Economic impacts of Business Aviation in Europe

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Overview

1. Motivation & Research questions
2. Definition of Business Aviation & previous research
3. Employment and GVA effects of Business Aviation in Europe
4. Connectivity-related benefits
5. Conclusions & Scope for further research
1. Motivation / Research questions

- **Economic footprint** of scheduled air transport (=mainline aviation) well discussed in the academic literature and other studies
- **Business Aviation** hardly dealt with at the academic and political levels
- Lack of knowledge on the sector’s impacts, except for some outdated studies

Completion of an EBAA-financed study on the sector

Scope: Europe (EU/EFTA) 2015, update: 2017

„What is Business Aviation, and what benefits does it provide for the society and its users?“
2. Definition of Business Aviation & previous research

What is Business Aviation (BA)?

Civil Aviation

Commercial Aviation

Scheduled services and holiday charters
Examples: Air France Paris-New York, Logan Air Barra-Glasgow, BH Air charter Düsseldorf-Varna...

Typical aircraft: Regional aircraft and airlines (20-500+ seats)

On-demand air (transport) services by commercial operators
Examples: Air taxi service, medical flights, aerial work on behalf of third parties...

Typical aircraft: Helicopters, small turboprops and business jets (<20 seats)

Non-commercial Aviation

In-house, own-account air services of firms
Examples: Employee air shuttle operated by employer, commercial flight school...

Typical aircraft: Helicopters, small turboprops and business jets (<20 seats)

Other private, leisure and hobby flying
Examples: non-profit sightseeing flights, flight school activities...

Typical aircraft: Piston and (ultra) light aircraft, balloons, gliders...

www.DLR.de • Chart 4  WCTRS 2019 – Maertens – Business Aviation

Pictures: Sven Maertens, Paul Hailday (Wikipedia)
2. Definition of Business Aviation & previous research

What is Business Aviation (BA)?

Possible definitions:
- “non-scheduled and non-military flying for business purposes” (NBAA)
- On-demand, non-public air services except for private and leisure flying (own)

Additional stakeholders in the BA system:
- aircraft owners
- maintenance, repair and overhaul (“MRO”) firms
- fixed-base operators (“FBO”)
- airports and airfields with BA focus
- air charter brokers
- consultants and market intelligence
- manufacturers of business aircraft and parts
2. Definition of Business Aviation & previous research

Previous research on BA

Coverage of business aviation in the academic literature on (air) transport economics, management and geography (based on the keywords “Business Aviation” and “Business Charter”) (as of Oct, 2018)

<table>
<thead>
<tr>
<th>Journal</th>
<th>Focus</th>
<th>Total # of research articles</th>
<th>Of which on business aviation</th>
<th>Of which on “Low Cost Carrier”, “Commercial Airline” and “Airport”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal of Air Transport Management</td>
<td>“major economic, management and policy issues facing the air transport industry”</td>
<td>1,301</td>
<td>3</td>
<td>136/15/583</td>
</tr>
<tr>
<td>Journal of Transport Geography</td>
<td>“geographical dimensions of transport, travel and mobility”</td>
<td>1,693</td>
<td>1</td>
<td>25/0/125</td>
</tr>
<tr>
<td>All ~3,800 journals listed in ScienceDirect</td>
<td></td>
<td>~15 Mio.</td>
<td>7</td>
<td>310/108/4,753</td>
</tr>
</tbody>
</table>

Specific BA topics like:

- Worldwide distribution of business aircraft fleet (Budd and Graham, 2009)
- Impact of slot shortages and capacity constraints on BA airport choice (Berster, Gelhausen and Wilken, 2011)
- User awareness and preferences (Kaps, Gardner and Hartung, 2001; Yen and Chen, 2017).
- BA flight operations issues (Pazourek and Václavík, 2017)
- Only marginal focus on BA, e.g. in the context of a Delphi-study on the future of the aviation industry (Linz, 2012) or of a study on the development of Warsaw Airport (Tloczynski, 2016).

