Analysis of the Variabilization of Airport Charges, in Germany

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Outline

• Background
  • Deregulation
  • Sample of Airports
  • Fleet Mix
  • Variability, Trend and Levels

• Reasons
  • Airlines efficiency
  • Relative weight of aircrafts
  • Countervailing power of airlines

• Correlations
  • Scale
  • Congestion
  • Ownership (or Regulation?!!)
  • Cost Structure

• Effects
• Conclusions
Background – Liberalization and Deregulation

- **First, the Airlines**
  - Competition, survival
  - Race to the bottom, cut costs
  - Pressure on the airports
  - Not only levels, but also structure important

- **Then, the Airports**
  - Some competition, but debate
  - More business oriented
  - Non-aviation revenues gain importance
  - But still aviation revenues most important

Variabilization of Airport Charges, in Germany
Background – Sample of Airports

Approx. 90% of total passenger traffic

<table>
<thead>
<tr>
<th>Airport</th>
<th>Passengers, 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRA</td>
<td>54,161,856</td>
</tr>
<tr>
<td>MUC</td>
<td>33,959,422</td>
</tr>
<tr>
<td>DUS</td>
<td>17,831,248</td>
</tr>
<tr>
<td>TXL</td>
<td>13,357,741</td>
</tr>
<tr>
<td>HAM</td>
<td>12,780,631</td>
</tr>
<tr>
<td>CGN</td>
<td>10,471,657</td>
</tr>
<tr>
<td>STR</td>
<td>10,321,438</td>
</tr>
<tr>
<td>HAJ</td>
<td>5,644,582</td>
</tr>
<tr>
<td>LEJ</td>
<td>2,719,256</td>
</tr>
<tr>
<td>BRE</td>
<td>2,232,018</td>
</tr>
<tr>
<td>DRS</td>
<td>1,849,836</td>
</tr>
<tr>
<td>FMO</td>
<td>1,606,425</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>166,936,110</strong></td>
</tr>
</tbody>
</table>

Source: ADV
### Background – Fleet Mix

#### Small Airports
- BRE
- DRS
- FMO
- LEJ

<table>
<thead>
<tr>
<th>Airport</th>
<th>Aircraft Family</th>
<th>Average 2007</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRE</td>
<td>B737</td>
<td>37,7%</td>
<td>51,7%</td>
</tr>
<tr>
<td></td>
<td>A320</td>
<td>49,9%</td>
<td>58,0%</td>
</tr>
<tr>
<td></td>
<td>CRJ</td>
<td>40,1%</td>
<td>52,1%</td>
</tr>
<tr>
<td></td>
<td>BAE146</td>
<td>46,9%</td>
<td>60,0%</td>
</tr>
</tbody>
</table>

#### Medium-sized Airports
- CGN
- HAM
- STR
- TXL

<table>
<thead>
<tr>
<th>Airport</th>
<th>Aircraft Family</th>
<th>Average 2007</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGN</td>
<td>B737</td>
<td>51,2%</td>
<td>67,5%</td>
</tr>
<tr>
<td></td>
<td>A320</td>
<td>50,0%</td>
<td>59,4%</td>
</tr>
<tr>
<td></td>
<td>CRJ</td>
<td>58,9%</td>
<td>60,1%</td>
</tr>
<tr>
<td></td>
<td>BAE146</td>
<td>73,9%</td>
<td>81,5%</td>
</tr>
</tbody>
</table>

#### Big Airports
- FRA*
- MUC
- DUS

<table>
<thead>
<tr>
<th>Airport</th>
<th>Aircraft Family</th>
<th>Average 2007</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRA</td>
<td>B737</td>
<td>58,3%</td>
<td>61,9%</td>
</tr>
<tr>
<td></td>
<td>A320</td>
<td>64,7%</td>
<td>67,5%</td>
</tr>
<tr>
<td></td>
<td>CRJ</td>
<td>68,6%</td>
<td>73,1%</td>
</tr>
<tr>
<td></td>
<td>BAE146</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For Frankfurt Airport, the B747 also an important source of revenue

