Benchmarking Coastal Airports with Regard to Seasonality

Revised Version: 25.11.2010

Vedad Avdagic
vedadavd_1@hotmail.com
Branko Bubalo
branko.bubalo@googlemail.com
Tolga Ülkü
tolgaul@yahoo.com

GARS Workshop “Benchmarking of Airports”
25-26 November, Berlin, Germany
Acknowledgments:

• The Paper is part of the GAP (German Airport Performance) Research Project at the Berlin School of Economics and Law (HWR) that is supported by the Federal Ministry of Research and Technology,

• See www.gap-projekt.de for further details.
Outline:

• Background and Research Motivation
• Data and Characteristics of Sample Airports
• Indicators of Inequality and Variation
• Financial Situation of Sample Airports
• Efficiency Measures
• Special Issues
• Summary and Outlook
<table>
<thead>
<tr>
<th>Rank</th>
<th>Airport</th>
<th>IATA Code</th>
<th>Result</th>
<th>Rank</th>
<th>Airport</th>
<th>IATA Code</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dusseldorf</td>
<td>DUS</td>
<td>99.49%</td>
<td>33</td>
<td>Oslo</td>
<td>OSL</td>
<td>45.09%</td>
</tr>
<tr>
<td>2</td>
<td>Zunch</td>
<td>ZRH</td>
<td>91.69%</td>
<td>34</td>
<td>Moscow-P</td>
<td>DME</td>
<td>44.47%</td>
</tr>
<tr>
<td>3</td>
<td>Paris CDG</td>
<td>CDG</td>
<td>91.60%</td>
<td>35</td>
<td>London City</td>
<td>LCY</td>
<td>42.67%</td>
</tr>
<tr>
<td>4</td>
<td>Frankfurt/Mun</td>
<td>FRA</td>
<td>89.07%</td>
<td>36</td>
<td>Valencia</td>
<td>VLC</td>
<td>41.01%</td>
</tr>
<tr>
<td>5</td>
<td>Madrid</td>
<td>MAD</td>
<td>87.94%</td>
<td>37</td>
<td>Toulouse</td>
<td>TLS</td>
<td>40.22%</td>
</tr>
<tr>
<td>6</td>
<td>London H</td>
<td>LHR</td>
<td>84.67%</td>
<td>38</td>
<td>Rhodes</td>
<td>RHO</td>
<td>40.08%</td>
</tr>
<tr>
<td>7</td>
<td>Nice</td>
<td>NCE</td>
<td>82.12%</td>
<td>39</td>
<td>Mahon</td>
<td>MAH</td>
<td>39.92%</td>
</tr>
<tr>
<td>8</td>
<td>Istanbul</td>
<td>IST</td>
<td>79.00%</td>
<td>40</td>
<td>Budapest</td>
<td>BUD</td>
<td>39.71%</td>
</tr>
<tr>
<td>9</td>
<td>Brussels</td>
<td>BRU</td>
<td>78.92%</td>
<td>41</td>
<td>Malaga</td>
<td>AGP</td>
<td>39.44%</td>
</tr>
<tr>
<td>10</td>
<td>Munich</td>
<td>MUC</td>
<td>74.55%</td>
<td>42</td>
<td>Gothenburg</td>
<td>GOT</td>
<td>38.78%</td>
</tr>
<tr>
<td>11</td>
<td>Stuttgart</td>
<td>STR</td>
<td>74.49%</td>
<td>43</td>
<td>Jersey</td>
<td>JER</td>
<td>38.74%</td>
</tr>
<tr>
<td>12</td>
<td>Amsterdam</td>
<td>AMS</td>
<td>72.05%</td>
<td>44</td>
<td>Lamaca</td>
<td>LCA</td>
<td>38.57%</td>
</tr>
<tr>
<td>13</td>
<td>London G</td>
<td>LGW</td>
<td>69.17%</td>
<td>45</td>
<td>Venice</td>
<td>VCE</td>
<td>37.16%</td>
</tr>
<tr>
<td>14</td>
