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How to mix per-flight and per-passenger based airport charges

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ABSTRACT

This paper investigates the questions of why carriers advocate for higher per-passenger airport charges and lower per-flight charges, and whether and when this proposal is welfare-enhancing. Specifically, the paper compares the optimal mix of per-flight and per-passenger based airport charges from both a monopoly carriers' and the social viewpoints conditional on airport cost recovery. It focuses on the trade-off between price and frequency (i.e., schedule delays) when time valuations are uniform, or differ, between business and leisure passengers. We identify an easy test for the evaluation of the mix of per-passenger and per-flight based airport charges by policy makers, which is simply to check whether the carrier's preferred per-flight charge is zero. Our analysis suggests that there is no need for immediate regulatory corrections of the current trend towards the strong use of per-passenger based airport charges.

1. Introduction

"Many airport facilities are built and maintained for the benefit of airline passengers. It is in the interest of both the airport and the airlines to recover these costs through passenger based charges instead of other aeronautical based charges." (International Air Transport Association, IATA, 2010).

Traditionally, aeronautical charges are based on aircraft weight formula, which is especially true for landing, parking and hangar charges.[1] But, as airport improvement fees, which are used to charge passengers for airport infrastructure development and/or debt repayment, have become a more important revenue source for airports (Zhang, 2012), airports worldwide derive today as much aeronautical revenues from per-passenger charges as from aircraft related (i.e., per-flight) charges (ACI, 2008). Yet, the trade association for the world's airlines (International Air Transport Association, IATA) seems to propose to further move away from per-flight related airport charges towards per-passenger related charges.

A recent empirical study of aeronautical charges at major US airports by Choo (2014) clearly shows that an increase in the per-passenger charges will be associated with a reduction of per-flight charges. But, why are carriers interested in raising per-passenger airport charges relative to per-flight charges? Is the carriers' proposal socially optimal? In this paper we investigate these questions. The issues are addressed by comparing a monopoly carrier's and the social viewpoints on the optimal

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[1] The International Civil Aviation Organisation (ICAO) proposes that landing charges as well as parking and hangar charges should be based on aircraft weight formula (ICAO, 2012).

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mix of airport-charges conditional on strict airport-cost recovery through revenues derived from airport per-flight and per-passenger charges.[2] A crucial element of the model is that passengers experience schedule delays, which measure the absolute difference between the passengers' most preferred and their actual travel times. Following Douglas and Miller (1974) and more recent work by, e.g., Bilotkach (2007), Brueckner (2004, 2010) and Brueckner and Flores-Fillol (2007), it is assumed that schedule delays are negatively related to the quantity of aircraft flights, i.e., frequency. This is because an increase in frequency increases the likelihood that passengers travel at their preferred times. Schedule delay costs then depend on frequency and time valuations. In this scenario, passenger demands depend on "generalized prices," which are composed of ticket price (fare) and schedule delay costs. The model therefore establishes a clear trade-off between low per-passenger charge, low fare, and low frequency versus low per-flight charge, high fare and high frequency.

Our analysis shows that an increase in the per-passenger airport charge and the associated reduction in the per-flight charge can indeed increase carrier profit. Essentially, the reduction in schedule delay costs associated with a marginal increase in frequency, which is fully internalized by the carrier when the passengers' time valuations are uniform, exceeds the marginal frequency cost when the per-flight charge is positive. The picture becomes more complex when passengers with distinct time valuations exist. There is good evidence that business passengers exert high time valuations relative to leisure passengers (e.g., Morrison, 1987; Morrison and Winston, 1989; USDOT, 1997; Pels et al., 2003). Then, if the carrier charges a uniform price to business and leisure passengers, exact internalization of reductions in schedule delays is not ensured. Specifically, if the average time valuations (defined as the arithmetic mean of all passengers' time valuations) exceeds the marginal passengers' time valuations (defined as the average time valuation of incremental passengers), the carrier's incentive to provide frequency is too low because it is concerned with the marginal time valuations. This translates into a preference for low per-passenger charge and high per-flight charge relative to a carrier that would be concerned about the average time valuations. The distinction between the marginal and average time valuations becomes however less relevant when a carrier can price discriminate between business and leisure passengers in the form of third-degree price discrimination by, for example, advanced purchase rebates.[3]

