European Universities Efficiency Benchmarking

Matthias Klumpp, HELENA Project, PIM, University of Duisburg-Essen

1. Introduction and Research Question
2. Dataset and DEA Method
3. DEA Results
4. Interpretation and Discussion
5. Conclusion and Further Research
1. Introduction

- In general **efficiency questions** in higher education have been increasingly discussed in literature (Cohn et al. 1989; Johnes and Johnes 1993; Ramsden 1994; Hashimoto & Cohn 1997; Sarrico et al. 1997; Glass et al. 1998; McMillan & Datta 1998; Stahl et al. 1998; Koshal & Koshal 1999; Jongbloed & Vossensteyn 2001; Korhonen et al. 2001; Kocher et al. 2006; Sarrico 2010; Opitz & Röbken 2011).

  - Background I: *New Public Management* – productivity improvement and accountability of public institutions (Madden et al. 1997; Sarrico et al. 2009).

  - Background II: *Within* institutions of higher education questions especially between different disciplines arise as to how *funds* are used most efficiently to contribute to overall strategy objectives.

- Usual **research gap** and **problem** regarding efficiency analysis in universities: *Definition and availability of data* representing accepted university objectives; → see also HE ranking discussions and critic.
1. Introduction

Project Presentation HELENA

Society

Peer Community

Teaching

Research

Outcome Qualities

Interdisciplinary and International Setting

Input Qualities

(Researchers/Lecturers/Students/Professionals)

Outcome Quantities

Efficiency

Resources/Infrastructure

Input Quantities

Objectives, Content, Profiling, Benchmarking

Quality Culture, Aspiration and Strategy (University)
1. Research Question

Core Research Question

• What international research results can be found regarding **efficiency in higher education** research, teaching & third mission?

Specific Research Questions and Hypotheses

• [H1] The EUMIDA dataset can be used for efficiency analysis.

• [H2] Mid-size universities are most efficient in a size-related comparison.

• [H3] Different strategies for HE objectives can be found among European universities.

• [H4] The fixed weightings feature in the DEA method can be used to simulate specific policy frameworks e.g. in performance-based funding.
2. Data Source

- Data Source **EUMIDA project (European University Micro Data)** for European Universities (>2,300) from 27 countries (EU-27 minus France and Denmark plus Norway and Switzerland).

- Data from national statistics offices but not officially „approved/authorized“.

- **University selection** by doctorates awarded annually (>10), staff (>100) and students (>10,000); exclusion of distance learning universities
  
  → All selected universities „research active“ and leading in their countries.

- For altogether **370 universities** a complete dataset with these minimum quality requirements are available and were used.

- Specific universities/countries as e.g. Czeck Republic had to be excluded due to missing data (International Students „0“).
2. DEA Method

- Data envelopment analysis (DEA) as established research method for non-parametric efficiency analysis (e.g. Taylor/Harris 2004; Worthington/Higgs 2011).
- Advantage of DEA is the combination of different output indicators for research, teaching and third mission in an individual weighting (profiling strategies of universities and HE policy).
CASE A: Input Staff, Outcome Students and Doctorates
3. DEA Results

