How to Mix Per-flight or Per-passenger Based Airport Charges

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ITEA Annual Conference, Toulouse
June 04, 2014
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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, July 2010)
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Is there something missing?
Passengers?!
We wonder:

- Why are carriers interested in raising per-passenger airport charges relative to per-movement charges?
- Is the carriers’ proposal socially optimal?

Is the carriers’ proposal practically relevant?
Introduction

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Is the carriers’ proposal practically relevant?
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).

Traditionally, aeronautical charges are indeed based on aircraft weight formula.

There is a growing tendency to cover airport costs by passenger service charges (Zhang, 2012).

Airports worldwide derive today as much aeronautical revenues from per-passenger charges as from aircraft related 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 aircraft weight related airport charges towards per-passenger based charges.
It is common to assume that load factors are 100% (e.g., the studies mentioned below). If seat capacity is further normalized to 1, per-flight and per-passenger charges are the same.

Flores-Fillol (2010) considers a congested airport, schedule delays and a per-flight charge to internalize congestion.

Silva and Verhoef (2013) consider a congested airport and per-flight and per-passenger charges: market power corrected by the per-passenger subsidy and the per-flight charge controls congestion.

Gillen and Mantin (2013): Profit maximizing per-passenger and per-route airport charges.
Contribution

- The contribution is to incorporate schedule delays and airport cost recovery.
- In our framework it holds:

  \[
  \text{full fare} = \text{ticket price} + \text{schedule delay cost}. \quad (1)
  \]

  (Note that an increase in the per-passenger charge may have no effect at all on the full fare.)

- And, to compare the carrier’s with the social viewpoints.
- (And, to capture passenger types with distinct time valuations and uniform or discriminating fares.)

- To abstract from competition effects, we deliberately concentrate on a monopoly carrier.
Main Insights

- (A positive per-passenger charge is indeed optimal from the carrier’s viewpoint.)
- The carrier’s and the social viewpoints on the airport-charges structures can be in line (i.e., there is no disagreement).
- (The latter depends on whether full fares (or variations depending on whether time valuations are uniform or distinct) are minimized conditional on airport-cost recovery.)
- A zero per-flight charge may indicate that the private and the social viewpoints are in line.
Remarks on the methodology:

- Schedule delays and airport cost recovery make it difficult to derive analytical solutions.
- Our analysis relies heavily on the discussion of first-order conditions.
- And, numerical simulations.
- We consider general functional forms.
- The presentation abstracts from comparative-static analysis.
The Basic Model

- Airport profit:
  \[ \Pi \equiv \tau_q q + \tau_f f - F \]  

- Carrier profit:
  \[ \pi \equiv (p - \tau_q)q - (\tau_f + c)f \]  

- Full fare:
  \[ \eta \equiv p + v\Gamma \quad \text{with} \quad \Gamma'(f) < 0, \Gamma'' > 0 \]  

- Consumer surplus:
  \[ CS \equiv B - \eta q \quad \text{with} \quad B''(q) < 0 \]  

- Welfare:
  \[ W \equiv B - qv\Gamma - cf - F \]
The Basic Model

- Time structure with two stages:
  - First stage: The per-passenger and per-flight charges are determined in order to ensure airport cost recovery.
  - Second stage: The carrier chooses price and frequency.

- It turns out that the airport cost-recovery constraint is binding in all our scenarios.

- For this reason, we write \( \tau_f \equiv \tau_f(\tau_q) \) with \( \tau'_f(\tau_q) < 0 \).
Example

- $\Gamma = 1 - f + \left(\frac{f^2}{2}\right)$ for $f < 1$
- $B(q) = 3q - \left(\frac{5q^2}{4}\right)$
- $c = F = 1/10$
- $v \in \{1/5, 2/5, 5/2\}$
Example

\[
\begin{array}{cccc}
0.10 & 0.1 & 0.20 \\
0.00 \\
0.02 \\
0.04 \\
0.06 \\
0.08 \\
0.10 \\
\end{array}
\]

\[
\begin{array}{ccc}
t & q \\
0.10 \\
0.15 \\
0.20 \\
\end{array}
\]
Main Insights

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Thank you.