Turning to the social maximizer, she is concerned not only about producer surplus but also about consumer surplus. Adding the consumers' viewpoint into consideration means minimization of full fares conditional on airport cost recovery. Thus, the carrier's and social viewpoints can be identical only if the carrier's preferred mix of airport charges minimizes full fares. While policy makers may have difficulties to identify the minimization of full fares, we further show that the carrier's and the social viewpoints are identical only if the carrier's preferred per-flight charge is exactly equal to zero when time valuations are uniform. Furthermore, the zero per-flight charge can still be optimal from the carrier's and the social viewpoints if time valuations differ between passenger groups, but only if ticket prices are discriminating. These results thus suggest an easy test for the potential conflicts of interest between the carrier and the social maximizer, which is to simply check whether the carrier's optimal mix of airport charges incorporates the zero per-flight charge. Numerical tests further indicate that the carrier's preferred per-passenger charges are more likely to be excessive from the social viewpoint if time valuations are high.

Our paper contributes to several strands of the literature. The first is to the literature on airport pricing, which typically concentrates on congestion pricing and the pricing of airport concession services based on passenger related charges.[4] For example, Flores-Fillol (2010) analyzes airport congestion pricing when schedule delays are present but assumes that aggregate passenger demand is fixed, normalizes the per-passenger airport charge to zero and therefore concentrates on frequency supply and per-flight related congestion charges. Silva and Verhoef (2013) consider a congested airport and per-flight and per-passenger charges. They find that market power should be corrected by the per-passenger subsidy and that the per-flight charge should be used to control congestion. It is well known that subsidies may be required to reach the first-best welfare result (e.g., Pels and Verhoef, 2004). The problem here is that airports are often required to cover all or at least a large share of their costs by own revenues (e.g., Zhang and Zhang, 2003), which means that the first-best result is often not achievable in practice. To our knowledge, our paper is the first that evaluates the mix of airport per-passenger and airport per-flight charges from the carrier's and the social viewpoints. Furthermore, it explicitly considers the empirically important airport cost-recovery constraint, which further distinguishes the present study from previous ones.

Note that similar issues may also arise in other transportation infrastructures. In the port sector, for example, port charges may be levied on the ship and cargo. More specifically, prices charged for servicing a containership and its cargo at a port may include: (i) (charged to the vessel) prices for pilotage, tuggage, dockage, line-handling, and vessel overtime; and (ii) (charged to container box) prices for wharfage, stevedoring, rental of terminal cranes, and number of containers moved on to and off the vessel. Furthermore, there have been discussions about the optimal pricing structures from the perspectives of shipping lines, the port, shippers (i.e., cargo owners) and welfare (e.g., Talley, 2009). The insights derived in the present paper may therefore be relevant for port policies and, thus, adds to the seaport literature. Since schedule delays can be considered as a quality dimension, this paper further adds to the literature on quality supplies, which was introduced by the seminal papers of Spence (1975) and Sheshinski (1976).

[2] In a recent study, Lazarev (2013) identifies and analyzes 76 US origin–destination markets that are served by only one airline. We discuss the issue of airline market structure further in the concluding remarks.

[3] Airlines are a frequently used example for markets where price discrimination is prevalent (for example, Borenstein, 1985; Dana, 1999a,b and Cowan, 2007). Stavins (2001) and Lazarev (2013) provide empirical evidence for airline third-degree price discrimination. To abstract away from self-selection, assume that early booking is prohibitive for business passengers.

[4] See Zhang and Czerny (2012) for a literature survey on airport congestion pricing and airport concession revenues.