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Can private airport competition improve runway pricing? The case of San Francisco Bay area airports ☆

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ABSTRACT

Travelers and airlines are frustrated by long and costly travel delays at public airports that are attributable to runway charges that do not account for aircraft congestion. Because the inefficient charges are likely to persist, we explore whether private airport competition could lead to more efficient charges that improve travelers' welfare, increase airlines' profits, and enable the airports to be profitable. We use the San Francisco Bay Area for our assessment and identify important conditions to achieve those outcomes, including competition among separately owned airports, bargaining between airports and airlines, and the ability of airports to differentiate prices and service.

1. Introduction

Public airports have failed to curb the increasingly long and costly travel delays that have frustrated both air travelers and airlines. The heart of the problem is that aircraft pay for runway landings—takeoffs are not charged—based on their weight subject to guidelines set by the Federal Aviation Administration (Van Dender, 2007). Weight-based landing fees do not vary with the volume of traffic, which affects congestion and delays, and are therefore inefficient. In principle, runway charges could be reformed to improve efficiency, but political resistance to reforming FAA policies (Winston, 2013) and the logistical challenges confronting a government authority that attempts to regulate prices for different airports in a metropolitan area suggest it would be more fruitful to explore whether private airport competition could improve airport runway pricing with government regulation, such as price caps, imposed only if it could enhance welfare. The U.S. Congressional airport privatization program and, for example, London's airport privatization experiment, where its major airports, Heathrow, Gatwick, and Stansted, have been sold to different owners, indicate that policymakers have a serious interest in the issue.

The purpose of this paper is to explore the potential effects of private airport competition on runway prices and the welfare of travelers, airlines, and airports for the San Francisco metropolitan area by developing an empirically tractable model of competition among Oakland, San Francisco, and San Jose airports. Previous literature has not modeled airport competition in this manner, but it has identified possible outcomes of privatization on runway pricing. Starkie (2001) and Zhang and Zhang (2003) pointed out in the stylized case of a monopoly airport that the rents from leasing space to other businesses such as retail shops induce the airport to set runway charges much closer to social marginal costs—to increase passenger throughput—than if the airport had no concessions. Basso (2008) provided a theoretical and numerical analysis that showed the welfare effects of airport privatization vary with competitive conditions. And empirical studies of European airports have indicated that privatization's effect on prices is debatable as Bel and Fageda (2010) found in a cross-section data analysis that runway charges are higher at private airports than at public airports and at private airports subject to regulation, while Bilotkach et al. (2012) found in a panel-data analysis that charges are lower at privatized airports.

Our main finding is that private airport competition could increase commercial travelers' welfare and airlines' profits and enable the airports to be profitable. The key conditions are that policymakers privatize all three Bay Area airports and sell them to different owners. In this environment, airports compete for airline operations by setting aircraft charges that reduce delays (*upstream competition*), aircraft charges are determined through negotiations between each airport and commercial carriers, which are organized as a bargaining unit (*bargaining between upstream and downstream firms*), and different classifications of users, commercial airlines and general aviation, face different charges (*upstream price differentiation*). We indicate how those conditions could be met in practice, thereby providing general guidance to policymakers who may want to institute private airport competition.

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Table 1
Summary statistics for SF airports.

	SFO	SJC	OAK
Total passengers in 2007[a]	34,346,413	10,653,817	14,533,825
Average trip distance of commercial travelers (miles)[b]	2084 (577)	1993 (603)	1996 (614)
Average flying time of commercial travelers (hour)[b]	4.93 (1.27)	4.78 (1.29)	4.70 (1.32)
Total commercial flight operations in 2007:3 [c]	69,331	31,257	44,991
Average commercial aircraft size (seats)[d]	146 (45)	126 (42)	134 (26)
Total general aviation (GA) flight operations in 2007:3 [c]	29,588	17,610	23,901
Percent of GA operations that are air taxis in 2007:3 [c]	84.1	42.1	31.6
Average number of commercial flights in a 15 minute interval in 2007:3 [e]	11 [1, 27]	6 [1, 15]	6 [1, 17]
Average departure delay in 2007:3 (min) [f]	15 (13)	9 (11)	10 (11)
Average arrival delay in 2007:3 (min) [f]	5 (4)	3 (3)	3 (3)

[a] Source: annual reports of the airports.
[b] Source: DB1B. Numbers in parentheses are standard errors.
[c] Source: http://aspm.faa.gov/opsnet/sys/Airport.asp.
[d] Source: Back Aviation Solutions database. Numbers in parentheses are standard errors.
[e] Source: ASPM data base. Numbers in parentheses are minimal and maximal values.
[f] Source: ASPM database. Numbers in parentheses are standard errors.