<td>Lisbon</td>
<td>LIS</td>
<td>67.04%</td>
<td>46</td>
<td>Chania</td>
<td>CHQ</td>
<td>37.12%</td>
</tr>
<tr>
<td>15</td>
<td>Hamburg</td>
<td>HAM</td>
<td>66.84%</td>
<td>47</td>
<td>Chania</td>
<td>CHQ</td>
<td>37.12%</td>
</tr>
<tr>
<td>16</td>
<td>Marseille</td>
<td>MRS</td>
<td>63.44%</td>
<td>48</td>
<td>Faro</td>
<td>FCO</td>
<td>34.06%</td>
</tr>
<tr>
<td>17</td>
<td>Warsaw</td>
<td>WAW</td>
<td>62.22%</td>
<td>49</td>
<td>Clermont-P</td>
<td>CFE</td>
<td>31.78%</td>
</tr>
<tr>
<td>18</td>
<td>Geneva</td>
<td>GVA</td>
<td>61.62%</td>
<td>50</td>
<td>Bremen</td>
<td>BRE</td>
<td>31.58%</td>
</tr>
<tr>
<td>19</td>
<td>Copenhagen</td>
<td>CPH</td>
<td>61.50%</td>
<td>51</td>
<td>Almeria</td>
<td>LEI</td>
<td>29.56%</td>
</tr>
<tr>
<td>20</td>
<td>Manchester</td>
<td>MAN</td>
<td>59.31%</td>
<td>52</td>
<td>Tenerife</td>
<td>TFS</td>
<td>29.17%</td>
</tr>
<tr>
<td>21</td>
<td>Vienna/S</td>
<td>VIE</td>
<td>56.62%</td>
<td>53</td>
<td>Sevilla</td>
<td>SVQ</td>
<td>28.38%</td>
</tr>
<tr>
<td>22</td>
<td>Nuremberg</td>
<td>NUE</td>
<td>56.00%</td>
<td>54</td>
<td>St. Petersburg</td>
<td>LED</td>
<td>27.62%</td>
</tr>
<tr>
<td>23</td>
<td>Moscow V</td>
<td>VKO</td>
<td>55.97%</td>
<td>55</td>
<td>Ljubljana</td>
<td>LJU</td>
<td>25.76%</td>
</tr>
<tr>
<td>24</td>
<td>Rome Fiumicino</td>
<td>FCO</td>
<td>55.73%</td>
<td>56</td>
<td>Stockholm</td>
<td>SSO</td>
<td>24.52%</td>
</tr>
<tr>
<td>25</td>
<td>Athens</td>
<td>ATH</td>
<td>54.21%</td>
<td>57</td>
<td>Kerkyra (Corfu)</td>
<td>CFU</td>
<td>24.30%</td>
</tr>
<tr>
<td>26</td>
<td>Paris ORY</td>
<td>ORY</td>
<td>53.34%</td>
<td>58</td>
<td>Genoa</td>
<td>GAO</td>
<td>23.65%</td>
</tr>
<tr>
<td>27</td>
<td>Lyon</td>
<td>LYS</td>
<td>53.08%</td>
<td>59</td>
<td>Sofia</td>
<td>SOF</td>
<td>22.18%</td>
</tr>
<tr>
<td>28</td>
<td>Arrecife</td>
<td>ACE</td>
<td>51.77%</td>
<td>60</td>
<td>Dresden</td>
<td>DRS</td>
<td>20.43%</td>
</tr>
<tr>
<td>29</td>
<td>Stockholm</td>
<td>ARN</td>
<td>51.55%</td>
<td>61</td>
<td>Santiago del Monte</td>
<td>OVD</td>
<td>18.30%</td>
</tr>
<tr>
<td>30</td>
<td>Cologne/Bonn</td>
<td>CGN</td>
<td>51.05%</td>
<td>62</td>
<td>Bologna</td>
<td>BLD</td>
<td>18.24%</td>
</tr>
<tr>
<td>31</td>
<td>Gran Canaria</td>
<td>LPA</td>
<td>48.50%</td>
<td>63</td>
<td>Riga</td>
<td>RIX</td>
<td>16.71%</td>
</tr>
<tr>
<td>32</td>
<td>Bologna</td>
<td>BLQ</td>
<td>45.51%</td>
<td>64</td>
<td>Vilnius</td>
<td>VNO</td>
<td>4.66%</td>
</tr>
</tbody>
</table>

Large airports with capacity bottlenecks are at the top of the table.

Airports with high seasonality are in the bottom of the table.