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Source: Own calculations using data from *Arbeitsgemeinschaft Deutscher Verkehrsflughäfen* (ADV)

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Variabilization of Airport Charges, in Germany
Background – **Definitions**

- **Variable** charges = passenger related charges
- **Fixed** charges = weight/aircraft related charges
- **Variability** = share of passenger related charges in total charges
- **Variabilization** = the process by which the share of passenger related charges is increasing
Background – Variability, Trends

Source: Own calculations using Published Charges Manuals
Aircraft characteristics from manufacturer’s official webpage

Assumptions: Seat Loading Factor = 80%
Ground Handling was excluded

General trend towards variabilization

Doesn’t cover the cargo market
• Although it varies among different airports, the share of passenger related charges has reached already very high levels, for some airports
Background – Expensiveness, Trends

Weighted average costs per turn-around flight

- No significant price increase over the period

Variabilization of Airport Charges, in Germany
Reasons – **Airline efficiency**

<table>
<thead>
<tr>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>More Weight based</td>
<td>More Passenger based</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>• Passenger traffic ↑↑ +</td>
<td>• Passenger traffic ↑↑ +</td>
</tr>
<tr>
<td>• Seat Load Factor ↑</td>
<td>• Seat Load Factor ↑</td>
</tr>
<tr>
<td></td>
<td>• Variable Charges ↑</td>
</tr>
<tr>
<td>Revenues ↑</td>
<td>Revenues ↑↑</td>
</tr>
</tbody>
</table>

Variabilization of Airport Charges, in Germany
Reasons – Aircraft’s weight

**Assumption:** Technological advancements made that aircrafts become lighter. Airports switched towards more passenger related charges to compensate for relative loses.

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>Typical Seating</th>
<th>MTOW Tonnes /Seat</th>
<th>Year of First Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>A320</td>
<td>150</td>
<td>73.5</td>
<td>0.490</td>
</tr>
<tr>
<td>A321</td>
<td>185</td>
<td>83</td>
<td>0.449</td>
</tr>
<tr>
<td>A319</td>
<td>124</td>
<td>64</td>
<td>0.516</td>
</tr>
<tr>
<td>A318</td>
<td>107</td>
<td>59</td>
<td>0.551</td>
</tr>
<tr>
<td>A330/300</td>
<td>335</td>
<td>230</td>
<td>0.687</td>
</tr>
<tr>
<td>A330/200</td>
<td>293</td>
<td>230</td>
<td>0.785</td>
</tr>
<tr>
<td>A340/300</td>
<td>295</td>
<td>275</td>
<td>0.932</td>
</tr>
<tr>
<td>A340/200</td>
<td>239</td>
<td>275</td>
<td>1.151</td>
</tr>
<tr>
<td>A340/600</td>
<td>380</td>
<td>372</td>
<td>0.979</td>
</tr>
<tr>
<td>A340/500</td>
<td>313</td>
<td>372</td>
<td>1.188</td>
</tr>
<tr>
<td>A380</td>
<td>525</td>
<td>560</td>
<td>1.067</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>MTOW Tonnes /Seat</th>
<th>Seats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airbus A-300-600</td>
<td>172</td>
<td>267</td>
</tr>
<tr>
<td>Airbus A-319-100</td>
<td>68</td>
<td>121</td>
</tr>
<tr>
<td>Airbus A-320-100</td>
<td>68</td>
<td>145</td>
</tr>
<tr>
<td>Airbus A-321-100</td>
<td>93</td>
<td>145</td>
</tr>
<tr>
<td>Airbus A-321-200</td>
<td>89</td>
<td>173</td>
</tr>
<tr>
<td>Boeing B737-300</td>
<td>67</td>
<td>118</td>
</tr>
<tr>
<td>Boeing B737-500</td>
<td>62</td>
<td>99</td>
</tr>
<tr>
<td>Boeing B737-800</td>
<td>80</td>
<td>180</td>
</tr>
<tr>
<td>CRJ-100</td>
<td>24</td>
<td>49</td>
</tr>
<tr>
<td>CRJ-700</td>
<td>35</td>
<td>70</td>
</tr>
<tr>
<td>FK10</td>
<td>45</td>
<td>101</td>
</tr>
<tr>
<td>DHC8-400</td>
<td>29</td>
<td>78</td>
</tr>
</tbody>
</table>

