Unevenness in air transportation, a multi-scalar analysis

Preliminary results of a PhD Research

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Airports are spaces of happiness and magical dreams...
...but also spaces of frustration, injustice and unevenness
Goals of the research

Theoretical framework

Empirical analysis

- Global scale
- Meso scale
- Local scale

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Goals of the research

Main goal

To evaluate the socio-spatial inequalities (unevenness) consequence of air transportation and to interpret the role of overlapping scalar geographies of experience.

Specific goal 1: Global-scale

To analyze the changing spatial and temporal dynamics of global air traffic flows in a liberalized environment.

Specific goal 2: Meso-scale

To analyze the socio-spatiotemporal organization of the city region in relation to the airport.

Specific goal 3: Local-scale

To analyze impact of air transportation on local social spaces and the impact of these on the socio-economic processes of air transportation.

Specific goal 4: multi-scale

To analyze the tensions and conflicts of air transportation among scale levels and devise futures acknowledging the relational nature of the air transportation process.
Theoretical framework

**Critical Economic Geography**
- Importance of inequality
- Multi-scalar approach: localities subject to international capitalist forces
- Instability
- Power, inter-class struggle

**Evolutionary economic geography**
- Institutions as economic shapers
- Evolution of regulation policies
- Importance of innovation and technology
- The survival of the fittest

**Quantitative Economic Geography**
- Dispersion Models
- Connectivity Models

**Relational economic geography**
- Scalar geography: geographical consequences of globalization
- Performance of firms and relational networks
- Power relations: actor-structure relationality, scalar relationality, socio-spatial relationality

**Airline economics**
- Particularities of the aviation industry
- Particularities of the networks
- Scope, scale and density economies in aviation

**Cultural turn**
- Emphasis on diversity of sources of available theorizing: importance of psychology in aviation
- Qualitative methodologies
Global-scale: air traffic flows
Global-scale: air traffic flows

What we have done?

* Spatial analysis: seat capacity concentration analysis
  * Comparative analysis for the EU and the US: 1990-2009
  * Gini index and its decomposition
  * Analysis of the seat capacity distribution in Spain: 2001-2008

* HHI

* Spatiotemporal analysis: connectivity analysis of airline networks
  * Direct, indirect and hub connectivity analysis for the Spanish airport system: 2001-2007
  * Netscan model

Why is important these analyses?

To assess the impact of the deregulation and liberalization in the air transport industry.

To understand impact of market instability and volatility on airline networks.

To know which regions benefits from the availability of air services.
Spatial analysis: seat capacity concentration

Lorenz Curve 1990 - 2009

Europe

United States
Spatial analysis: seat capacity concentration

Gini index decomposition 1990 - 2009

![Graph showing Gini index decomposition for EU and US from 1990 to 2009. The graph includes data points for Network, Low-Cost, and Other categories.]
• One direct connection (Singapore Airlines) 4 weekly flights
• Several indirect flights via European hubs
• The quality of the connection varies depending on the different detour and transfer time.

### Connectivity analysis - Example

<table>
<thead>
<tr>
<th>hub</th>
<th>alliance</th>
<th>transfer time (min)</th>
<th>detour factor</th>
<th>frequency/week</th>
<th>quality</th>
<th>CNU</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCN</td>
<td>direct flight</td>
<td>SIN</td>
<td>Star</td>
<td>0</td>
<td>100%</td>
<td>4</td>
</tr>
<tr>
<td>Amsterdam</td>
<td>SkyTeam</td>
<td>165</td>
<td>116%</td>
<td>14</td>
<td>0.43</td>
<td>6</td>
</tr>
<tr>
<td>Paris CDG</td>
<td>SkyTeam</td>
<td>205</td>
<td>113%</td>
<td>28</td>
<td>0.36</td>
<td>10</td>
</tr>
<tr>
<td>Frankfurt</td>
<td>Star</td>
<td>177</td>
<td>109%</td>
<td>80</td>
<td>0.29</td>
<td>24</td>
</tr>
<tr>
<td>Istanbul</td>
<td>Star</td>
<td>334</td>
<td>108%</td>
<td>3</td>
<td>0.07</td>
<td>0</td>
</tr>
<tr>
<td>Heathrow</td>
<td>OneWorld</td>
<td>191</td>
<td>118%</td>
<td>77</td>
<td>0.30</td>
<td>23</td>
</tr>
<tr>
<td>Zurich</td>
<td>Star</td>
<td>148</td>
<td>107%</td>
<td>21</td>
<td>0.50</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>227</strong></td>
<td><strong>0.34</strong></td>
<td></td>
<td></td>
<td>77</td>
</tr>
</tbody>
</table>
Results

- Overall, deregulation and liberalization enhanced connectivity and more cities were tied to airline networks, however peripheral regions worsened their relative access to them or are only served by regional and no-frills airline services.


  * Although for some niche markets there was deconcentration at the intercontinental level.

- The role of foreign hubs and foreign airlines is increasingly important in shaping the availability of air services and the connectivity possibilities.