1-RUNWAY UTILIZATION GIVEN BY YEARLY ACTUAL CAPACITY / AVAILABLE CAPACITY, 2002
Motivation for Study and Effects of Seasonality

• Tendency to evaluate Airports with Seasonal Air Traffic as underutilized

• But
  – Tourism creates positive externalities, that justifies investment in such airports
  – The seasonal nature of the airport must be considered and measured to make more meaningful comparisons
  – Here a first attempt, thanks to good data!
Outline:

• Background and Research Motivation
• Data and Characteristics of Sample Airports
• Indicators of Inequality and Variation
• Financial Situation of Sample Airports
• Efficiency Measures
• Special Issues
• Summary and Outlook
The Situation: Seasonality in Europe*

Traffic variability 2009

- < 1.15
- > 1.15
- > 1.25
- > 1.35
- > 1.45

Source: Eurocontrol

* Includes over flights
Airport Sample

- Dubrovnik (DBV)
- Ljubljana (LJU)
- Podgorica (TGD)
- Pula (PUY)
- Split (SPU)
- Tivat (TIV)
- Zadar (ZAD)
- Zagreb (ZAG)

Osijek and Rijeka have been excluded, as they are too small.
Data Sources:

First Hand:
• Monthly Data from Participating Airports

Secondary Sources:
• Flight Schedule Data from Flightstats.com and Official Airline Guide (OAG)
• Eurostat Statistical Database and Eurocontrol “Performance Review Report”
# Airline Profiles at the different airports:

Data extracted from September 2010;

<table>
<thead>
<tr>
<th>Airline Name</th>
<th>Airline</th>
<th>ZAG</th>
<th>SPU</th>
<th>DBV</th>
<th>TGD</th>
<th>TIV</th>
<th>ZAD</th>
<th>PUY</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CROATIA AIRLINES</td>
<td>OU</td>
<td>64%</td>
<td>41%</td>
<td>29%</td>
<td>2%</td>
<td>0%</td>
<td>43%</td>
<td>40%</td>
<td>38%</td>
</tr>
<tr>
<td>MONTENEGRO AIRLINES</td>
<td>YM</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>65%</td>
<td>38%</td>
<td>0%</td>
<td>0%</td>
<td>13%</td>
</tr>
<tr>
<td>GERMANWINGS</td>
<td>4U</td>
<td>5%</td>
<td></td>
<td>13%</td>
<td>3%</td>
<td>0%</td>
<td>6%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>JAT AIRWAYS</td>
<td>JU</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>16%</td>
<td>16%</td>
<td>0%</td>
<td>0%</td>
<td>4%</td>
</tr>
<tr>
<td>EASYJET</td>
<td>U2</td>
<td>0%</td>
<td>8%</td>
<td>9%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
</tr>
<tr>
<td>TYROLEAN AIRWAYS</td>
<td>VO</td>
<td>4%</td>
<td>0%</td>
<td>0%</td>
<td>5%</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>MALEV HUNGARIAN AIRLINES</td>
<td>MA</td>
<td>4%</td>
<td>3%</td>
<td>0%</td>
<td>4%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>NORWEGIAN AIR SHUTTLE</td>
<td>DY</td>
<td>0%</td>
<td>6%</td>
<td>6%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>RYANAIR</td>
<td>FR</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>41%</td>
<td>10%</td>
<td>2%</td>
</tr>
<tr>
<td>AUSTRIAN AIRLINES AG</td>
<td>OS</td>
<td>1%</td>
<td>3%</td>
<td>4%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>AIR FRANCE</td>
<td>AF</td>
<td>4%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>LUFTHANSA CITYLINE</td>
<td>CL</td>
<td>2%</td>
<td>3%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>CZECH AIRLINES</td>
<td>OK</td>
<td>2%</td>
<td>3%</td>
<td>1%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>AEROFLOT RUSSIAN AIRLINES</td>
<td>SU</td>
<td>2%</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>SAS SCANDINAVIAN AIRLINES</td>
<td>SK</td>
<td>1%</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>0%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>TURKISH AIRLINES</td>
<td>TK</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>AUGsburg AIRWAYS</td>
<td>IQ</td>
<td>2%</td>
<td>0%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>JET2.COM</td>
<td>LS</td>
<td>0%</td>
<td>1%</td>
<td>4%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>WIZZ AIR</td>
<td>W6</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>BRITISH AIRWAYS</td>
<td>BA</td>
<td>0%</td>
<td>0%</td>
<td>4%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
</tbody>
</table>
## Destination Profile at selected airports:

