Atomistic Congestion Tolls at Concentrated Airports?

Seeking a Unified View

In the Internalization Debate

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- joint with Jan Brueckner – cf. working paper

- Are **marginal congestion costs** at commercial **airports** (mostly) **internal** or **external**?
    - Academic debate,
    - Obvious impact on policy recommendations,
    - Depends on market structure and substitutability.

- the debate, the model, the results

The debate

Daniel, 1995:	"no internalization" hypothesis provides better empirical fit for MSP; competitive fringe explanation
Daniel & Harback, 2007:	further empirical support (more airports)
Brueckner, 2002:	theoretical model, empirical illustration: partial internalization
Mayer & Sinai, 2003:	empirical evidence for partial internalization

…simple, unified framework showing the sources of theoretical disagreement

The model

- 1 airport, 2 airlines (1 and 2), 1 period (congested).
- A. perfectly elastic demand (eliminate market power), perfect substitutes;

  B. imperfectly elastic demand, perfect substitutes;

  C. imperfectly elastic demand, differentiated products

Airline profit function:

$$\pi_i = [p - t(f1 + f2)]sf_i - [\tau s + g(f1 + f2)]f_i,\ i = 1, 2$$

or

$$\pi_\mathrm{i} = (p - \tau\ )sf_\mathrm{i} - c(f_1 + f_2)f_{\mathrm{i},}\ \mathrm{i}=1,2$$

where

$$c(f1 + f2) \equiv st(f1 + f2) + g(f1 + f2)$$

$c\ > 0$ and $c\ \geq 0$ when c is positive

The results

A. Perfectly elastic demand, perfect substitutes: 4 cases

A.1. Social optimum: $p - \tau - [(f_1 + f_2)c + c]/s = 0$

A.2. Cournot duopoly: $p - \tau - [f_1 c + c]/s = 0$

$T = f^* c'(2f^*) = 0.5\text{MCD}^*$

(partial internalization)

A.3. Stackelberg leader (1),

$$p - \tau - (1/s)[f_1 c'(1 + \partial f2/\partial f1) + c] = 0$$

$$T_1 = 0.5(1 + \lambda^*)\mathrm{MCD}^*$$

Toll between Cournot and Pigouvian value.

Cournot follower (2):

$$p - \tau - [f_2 c' + c]/s = 0$$

A.4. Stackelberg leader (1),

$$p - \tau - c/s = 0$$

↑

Competitive fringe (2):

$$p - \tau - c/s = 0$$

Pigouvian tolls required.

B. Imperfectly elastic demand, perfect substitutes;

demand function $d[s(f_1+f_2)]$, $d'<0$

B.4. Stackelberg leader (1), $d - \tau - c/s = 0$

Competitive fringe (2): $d - \tau - c/s = 0$

No mark-up.

Pigouvian tolls required.

C. Imperfectly elastic demand, imperfect substitutes (independent demand)

demand functions $p_1=d_1[sf_1]$, $p_2=d_2[sf_2]$, $d_1'<0$, $d_2'<0$

C.4. Leader (1), $$d_1 + sf_1 d_1' - \tau - \frac{1}{s}\left[f_1 c'\left(1+\frac{\partial f_2}{\partial f_1}\right) + c\right] = 0.$$

Toll between Cournot and Pigouvian value.

Fringe (2): $$d_2 - \tau - c/s = 0$$

Pigouvian toll.

This generalizes to the case of imperfect substitutes.

Which model describes reality best?

- Market structure may differ across airports.
- Air travel is a commodity, but consumer loyalty programs limit substitution.
- The welfare loss from inappropriately charging atomistic tolls may be small (Morrison and Winston, 2006).
- US is not EU: different runway allocation mechanisms