BA is virtually non-existent in the academic transportation literature.
2. Definition of Business Aviation & previous research

Previous research on BA

Selected (industry) studies on BA

<table>
<thead>
<tr>
<th>Content / Category</th>
<th>Authors, Year</th>
<th>Regional Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecasts</td>
<td>Business Aircraft Market Forecast, Bombardier, 2016&lt;br&gt;Global Business Aviation Outlook, Honeywell, 2017&lt;br&gt;10 year business aviation market forecast, Jetcraft, 2017</td>
<td>Global</td>
</tr>
<tr>
<td>Market overview and trends, key economic benefits</td>
<td>Business Aviation Factbook series, NBAA, 2014</td>
<td>USA</td>
</tr>
<tr>
<td>Macro-economic impacts (I-O-analysis)</td>
<td>The economic impact of business aviation in Europe, PricewaterhouseCoopers, 2008</td>
<td>Europe</td>
</tr>
</tbody>
</table>

Up to date economic impact data for Europe needed

Joint Booz Allen Hamilton / DLR studies on behalf of EBAA in 2016 and 2018
• Not only assessment of direct, indirect and induced effects along the value chain
• But also estimations for the actual travel time savings and for the increase in productive work time
3. Employment and GVA effects

Methodology and Data

Overview

- Direct employment estimations based on different data sources (2017)
  - Business aircraft operators
  - FBO
  - MRO
  - Manufacturers of business aircraft, components and parts

Step 1

- Bottom-up collection of BA employees (2017)
- Use of WIOD (2016 release, 2014 data) to estimate GVA
- Use of WIOD to estimate indirect and induced effects

Step 2

- Direct employment of the Business Aviation sector (2017)
- Ratios from National accounts (2014) (World Input Output Database)

Step 3

- Input-Output Model (2014) (World Input Output Database)
- Indirect and induced impacts of the Business Aviation Sector (2017)
- Total Impact (2017)
3. Employment and GVA effects

Methodology and Data

Example A: Step 1 – Direct employment and GVA of Business Aircraft Operators

- Employees per aircraft ratios (IP Airline Fleets 2010 and Ascend database)
  - 7.67 jobs / fixed-wing a/c
  - 5.05 jobs / helicopter

- Business aircraft fleet 2017 (Ascend)
  - 2,660 helicopters
  - 3,103 fixed-wing a/c

- Employment with business aircraft operators 2017

- GVA of business aircraft operators 2017

- Ratios from National accounts 2014 (Eurostat, WIOD)

Example B: Step 1 – Direct employment and GVA of MRO/FBO

- Current MRO/FBO firm list (Handbook of Business Aviation)
- Employment figures shown on company websites
- Employment figures reported in financial company databases
- Employment figures reported by firms directly on request (E-Mail survey)
- Average employment figure (median) for firms to which a more specific estimate could not be applied

- Ratios from National accounts 2014 (Eurostat, WIOD)

- GVA of MRO/FBO firms in the business aircraft sector 2017

Bottom-up collection of employees
Use of WIOD (2016 release) to estimate GVA
3. Employment and GVA effects

Example A: Direct employment of Business Aircraft Operators (2017)

37,233 employees with business fixed-wing aircraft and helicopters in 2017 (33.6k of which in EU28)
3. Employment and GVA effects

Results

Total direct employment in the European business aviation sector (2017)

France is leading in BA manufacture, while Germany and the UK have the highest shares in employment in BA operations.
3. Employment and GVA effects

**Results**

Total GVA in the European business aviation sector (2017)

France ranks first with a GVA of more than EUR 4 bn, but Switzerland follows with a GVA of about EUR 2.5 bn, which may reflect a relatively high labor productivity of the Swiss business aviation sector.
3. Employment and GVA effects

Results

Total employment in the European business aviation sector (direct, indirect, induced; 2017)