Data extracted from September 2010;

<table>
<thead>
<tr>
<th>Share of Scheduled Flights Destination</th>
<th>ZAG %</th>
<th>Share of Scheduled Flights Destination</th>
<th>SPU %</th>
<th>Share of Scheduled Flights Destination</th>
<th>DBV %</th>
<th>Share of Scheduled Flights Destination</th>
<th>ZAD %</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIE</td>
<td>10%</td>
<td>ZAG</td>
<td>15%</td>
<td>ZAG</td>
<td>17%</td>
<td>PUY</td>
<td>26%</td>
</tr>
<tr>
<td>MUC</td>
<td>8%</td>
<td>MUC</td>
<td>7%</td>
<td>LGW</td>
<td>9%</td>
<td>ZAG</td>
<td>15%</td>
</tr>
<tr>
<td>FRA</td>
<td>8%</td>
<td>LGW</td>
<td>5%</td>
<td>VIE</td>
<td>6%</td>
<td>STN</td>
<td>9%</td>
</tr>
<tr>
<td>SPU</td>
<td>8%</td>
<td>VIE</td>
<td>5%</td>
<td>MUC</td>
<td>4%</td>
<td>RYG</td>
<td>6%</td>
</tr>
<tr>
<td>DBV</td>
<td>7%</td>
<td>CGN</td>
<td>4%</td>
<td>FRA</td>
<td>4%</td>
<td>BRQ</td>
<td>6%</td>
</tr>
<tr>
<td>CDG</td>
<td>6%</td>
<td>OSL</td>
<td>4%</td>
<td>MAD</td>
<td>3%</td>
<td>CGN</td>
<td>6%</td>
</tr>
<tr>
<td>BUD</td>
<td>4%</td>
<td>FCO</td>
<td>4%</td>
<td>DUB</td>
<td>3%</td>
<td>CRL</td>
<td>6%</td>
</tr>
<tr>
<td>SJJ</td>
<td>4%</td>
<td>FRA</td>
<td>4%</td>
<td>BRU</td>
<td>3%</td>
<td>HHN</td>
<td>6%</td>
</tr>
<tr>
<td>ZRH</td>
<td>4%</td>
<td>DME</td>
<td>3%</td>
<td>DME</td>
<td>3%</td>
<td>FDH</td>
<td>3%</td>
</tr>
<tr>
<td>ZAD</td>
<td>4%</td>
<td>SVO</td>
<td>3%</td>
<td>BCN</td>
<td>3%</td>
<td>NYO</td>
<td>3%</td>
</tr>
<tr>
<td>BRU</td>
<td>3%</td>
<td>ARN</td>
<td>3%</td>
<td>DUS</td>
<td>2%</td>
<td>NRN</td>
<td>3%</td>
</tr>
<tr>
<td>SKP</td>
<td>2%</td>
<td>SXF</td>
<td>3%</td>
<td>STN</td>
<td>2%</td>
<td>DME</td>
<td>3%</td>
</tr>
<tr>
<td>LHR</td>
<td>2%</td>
<td>BUD</td>
<td>3%</td>
<td>MAN</td>
<td>2%</td>
<td>BRI</td>
<td>3%</td>
</tr>
<tr>
<td>PRG</td>
<td>2%</td>
<td>STR</td>
<td>3%</td>
<td>SXF</td>
<td>2%</td>
<td>DUB</td>
<td>3%</td>
</tr>
<tr>
<td>CGN</td>
<td>2%</td>
<td>ZRH</td>
<td>3%</td>
<td>LPL</td>
<td>2%</td>
<td>BRE</td>
<td>3%</td>
</tr>
<tr>
<td>SVO</td>
<td>2%</td>
<td>KBP</td>
<td>3%</td>
<td>ARN</td>
<td>1%</td>
<td>ARN</td>
<td>0%</td>
</tr>
<tr>
<td>IST</td>
<td>2%</td>
<td>BRS</td>
<td>2%</td>
<td>OSL</td>
<td>1%</td>
<td>ZAD</td>
<td>0%</td>
</tr>
<tr>
<td>AMS</td>
<td>2%</td>
<td>GOT</td>
<td>2%</td>
<td>EMA</td>
<td>1%</td>
<td>VIE</td>
<td>0%</td>
</tr>
<tr>
<td>PRN</td>
<td>2%</td>
<td>PRG</td>
<td>2%</td>
<td>FCO</td>
<td>1%</td>
<td>LYS</td>
<td>0%</td>
</tr>
<tr>
<td>CPH</td>
<td>2%</td>
<td>DUS</td>
<td>2%</td>
<td>OTP</td>
<td>1%</td>
<td>KBP</td>
<td>0%</td>
</tr>
</tbody>
</table>
Aircraft Types: Fleet Mix at the different airports

