Airport noise pollution:
how to regulate efficiently by confronting victims and polluters?

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Introduction

- Noise pollution = societal problem for all major airports
- Tension: residents versus airlines, airport developers, airport workers (NIMBY)
  - Noise = Externality between residents and aircraft
  - currently (un)solved through regional/urban development policies
  - problem of increasing world air traffic
Current noise solutions

- landing/take-off time slot management;
- quotas or/and noise tax;
- regional development/government;
- Brussels Airport: medium size, 3 regions; 2 conflicting communities; 30 municipalities; federal investments to double air traffic;
- Other airports: Roissy, Schipol, Heatrow, Chicago, Singapore.
Social costs to residents

- Hedonic prices models or surveys
  - typically in urban area!
  - noise costs = 75% social cost
  - noise costs = 0.0201 Euro per passenger-km = 2,000 Euros per 100-seat aircraft flight over 1,000 km.
  - -1% housing rents per 1% per acoustic decibel
    - the price of a house would diminish by 15% if it is located in a noisy airport environment that increases the average decibel (dBA) by 15% compared to quiet locations.
  - Bréchet et al. (2009) confirms for Brussels' airport.
    - Few 1,200 Euros per year; Many 220 Euros per year; Total 10 m euros
Local economic benefits

- Air traffic growth
  - Revenue 3-4% annual growth
  - Double by 2030
  - 18 of the 31 large hub airports in the US plan to add runways in the next decade

- Benefits
  - High profit,
  - tax revenues and
  - direct and indirect employment opportunities

- Brussels' airport
  - Airport revenues 300 m Euros, profit 160m
  - Plus airlines revenues and indirect activities

- Should we count jobs?
  - caution to substitution effects! Count only, if involuntary unemployment or imperfections in labor market.
Cost-benefit analysis

• Benefit >>> costs
  – Heatrow
    • 2% on air fares would suffice to compensate for the whole set of environmental effects (noise pollution, air pollution, etc.)
  – Brussels:
    • 160mEuros>>>10mEuros
    • Tax 12.5 Euros/passenger allows to pay house rents below a route

• Problem:
  – how to assess the tax?
  – how to assess demand for aircraft movement?
  – how to assess local cost of aircraft movement and noise?
    • Difference between theoretical noise and practical impact
  – how to arbitrage?
Objectives of paper

• How to internalize the externalities between aircraft noise makers and victims?
• How to organize tax/compensation?

• Market institutions can be appropriate
  – Local market for noise licenses
  – principle of « polluter pays »

• Minimum government intervention
  – No federal, no municipal negotiation; No resident and airport lobby; No empirical study

• Theory viewpoint
  – See earlier paper by Bréchet Picard
  – Here, brief overview

• Utopia? Decent benchmark for discussion
Fact 1

- Residents’ disutility from aircraft noise
- depends on location
=> willingness to pay to avoid noise
Fact 2

- Aircraft/airline companies offer air city-connections with various profitability levels
  - GDP Growth
  - Oil price
  - CO2 emissions
  - Alternative transport (fast rail, road, sea...)

=> demand for aircraft movements
Fact 3

- several routes for land and take off
- on several zones (e.g. municipalities)

Fig. 1: Feasible routes from an airport.

Figure 2: Actual and proposed routes from Brussels airport.
Market design

- Zones (e.g. municipalities) assign/elect residents representatives
- Assign the right to emit noise permits to representatives along each route
- Ask aircraft/airline companies to buy noise permits for aircraft movement
- Organize a market clearing (computer program like but simpler than markets for CO2 (ECX), Energy EUREX)
- Allow transaction at market clearing price
This presentation

• one type of aircraft
• homogenous residents
• one relevant time period, say day 8:00-20:00 or night 20:00-8:00

• More details in Bréchet Picard 2010-2011
The case of a single route

- Monopsony: residents have market power
- Market clearing
The case of a single route

- Compensation for noise damage (ab, 55 Euros/movement ZVT, Bréchet)
- Rent to residents (bc, 55 Euros/movement ZVT, Bréchet)
- Reduction in aircraft movements ($y^0$ to $y^M$)
- Efficient compensation and activity (e)

Fig. 4: Market equilibrium with monopsony route
The case of two routes

1. Competition reduces residents’ market power
2. Spread reduces marginal damage
The case of two routes

Fig. 5: Market equilibrium with two routes
The case of two zones

- Zones bid two permit prices $(P_1, P_2)$ for the same route.
- Market design: auctioneer calibrates the permit price of most harmed critical zone $(P = 2 \times P_1)$.
- Route is a complementary good (tragedy of the anti-commons; double marginalization).
The case of two zones

Theory result: *tragedy of the anti-commons mitigated if zones are balanced in harm (that is P1 close to P2)*
Conclusion

• How to internalize the externalities between aircraft noise makers and victims?
• How to organize tax/compensation?

• Market institutions can be appropriate
  – local market for noise licenses
  – principle of « polluter pays »
  – exits rents (as in any market) to residents
  – price and rents mitigated if many routes and balanced zones

• Discussion benchmark
  No other policy
  – compensates noise victims
  – balances marginal benefits and costs

• Natural economists’ response to noise pollution around airport
• This can be used as a benchmark for the discussion of other policies