<table>
<thead>
<tr>
<th>Level</th>
<th>Aircraft ops</th>
<th>FBO/Handling</th>
<th>MRO</th>
<th>Ops (total*)</th>
<th>Aircraft &amp; parts</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>37,233</td>
<td>2,683</td>
<td>11,644</td>
<td>51,560</td>
<td>41,238</td>
<td>92,798</td>
</tr>
<tr>
<td>Indirect</td>
<td>100,737</td>
<td>2,749</td>
<td>10,788</td>
<td>114,274</td>
<td>113,337</td>
<td>227,610</td>
</tr>
<tr>
<td>Induced</td>
<td>23,048</td>
<td>712</td>
<td>2,714</td>
<td>26,475</td>
<td>27,161</td>
<td>53,635</td>
</tr>
<tr>
<td>Total</td>
<td>161,018</td>
<td>6,144</td>
<td>25,147</td>
<td>192,309</td>
<td>181,735</td>
<td>374,044</td>
</tr>
</tbody>
</table>

In total, some 374,000 European jobs are directly or indirectly dependent on the European Business Aviation sector, a number which exceeds the total number of jobs e.g. in Cyprus.
4. Connectivity-related benefits

- Impact of BA on **business efficiency** of its users discussed in a number of studies (e.g., Andersen, 2001, PricewaterhouseCoopers, 2008, or Oxford Economics, 2012).
- **Travel time savings** and **more seamless connections**, stemming from…
  - “à la carte” nonstop connections on city pairs that are not sufficiently served (directly) by scheduled air transport,
  - higher flexibility.
- We present and apply a methodology to quantify these effects for the European Business Aviation sector.
4. Connectivity-related benefits

Travel time savings

• Data science approach
• Comparing each trip from a sample of over 800,000 BA flights (2014) against the best scheduled alternatives

<table>
<thead>
<tr>
<th>Biz Aviation itineraries</th>
<th>Scheduled alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Dataset: Full sample of BA flight 2014 from WingX</td>
<td>• Travel times provided by Rome2Rio.com.</td>
</tr>
<tr>
<td>• Total trip time estimation:</td>
<td>• Consideration of ground transport like HST</td>
</tr>
<tr>
<td>Ground access/egress time estimate + handling/waiting time</td>
<td>• Addition of 35min check-in time to scheduled flight times</td>
</tr>
<tr>
<td>estimate + actual flight time</td>
<td></td>
</tr>
</tbody>
</table>

• Computation of cumulative and average time savings
4. Connectivity-related benefits

Travel time savings

Results (2014)

Average travel time saving stemming from business aviation of about 127min.

Average time savings for multi-city trips of 6 hours and 33 minutes + 15 Mio. € for hotel cost savings.

More productive worktime (153min per flight; 800k trips; 4.7 pax/flight) = 3,100 full-time equivalents
4. Connectivity-related benefits

Improved regional connectivity

Results (2014)

800,000 BA flights on some 81k different European city pairs, of which 25,280 (31%) are not connected nonstop by scheduled air transport.

Strong connectivity benefit even for large metropolitan regions, ranging from 178% (London) to over 700% (Côte d'Azur).
4. Conclusions and Limitations (1)

• **European business aviation supports some 374,000 jobs** - directly or indirectly.

• These create **EUR 32bn in GVA**, which equals the total GVA of Latvia (0.19% of the EU GDP).

• **France, Switzerland, Germany and the UK as main locations** for the sector, representing 76% of the total GVA.

• BA enables **travel time savings of ~127 min per trip** compared to scheduled transport, plus additional advantages like higher flexibility.

• 1/3 of all BA flights provides **connectivity to city-pairs not directly served** by scheduled (air) transport.

• **BA even improves connectivity of large metropolitan areas** like London, Paris or Munich (by, on average, 450%).
4. Conclusions and Limitations (2)

• Certain limitation of I-O results as national account data for superordinate sectors had to be applied to the BA sector.
• “Classical” limitations of I-O, like the risk of misuse for investment decisions.
• Underestimation of travel time benefits
  • No modelling of additional advantages like higher flexibility
  • E.g., we have assumed that the fastest commercial alternative would leave the point of origin at exactly the same time as the BA option. In reality, so-called scheduled delay is likely to occur.
• Better knowledge on the actual purpose and structure of BA flights needed (“traveller survey”) for the modelling of user benefits
Thank you!