Source: Airbus Official Website

• More investigation needed
Reasons – Countervailing Power of Airlines

- Traditional thinking is airports are natural monopolies
- However:
  - If the sunk cost characteristic is clear
  - It is not clear at which point the economies of scale stop to exist
- Moreover:
  - Germany has a dense network of airports (average distance 77km)
  - And very good roads and rail infrastructure
- Additionally:
  - Airlines - large, sophisticated companies – might be able to threaten convincingly with a withdrawal from an airport
Correlations – Scale, Levels

2007

- It is clear that smaller airports tend to have a lower variability
Correlations – Scale, Trends

1998 - 2007

- Small airports tend to increase the share of variable charges at a slower pace compared to medium- and big-sized airports
The share of smaller aircrafts (here, especially CRJ) is expanding. This could counterbalance the desire of small airports to hurry up with the process of variabilization.
Congestion – Congestion I

Peak Hour Analysis, 2007

R60M, Day 1-5, 6-22 (local)

Source: fhkd – German Airport Coordinator
Correlations – Congestion II

There seems to be a connection between the level of variabilisation and congestion.

However, congested airports (to certain degrees) are only 4 or 5 in Germany, the others have free capacities. So, in the end, is there any real connection between the two?
Correlations – Ownership

It seems that there is a connection also between the ownership structure and the level of variability.

All the partially privatised airports are in the high variability club.

The only exception is TXL.

BUT,
Correlations – Regulation

- The partially privatised airports have, all of them, a price-cap regulation

- It becomes increasingly difficult to distinguish the exact correlation
- Possible reason: ownership and regulation are linked
- However, variabilization seems more directly connected to regulation
Correlations – **Cost structure**

- The assumption is that airports simply adapted to the cost structure
- Data availability constraints did not allow us to test this statement, but:

  I. Cost structure changed, so charges followed the same development
  
  Doubtless!
  It is hard to believe that cost structure changed so much in only 10 years

  II. Cost structure did not change much, just that now airports having new incentive scheme, adapted to that structure
  
  More credible.
  But, if so, what were the factors that did not allow them to adapt in the past?
Effects – General

• As long as passenger demand will increase, everyone would have only to profit out of this situation.

• Risk of an exogenous demand shock
  - Short-term, risk may exist as SLF decreases, and smaller aircrafts.
  - Medium-term, it is expected that airlines restore SLF.

• More sensible to market fluctuations means more market risk
  - May increase the over-all cost of raising capital, needed for infrastructure developments.
## Effects – Demand Shock

### Total Revenues = Aviation Revenues + Non-aviation Revenues

**Source:** Own made calculations

**Assumptions:**
- Only aeronautical revenues are affected
- The impact on the different segments of demand (LCC, charter, business) equally distributed