Data extracted from September 2010;

<table>
<thead>
<tr>
<th>Aircraft Types</th>
<th>Average Seats per Aircraft</th>
<th>ZAG</th>
<th>SPU</th>
<th>DBV</th>
<th>TGD</th>
<th>TIV</th>
<th>ZAD</th>
<th>PUY</th>
<th>RJK</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>DH4</td>
<td>73</td>
<td>37%</td>
<td>21%</td>
<td>10%</td>
<td>9%</td>
<td>0%</td>
<td>73%</td>
<td>53%</td>
<td>0%</td>
<td>24%</td>
</tr>
<tr>
<td>319</td>
<td>133</td>
<td>27%</td>
<td>33%</td>
<td>28%</td>
<td>3%</td>
<td>2%</td>
<td>10%</td>
<td>8%</td>
<td>0%</td>
<td>22%</td>
</tr>
<tr>
<td>100</td>
<td>105</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>64%</td>
<td>48%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>14%</td>
</tr>
<tr>
<td>320</td>
<td>156</td>
<td>17%</td>
<td>19%</td>
<td>18%</td>
<td>2%</td>
<td>10%</td>
<td>0%</td>
<td>11%</td>
<td>0%</td>
<td>14%</td>
</tr>
<tr>
<td>AT7</td>
<td>68</td>
<td>1%</td>
<td>0%</td>
<td>2%</td>
<td>16%</td>
<td>17%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>4%</td>
</tr>
<tr>
<td>733</td>
<td>133</td>
<td>2%</td>
<td>4%</td>
<td>7%</td>
<td>1%</td>
<td>8%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
</tr>
<tr>
<td>EM2</td>
<td>30</td>
<td>4%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>73G</td>
<td>127</td>
<td>0%</td>
<td>2%</td>
<td>2%</td>
<td>0%</td>
<td>8%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>88%</td>
</tr>
<tr>
<td>73H</td>
<td>118</td>
<td>0%</td>
<td>4%</td>
<td>5%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>CRJ</td>
<td>50</td>
<td>4%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>321</td>
<td>184</td>
<td>0%</td>
<td>0%</td>
<td>8%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>E95</td>
<td>107</td>
<td>0%</td>
<td>3%</td>
<td>3%</td>
<td>1%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>738</td>
<td>161</td>
<td>0%</td>
<td>4%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>13%</td>
</tr>
<tr>
<td>734</td>
<td>148</td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
<td>0%</td>
<td>2%</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>757</td>
<td>159</td>
<td>0%</td>
<td>1%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>16%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>F70</td>
<td>76</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>CR9</td>
<td>88</td>
<td>0%</td>
<td>1%</td>
<td>3%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>AR8</td>
<td>83</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>M90</td>
<td>157</td>
<td>0%</td>
<td>1%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>735</td>
<td>111</td>
<td>0%</td>
<td>1%</td>
<td>0%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
</tbody>
</table>

113 99% 96% 98% 99% 96% 85% 87% 100% 97%
For SPU, ATM increases but PAX decreases from 2008 to 2009. It can be because of:

i) the structure of traffic (smaller planes), or

ii) the seat-load-factor is lower (same planes, but less passenger for a plane) – probably this because the profits have declined in half from 08-09

Can we get the fleet mix for 2008 and 2009?
Passengers per ATM

Monthly PAX / ATM

PAX/ATM

0 20 40 60 80 100 120 140

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

2008

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

2009

Months

Dubrovnik
Ljubljana
Podgorica
Pula
Split
Tivat
Zadar
Zagreb
Outline:

• Background and Research Motivation
• Data and Characteristics of Sample Airports
• Indicators of Inequality and Variation
• Financial Situation of Sample Airports
• Efficiency Measures
• Special Issues
• Summary and Outlook
Indications of Seasonality: Monthly ATM 2008-2009

Air Transport Movements
Indications of Seasonality: Monthly PAX 2008-2009

The diagram illustrates passenger traffic at various airports in monthly intervals from January 2008 to December 2009. It shows significant differences in passenger numbers across months and airports.