Results are in line with:
Meso-scale: the airport region
What we have done?

We have calculated the catchment areas of >500 European airports. An appraisal of the use of CORINE land cover for catchment area GIS analysis.

We have calculated the geographical efficiency (how efficiently an airport benefits from its location). We only looked into the relationship between population and air traffic.

Why is important these analyses?

To assess the travel possibilities of European citizens.

To assess the regional differences in airport choice possibilities.

To evaluate which airports benefit more (in terms of traffic generation) from its location.

To evaluate how location is important for airports.

To evaluate market leakage situations.
Catchment area analysis

Amsterdam Schiphol Airport
Distance 50km
Inhabitants: 5,664,523

Population Density (InHab / Sq. Km.)
- 0 or no data
- 1 - 70
- 71 - 300
- 301 - 650
- 651 - 1050
- 1051 - 2150
- 2151 - 3000
- 3001 - 4000
- 4001 - 20500
- > 20501

Amsterdam Schiphol Airport
0 5 10 15 20 25 30 Kilometers

N
Catchment area analysis: market leakage

GRQ, LEY, ENS, FMO
Distance 100km

Population Density (InHab / Sq. Km.)
0 or no data
1 - 70
71 - 300
301 - 650
651 - 1050
1051 - 2150
2151 - 3000
3001 - 4000
4001 - 20500
> 20501

476,918 hab.
Preliminary Results

• There are important differences in terms of catchment area potential among EU airports.

• For airports part of a multi-airport system in a mega-city region there is not a causal relationship between population and traffic.
  *There are other factors explaining the differentiated geographical efficiency.

• Airports in more economically develop regions (GDP) or tourist destinations seem to be more efficient.

• These results can have importance for management decisions and models.
Local-scale: aircraft noise annoyance
**What we have done?**

*We have evaluated the power relations existing in an airport context.* We brought together the existing literature in the fields of airport environmental capacity, non-acoustic factors of noise annoyance, NIMBYism and environmental conflicts.

*Case study:* We analyze the socio-environmental conflict between *Barcelona airport and the neighboring community of Gavà Mar.* Interviews with stakeholders (municipal representatives, local environmental organization, residents association of the community, air-traffic controller).

**Why is important these analyses?**

To assess the impact of noise annoyance tensions on airport capacity.

To assess the power relations between airports, regions and citizens.

To evaluate how policy can shape annoyance independently from the noise itself.

To enhance the well-being of citizens.
Including literature from the field of psychology: Non-acoustical factors of noise annoyance

Fig. 2. Stallen’s noise annoyance as a form of psychological stress framework.
Fig. 3. Non-acoustic aircraft noise factors.
Source: Flindell and Stallen, 1999; Stallen, 1999.

<table>
<thead>
<tr>
<th>Benefits of the airport</th>
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<tbody>
<tr>
<td>- Expected personal benefits</td>
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<td>- Expected social benefits vs. social costs</td>
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<tr>
<th>Perceived control</th>
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<tr>
<td>- Predictability of noise exposure</td>
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<td>- Transparency: accessibility and comprehensibility of information</td>
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<td>- Trust between parties</td>
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<td>- Voice: opportunities to exert influence on source behavior</td>
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<th>Decisional freedom regarding exposure</th>
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<tr>
<td>- Opportunities for insulation program choices</td>
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<td>- Other compensation options</td>
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<th>Third party risk</th>
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<tr>
<td>- Fear of catastrophic potential</td>
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<table>
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<th>Sensitivity to noise</th>
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<tbody>
<tr>
<td>- General</td>
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<tr>
<td>- Personal</td>
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</table>
Results

• The lack of trust between parties, the impossibility of predicting noise exposure, the absence of opportunities for civil society to speak and the difficulty of accessing relevant information foster annoyance and mobilization in the communities that live around the airport.

• Policy shapes annoyance.

• Non-acoustic factors are many times more important than the noise itself.

• At Barcelona airport, citizens affected by noise have been able to learn and make use of their social capital to come up with an operational proposal that avoids flying over Gavà Mar while allowing Barcelona airport to operate properly.

• Communities do not always adopt a simple oppositional attitude based on selfish complaints that could be classified as NIMBY behavior. Gavà Mar residents have evolved into more proactive behavior, which could be classified as post-NIMBY.

Results are in line with:
Conclusions
Conclusions

• Air transportation is inherently uneven in its effects, impacts and benefits.

• Evolution of the institutional framework has an important role in shaping the spatiotemporal power relations in each scale of analysis.

• Increasing volatility of the developments in each scale of analysis → more actors, more private stakeholders, more global forces impacting at the local and regional scale.

• Need for a comprehensive multi-scalar approach in the planning and the management of mega-infrastructures and mega-city regions.

• Regarding methodology: importance of combining quantitative and qualitative approaches.
Publications stemming from this PhD research

Publications in JCR journals


Paper submitted to a JCR journal

Working papers to be submitted to JCR journals

Thank you for your attention!

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