2. Modeling framework

Modeling private airport competition is challenging because consumer welfare and the profitability of the downstream firms, air carriers, and upstream firms, airports, is affected. We construct an appropriate network of air transportation routes to study and then model competition among private San Francisco Bay Area airports as a sequential-moves game given the network. The model and our findings account for horizontal airport competition, the vertical relationship between airports and airlines, and horizontal airline competition where airlines compete in both price and capacity.

2.1. The air transportation network

We confine our assessment to the San Francisco Bay Area airports, San Francisco Airport (SFO), Oakland Airport (OAK), and San Jose Airport (SJC), because those airports comprise a plausible market where competition is feasible and may be beneficial to travelers and airlines. As shown in the summary of the airports' operations in Table 1, SFO is the largest of the airports in terms of passengers, commercial flights, and general aviation operations, especially air taxi operations that use larger planes than other general aviation operations do. SFO also has longer departure and arrival delays but the average trip distances, flying times, and size of commercial aircraft serving the airports are similar.

The basic unit of observation of our analysis is round trip airline activity involving one of the three San Francisco Bay Area airports as the origin or destination and another U.S. domestic airport to complete the route. Our network of routes excludes international routes because data are not publicly available for the fares and service quality variables of all the carriers, domestic and international, which serve those routes and for the delays at the foreign airports that comprise the routes. This omission does not appear to be important for OAK and SJC airports because the share of international passengers at those airports is less than 2%, but the share of international passengers at SFO is roughly 20%.[1] We therefore discuss later how our findings may be affected by international airline operations and we also indicate how we account for any effects of international airline travel on travelers' demand and carriers' supply.

As noted, we are interested in whether private airport competition can improve pricing efficiency and reduce delays; thus, we distinguish takeoff and landing runway charges set by private Bay Area airports from (regulated) weight-based landing fees at public airports in other metropolitan areas by defining airline markets by directional city-pairs, so San Francisco → Los Angeles is a different market than Los Angeles → San Francisco. Airlines offer multiple products that we define as the combination of an airport itinerary, air carrier, and a ticket class (price range).[2] We capture private airport competition's effect on delays by including the 71 airports (including the SF airports) with sufficient congestion that their traffic delays are monitored by the Federal Aviation Administration (FAA). As a result, our analysis covers 120 city-pair markets.

We simplify our analysis by making the following assumptions.

Assumption 1. Pricing policy changes at SF airports will not affect congestion in non-SF markets.

Let A denote the set of the 71 airports in city-pair markets comprised by a San Francisco Bay Area market. For each airline f we restrict our analysis to its sub-network denoted by $H_f \equiv (\Phi_f, A)$, where Φ_f is the set of spoke routes that are used by airline f to provide non-stop and connecting service to and from SF airports. Thus, $\Phi_f = \{\Phi_f^{SF}, \Phi_f^{NSF}\}$, where Φ_f^{SF} is the set of the carrier's spokes connected to the three SF airports and Φ_f^{NSF} contains non-SF spokes that are used by the airline to provide connecting services.[3]

Assumption 2. Pricing policy changes at SF airports will not affect the structure of an airline's sub-network.

Assumption 2 states that Φ_f is fixed in our analysis for any airline f. We restrict airlines' entry and exit behavior because modeling those dynamic decisions would significantly complicate the complex network equilibrium that we are trying to solve. On the one hand, this restriction may not be particularly strong in our case because SFO is a United Airlines hub and close to the main city in the metropolitan area, while OAK and SJC are smaller airports dominated by Southwest Airlines, which is a low-cost carrier serving point to point routes. Thus, in response to higher airport charges, United Airlines, for example, might not be willing to move its hub-and-spoke operations by shifting a large share of its flights from SFO to OAK and SJC. On the other hand, United could adjust its overall network to effectively play off its SFO hub against its other hubs in the west, including LAX and Denver, to serve certain routes that face higher airport charges at SFO. For example, it could reduce its service to Santa Barbara from SFO and provide more service to Santa Barbara from LAX. Oum et al. (1995) show that by adjusting their hubbing activity at hub airports, airlines could gain a competitive advantage.

[1] Those figures are from Airports Council International.

[2] For example, the San Francisco Bay Area to New York City metropolitan area market may consist of the following set of products: 1) A $300 non-stop United Airlines (UA) flight from SFO to EWR (Newark); 2) A $300 connecting (one-stop) UA flight from SFO to EWR through ORD (Chicago); 3) A $300 non-stop UA flight from SJC to EWR; 4) A $300 non-stop UA flight from SFO to JFK (New York); 5) A $300 connecting UA flight from SFO to EWR through DEN (Denver); and 6) A $300 non-stop American Airlines (AA) flight from SFO to EWR.

[3] For example, the spoke connecting ORD and BOS is used by United to provide connecting service between SFO and BOS.