Airports and their respective lines on the diagram include:
- Dubrovnik
- Ljubljana
- Podgorica
- Pula
- Split
- Tivat
- Zadar
- Zagreb

The data reveals a clear seasonal variation, with peaks in the summer months and troughs in winter, indicating the impact of seasonality on airport performance.
Indicators of Seasonality

In Split, appr. 22% of the total ATMs in 2008 was served in August, 15% in September. But only around 3% was in January and February.

Similar situation for Zadar, Pula and Dubrovnik...
Indicators of Seasonality

In Zadar, 30% of the total ATMs in 2009 was served in July, but only around 2-3% in winter months.
• The three capital cities in the sample LJU, TGD and ZAG show more stable traffic throughout the year.
Indicators of Seasonality

Distribution of yearly PAX

<table>
<thead>
<tr>
<th>Month</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td></td>
</tr>
<tr>
<td>Feb</td>
<td></td>
</tr>
<tr>
<td>Mar</td>
<td></td>
</tr>
<tr>
<td>Apr</td>
<td></td>
</tr>
<tr>
<td>May</td>
<td></td>
</tr>
<tr>
<td>Jun</td>
<td></td>
</tr>
<tr>
<td>Jul</td>
<td></td>
</tr>
<tr>
<td>Aug</td>
<td></td>
</tr>
<tr>
<td>Sep</td>
<td></td>
</tr>
<tr>
<td>Oct</td>
<td></td>
</tr>
<tr>
<td>Nov</td>
<td></td>
</tr>
<tr>
<td>Dec</td>
<td></td>
</tr>
</tbody>
</table>

- Dubrovnik
- Ljubljana
- Podgorica
- Pula
- Split
- Tivat
- Zadar
- Zagreb
Seasonality Indicator 1: “Peak Month to Average Month”, 2009

- In terms of PAX and ATM
- Quick way of ranking
- Factor does not include annual fluctuation, therefore not ideal candidate for measuring seasonality

<table>
<thead>
<tr>
<th>Rank ATM</th>
<th>Peak-to-Average Factor</th>
<th>Airport</th>
<th>Rank PAX</th>
<th>Peak-to-Average Facator</th>
<th>Airport</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.28</td>
<td>Zagreb</td>
<td>1</td>
<td>1.28</td>
<td>Podgorica</td>
</tr>
<tr>
<td>2</td>
<td>1.3</td>
<td>Podgorica</td>
<td>2</td>
<td>1.32</td>
<td>Zagreb</td>
</tr>
<tr>
<td>3</td>
<td>1.65</td>
<td>Ljubljana</td>
<td>3</td>
<td>1.64</td>
<td>Ljubljana</td>
</tr>
<tr>
<td>4</td>
<td>1.78</td>
<td>Tivat</td>
<td>4</td>
<td>1.77</td>
<td>Tivat</td>
</tr>
<tr>
<td>5</td>
<td>2.15</td>
<td>Dubrovnik</td>
<td>5</td>
<td>2.32</td>
<td>Dubrovnik</td>
</tr>
<tr>
<td>6</td>
<td>2.38</td>
<td>Split</td>
<td>6</td>
<td>2.38</td>
<td>Split</td>
</tr>
<tr>
<td>8</td>
<td>2.54</td>
<td>Zadar</td>
<td>7</td>
<td>2.58</td>
<td>Zadar</td>
</tr>
<tr>
<td>9</td>
<td>2.9</td>
<td>Pula</td>
<td>8</td>
<td>3.05</td>
<td>Pula</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Average</td>
<td>9</td>
<td>2.20</td>
<td>Average</td>
</tr>
</tbody>
</table>
Seasonality Indicator 2: “Lorenz Curve”

