner ticketing carrier. Thus a key distinction between virtual codeshare and traditional codeshare is that traditional codeshare requires the passenger to travel on different operating carriers' planes (interline air travel) on a multi-segment route, while virtual codeshare does not involve interline air travel even when the passenger changes planes on a multi-segment route. We focus on virtual codesharing because Gayle (2008) finds that this is the only type of codesharing that is associated with price increases.

Fig. 1 gives an example where two airlines' route networks overlap and the airlines may virtual codeshare together in the origin–destination market. The figure shows that Northwest and Delta both operate non-stop flights in the Atlanta to Detroit market. If they virtual codeshare together in this market, then a subset of the passengers on the Delta plane would have bought their tickets from Northwest, while a subset of the passengers on the Northwest plane would have bought their tickets from Delta.

Fig. 2 shows an alternate situation in which the airlines' route networks may overlap. In Fig. 2, Northwest operates a non-stop flight in the Atlanta to Detroit market, while Delta operates a one-stop itinerary in the Atlanta to Detroit market, but unlike Fig. 1, Delta does not operate a non-stop flight in this market. Northwest and Delta's networks are still considered to be overlapping in Fig. 2 even though Delta operates only a one-stop itinerary while Northwest operates a non-stop itinerary. Both carriers may virtual codeshare together in Fig. 2.

In Fig. 2 it might seem counter-intuitive that a passenger would choose a one-stop itinerary even though a non-stop flight between the origin and destination is available. However, passengers often choose less convenient routes (flight itineraries that require intermediate stops) to get from their origin to destination when such alternate routing is competitively priced. In other words, within reasonable bounds, some passengers are willing to trade-off travel itinerary convenience for a lower price.

Fig. 2 can also be used to illustrate a situation in which virtual codesharing is likely to have a demand-increasing effect associated with it. In the event that Northwest and Delta do not have a codeshare alliance, Northwest can only offer its Atlanta-based

[3] See Ito and Lee (2007) and Gayle (2008) for discussions of the main types of codeshare products in the U.S. domestic market.

[4] See Gayle (2013) for an empirical investigation of situations in which double markup may persist for traditional codeshare products. Chen and Gayle (2007) provides an analogous theoretical analysis of this issue.