<table>
<thead>
<tr>
<th>Airport</th>
<th>0%</th>
<th>5%</th>
<th>10%</th>
<th>15%</th>
<th>20%</th>
<th>25%</th>
</tr>
</thead>
<tbody>
<tr>
<td>BER</td>
<td>1.16</td>
<td>1.12</td>
<td>1.09</td>
<td>1.05</td>
<td>1.01</td>
<td>0.98</td>
</tr>
<tr>
<td>BRE</td>
<td>1.06</td>
<td>1.02</td>
<td>0.99</td>
<td>0.95</td>
<td>0.91</td>
<td>0.88</td>
</tr>
<tr>
<td>DRS</td>
<td>0.83</td>
<td>0.79</td>
<td>0.75</td>
<td>0.71</td>
<td>0.67</td>
<td>0.63</td>
</tr>
<tr>
<td>DUS</td>
<td>1.27</td>
<td>1.23</td>
<td>1.20</td>
<td>1.17</td>
<td>1.13</td>
<td>1.10</td>
</tr>
<tr>
<td>FRA</td>
<td>1.17</td>
<td>1.13</td>
<td>1.10</td>
<td>1.06</td>
<td>1.03</td>
<td>0.99</td>
</tr>
<tr>
<td>HAM</td>
<td>1.16</td>
<td>1.12</td>
<td>1.09</td>
<td>1.05</td>
<td>1.01</td>
<td>0.98</td>
</tr>
<tr>
<td>MUC</td>
<td>1.02</td>
<td>0.99</td>
<td>0.97</td>
<td>0.94</td>
<td>0.91</td>
<td>0.88</td>
</tr>
<tr>
<td>STR</td>
<td>1.10</td>
<td>1.07</td>
<td>1.03</td>
<td>0.99</td>
<td>0.96</td>
<td>0.92</td>
</tr>
<tr>
<td>CGN</td>
<td>1.23</td>
<td>1.19</td>
<td>1.14</td>
<td>1.09</td>
<td>1.05</td>
<td>1.00</td>
</tr>
</tbody>
</table>

- Total Revenues
- Total Costs

Variabilization of Airport Charges, in Germany
Opinions about variabilization

• Graham Anne, 2003
  • Such situation is desirable as airport charges become more related to the revenue stream of the airlines

• Klenk Michael, 2004
  • Airports should bring a greater participation to the market risk, by incorporating more of the real market conditions

• We are not saying that this is necessarily a bad thing. But, in all cases, it should not be ignored.
Conclusions

• Identifying the precise reason for airport charges variabilization proves to be a challenging task

• But, most probably there is a constellation of factors which concurred to create such a development

• Risk - The main concern is how to avoid critical situations. When conditions are bond the decisional outcome may be suboptimal

• Further research
  • Look also at LCC - an indicator of competition
  • Interesting to study also the situation in other countries
  • Find better risk estimations
Questions

• What are other hypothesis to test?

• Is variabilization a natural process? Should IATA adapt?
Thank you for your attention.

GERMAN AIRPORT PERFORMANCE

A Joint Project of:
University of Applied Sciences Bremen
Berlin School of Economics (FHW)
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Comments and Feedback from the Audience (1)

- Seat Loading Factor of 80% might be too high (this is usually valid for charter operators, but for others is less). Recommendations:
  - Use a lower SLF
  - Use SLF different each year (try get SLF yearly estimations)
  - Or apply a sensitivity analysis and see how variabilization changes (70-80%)

- Leisure and Charter did not like variabilization under a price-cap regime

- To test the aircrafts become lighter hypothesis - need the declared data of airlines, about aircraft characteristics – analysis relevant

- True LCC airports (HAHN) may have 100% passenger charges. Construct a separate sample of LCC airports and analyze them.

- Price elasticity doesn’t allow airlines to pass on the whole tax-box.
- IATA is already aware of variabilization and acts accordingly. After all, every shift in charges structure goes through them. IATA acts as a second regulator.
- With variabilization, if an airline fails, it is easier for another airline to replace it. Does this represent a diminished risk? – (Risk of a failing airline)
Comments and Feedback from the Audience (2)

- Leave out scale correlation. Better try to test competition. But how to assess competition?

- Other hypothesis to test
  - Share of main carrier at the airports. Correlate with the level of variabilization.

- Congestion. Differentiate between full-time excess demand and temporary excess demand

- From the congestion correlation chart it comes out that current charges structure do not contribute to allocate capacity efficiently.

- How to phase out small aircrafts? ie. Fraport used min. tonnage

- Price-cap regulation survived only in HAM. The others discontinued (did not extend the contracts). It matters a lot how you design the formula.

- HAM, probably the most successful airport in Germany. The price-cap formula worked. But also consider the investment environment in which HAM exists.