- “Visualizes” Inequality
- Preparation through Cumulative Diagram and Ranking
- The further away from “Total Equality” 45-Degree line, the more seasonal is the Airport
Seasonality Indicator 2: “Lorenz Curve”

Lorenz-Curves for 2008 ATMs

- Dubrovnik
- Ljubljana
- Podgorica
- Pula
- Split
- Tivat
- Zadar
- Zagreb
- Total Equality

Cumulative Share of Months

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Seasonality Indicator 3: “GINI-Coefficient”

- In addition to Ratios and Lorenz-Curve, we can also use the Gini-Coefficient, which is to some extent the graphical representation of the Lorenz Curve.
- The most commonly used measure of inequality.
- The coefficient varies between 0, which reflects complete equality and 1, which indicates complete inequality.*
- Applicable for Seasonality?
- We are still experimenting about what are good indicators of seasonality.

* Source: World Bank
Seasonality Indicator 3: “GINI-Coefficient”

- Ranking possible by one Index, therefore Gini is a good indicator for Benchmarking seasonal Differences
- Results will differ if we use different measure of inequality, PAX or profits instead of ATMs

<table>
<thead>
<tr>
<th>GINI-Index</th>
<th>Airport</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>Zagreb</td>
</tr>
<tr>
<td>0.12</td>
<td>Ljubljana</td>
</tr>
<tr>
<td>0.12</td>
<td>Podgorica</td>
</tr>
<tr>
<td>0.25</td>
<td>Tivat</td>
</tr>
<tr>
<td>0.30</td>
<td>Zadar</td>
</tr>
<tr>
<td>0.30</td>
<td>Split</td>
</tr>
<tr>
<td>0.32</td>
<td>Pula</td>
</tr>
<tr>
<td>0.36</td>
<td>Dubrovnik</td>
</tr>
<tr>
<td>0.42</td>
<td>Rijeka</td>
</tr>
<tr>
<td>0.18</td>
<td>Average</td>
</tr>
<tr>
<td>0.00</td>
<td>Total Equality</td>
</tr>
</tbody>
</table>

Note: Zagreb had the least seasonal difficulties in 2008, other Croatian Airports suffer more

• Results will differ if we use different measure of inequality, PAX or profits instead of ATMs
  Note - further Research to make Seasonal and Non-Seasonal Airports comparable

Note: Zagreb had the least seasonal difficulties in 2008, other Croatian Airports suffer more
Daily Traffic Variation:

Besides the monthly variation, daily variation of traffic is also interesting to take a closer look:

→ In Zagreb, we observe a peak on Friday.

![Daily Traffic Variation, Fri & Sat, ZAG](chart.png)
Daily Traffic Variation:

→ The graph shows the air traffic movements for each hour of the day for Split Airport.
→ In Split we observe a peak on Saturday (recall the abandoned peak-pricing on Saturdays in Split)
Outline:

• Background and Research Motivation
• Data and Characteristics of Sample Airports
• Indicators of Inequality and Variation
• Financial Situation of Sample Airports
• Efficiency Measures
• Summary and Outlook
Financial Indicators:

The traffic shows us reasonable seasonal variations:

➔ But how do these variations are reflected in the financial figures?
➔ How do the revenues, costs, profits look like?

However, the financial data is not complete yet, Data for Dubrovnik is on an annual level and Zadar 08-09 is completely missing
Financial Indicators: Total Revenues

Annual total revenues can only give us an idea about the scale of the airports. From 2008 to 2009, there is no dramatic changes.

Even ZAG with less seasonality has a peak on revenues in June.
Do they have any pricing strategy regarding the summer months?
Why does LJU have such low revenues? Even compared to Tivat (which has comparable traffic)
Financial Indicators: Total Costs

- Annual total costs can only give us an idea about the scale of the airports.
- Later per PAX or ATM is more meaningful.
- From 2008 to 2009, there is no dramatic changes except PUY was able to reduce its costs.

- Total costs in ZAG and SPU increase in the last months of the year! Reason?
- For the other airports, it is stable over the months.
- Whereas the revenues much lower in the winter months, which is the main challenge for such airports.

![Graph showing total costs for different airports]
Financial Indicators: Profits, Annual

Profits (Total revenue - Total cost)

- Dubrovnik
- Ljubljana
- Podgorica
- Pula
- Split
- Tivat
- Zagreb

2008 - Annual
2009 - Annual

Millions

€0.00
€1.00
€2.00
€3.00
€4.00
€5.00
€6.00
€7.00
Financial Indicators: Profits, Monthly

Profits ("Total Revenues - Total Costs")

Millionen

€3,00
€2,50
€2,00
€1,50
€1,00
€0,50
€0,00
€-0,50
€-1,00
€-1,50
€-2,00

2008
2009

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Ljubljana
Podgorica
Pula
Split
Tivat
Zagreb
Financial Indicators: Total Costs and Revenues

In SPU, the airport starts to recover its costs in June of 2008...

whereas,

In ZAG, airport’s revenues are higher than its costs for each month in 2008.

What possibilities are there:

i) To increase the revenues in winter?
ii) To decrease the costs in winter?
iii) To increase the revenues in summer to better subsidize the costs in winter?
Financial Indicators: Share of Aviation Revenues

→ Share of non-aviation revenues is in average around 40%, which is as in European Average (see next slide for selected European airports)
Financial Indicators: Share of Aviation Revenues

In other European Airports:

If we consider the European airports as a benchmark; Is there a chance of improvement on non-aviation performance? More research!!
Outline:

• Background and Research Motivation
• Data and Characteristics of Sample Airports
• Indicators of Inequality and Variation
• Financial Situation of Sample Airports
• Efficiency Measures
• Special Issues
• Summary and Outlook
Short term employees in **SPU**(2008)

→ Jan: 17  → July: 111

→ Split strategy to hire extra workers in busy summer months.

Similar Situation for **PUY**
Efficiency Measures:

→ TIV is by far the best one within the sample.
→ 60 Employees in TIV, compared to 350 in LJU with similar traffic figures?
→ further data analysis needed
Efficiency Measures:

The financial indicators for the Croatian airports are actually quite similar, we still need to analyze in more detail the data from Ljubliana and Podgorica.
Efficiency Measures:

→ PUY is an outlier so it is taken out of the graph.
→ Calculation of break even point in the future
Efficiency Measures:

Non aeronautical revenue/PAX

- Dubrovnik
- Ljubljana
- Podgorica
- Pula
- Split
- Tivat
- Zagreb

2008 - Annual
2009 - Annual
Efficiency Measures:

Costs/PAX

Comment here!
Efficiency Measures:

- PUY is an outlier so it is taken out of the graph.
- Personnel costs are fairly consistent during the year, even though there are many fewer PAX in the off season months they still pay out the same salaries.
- Also a big number of services contracted is done in the first and last month of the year.
Outline:

• Background and Research Motivation
• Data and Characteristics of Sample Airports
• Indicators of Inequality and Variation
• Financial Situation of Sample Airports
• Efficiency Measures
• Special Issues
• Summary and Outlook
Conclusion

• All airports have peak revenues in summer months, even capital cities who show smaller indications of seasonality.
  • What is the pricing strategy in the summer months?
• In winter months costs are greater than revenues, main challenge for airports?
  – Why do the total costs for ZAG and SPU increase in closing months.
• Some airports such as SPU break even in June, whereas ZAG makes profit in each month of the year
• Need to obtain the fleet mix for airports
• Share of non-aviation revenue is in the range of European average.
Conclusion

• Monthly total revenues/PAX are smaller than monthly total costs/PAX in low demand months and vice versa.
  - Economies of scale: The more PAX the lower cost/PAX become
  - Break even point: How many PAX to break even?
  - Monthly revenues,costs/PAX for PUY are inconsistent with other airports

• Only SPU and PUY are adapting a strategy to higher extra workers in busy summer months
Further Studies:

On Financial Efficiency

1. Calculating the cost of seasonal operation
   - Mainly investigating the fixed costs and level of outsourcing to reduce costs
   - Analyze role of state aid to maintain a financially viable operation in the light of the positive externalities the airport creates

2. Focusing on Peak Hour Pricing and financial effects
Thank you for your attention.

A Joint Project of:
University of Applied Sciences Bremen
Berlin School of Economics (FHW)
Int. University of Applied Sciences Bad Honnef

Contact:
Vedad Avdagic
Vedadavd_1@hotmail.com

Branko Bubalo
Branko.bubalo@googlemail.com

Tolga Ulku
Tolgaul@yahoo.com

www.gap-projekt.de