CASE B: Input Staff, Outcome Intern. Students and Doctorates
3. DEA Results

CASE C: Input Staff, Outcome Int. Students, Students & Doctorates

Efficiency Score

Total Number of Staff
### 3. DEA Results – All Cases A-D

<table>
<thead>
<tr>
<th>EUMI-DA ID</th>
<th>University Name</th>
<th>Found. Year</th>
<th>Univ. Hospital</th>
<th>Staff (Input)</th>
<th>Doctorate Degrees Awarded (Output)</th>
<th>Total Students (Output)</th>
<th>Total Int. Students (Output)</th>
<th>Efficiency (Case A without Int. Students)</th>
<th>Efficiency (Case B without Total Stud.)</th>
<th>Efficiency (Case C - all Output Indic.)</th>
<th>Efficiency (Case D - Restricted Weights 25%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RO052</td>
<td>RO NSPA Bucharest</td>
<td>1991</td>
<td>No</td>
<td>282</td>
<td>50</td>
<td>14319</td>
<td>110</td>
<td>100.0%</td>
<td>56.0%</td>
<td>100.0%</td>
<td>18.4%</td>
</tr>
<tr>
<td>UK135</td>
<td>UK U. Cardiff</td>
<td>1883</td>
<td>Yes</td>
<td>1105</td>
<td>350</td>
<td>26587</td>
<td>4143</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>88.4%</td>
</tr>
<tr>
<td>UK137</td>
<td>UK U. Glamorgan</td>
<td>1913</td>
<td>No</td>
<td>487</td>
<td>40</td>
<td>22710</td>
<td>3777</td>
<td>91.8%</td>
<td>95.1%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>UK126</td>
<td>UK U. Westminster</td>
<td>1838</td>
<td>No</td>
<td>604</td>
<td>25</td>
<td>23224</td>
<td>5446</td>
<td>75.7%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>70.3%</td>
</tr>
<tr>
<td>GR016</td>
<td>GR U. Patras</td>
<td>1964</td>
<td>Yes</td>
<td>1324</td>
<td>127</td>
<td>22089</td>
<td>1123</td>
<td>93.2%</td>
<td>36.2%</td>
<td>95.0%</td>
<td>58.4%</td>
</tr>
<tr>
<td>GR013</td>
<td>GR U. of Economics Athens</td>
<td>1920</td>
<td>No</td>
<td>371</td>
<td>30</td>
<td>17557</td>
<td>744</td>
<td>87.4%</td>
<td>48.6%</td>
<td>89.7%</td>
<td>71.3%</td>
</tr>
<tr>
<td>SK011</td>
<td>SK Elizabeth Coll. Bratislava</td>
<td>2003</td>
<td>Yes</td>
<td>333</td>
<td>36</td>
<td>13304</td>
<td>619</td>
<td>78.7%</td>
<td>40.0%</td>
<td>80.4%</td>
<td>58.3%</td>
</tr>
<tr>
<td>GR010</td>
<td>GR U. Macedonia</td>
<td>1948</td>
<td>No</td>
<td>367</td>
<td>24</td>
<td>14086</td>
<td>500</td>
<td>75.6%</td>
<td>26.6%</td>
<td>76.8%</td>
<td>42.7%</td>
</tr>
<tr>
<td>UK128</td>
<td>UK U. Wolverhampton</td>
<td>1932</td>
<td>No</td>
<td>653</td>
<td>25</td>
<td>21305</td>
<td>3044</td>
<td>64.3%</td>
<td>55.0%</td>
<td>69.1%</td>
<td>58.6%</td>
</tr>
<tr>
<td>GR020</td>
<td>GR Kapodistrian U. Athens</td>
<td>1837</td>
<td>Yes</td>
<td>3070</td>
<td>401</td>
<td>93004</td>
<td>3931</td>
<td>65.3%</td>
<td>41.2%</td>
<td>67.3%</td>
<td>44.7%</td>
</tr>
<tr>
<td>NL006</td>
<td>NL U. Groningen</td>
<td>1614</td>
<td>Yes</td>
<td>1498</td>
<td>306</td>
<td>25322</td>
<td>1321</td>
<td>66.1%</td>
<td>64.5%</td>
<td>66.1%</td>
<td>31.0%</td>
</tr>
<tr>
<td>RO034</td>
<td>RO U. Sibu</td>
<td>1844</td>
<td>No</td>
<td>1166</td>
<td>104</td>
<td>26415</td>
<td>157</td>
<td>65.7%</td>
<td>62.8%</td>
<td>65.7%</td>
<td>8.4%</td>
</tr>
<tr>
<td>DE052</td>
<td>DE U. Marburg</td>
<td>1527</td>
<td>No</td>
<td>2704</td>
<td>473</td>
<td>19142</td>
<td>1956</td>
<td>55.2%</td>
<td>55.2%</td>
<td>55.2%</td>
<td>21.9%</td>
</tr>
<tr>
<td>UK132</td>
<td>UK U. York</td>
<td>1963</td>
<td>No</td>
<td>1576</td>
<td>250</td>
<td>13184</td>
<td>2725</td>
<td>50.1%</td>
<td>50.1%</td>
<td>50.1%</td>
<td>36.1%</td>
</tr>
<tr>
<td>AT001</td>
<td>AT U. Vienna</td>
<td>1365</td>
<td>No</td>
<td>4924</td>
<td>594</td>
<td>67457</td>
<td>11962</td>
<td>36.5%</td>
<td>49.2%</td>
<td>49.5%</td>
<td>53.4%</td>
</tr>
</tbody>
</table>
(Smaller) UK universities seem to be **efficiency leaders** in Europe, especially regarding doctorates (research) and international students (third mission) as output objectives.

Southern European universities seem to be very efficient in terms of teaching (large student numbers, low staff levels).

German an Skandinavian universites are medium efficient and focused on research (doctorates) output.

**Quality aspects** are not included here – assumption: all degrees (PhD) & study conditions are at the same quality level in Europe (EHEA).
4. Discussion (II)

- **Mid-size universities** have higher chances to operate efficiently though there are also efficient large university operations (Athens, Vienna).

- **Fixed Weighting schemes** as tested here with fixed weightings of 25% for all three output areas are severely **punishing „focused“ universities** - therefore inadequate for e.g. performance based funding; a non-parametric DEA approach seems to be needed for „fair“ policy and funding schemes in Europe (national/university budget allocation).

- **EUMIDA data** has to be re-evaluated for e.g. staff numbers: Cardiff U. homepage reports 6,154 staff total and 2,149 full-time academic staff compared to 1,105 staff reported in EUMIDA (Cardiff University, 2012).
Research Results

[H1] The EUMIDA dataset can be used for efficiency analysis. Only partny approved: Specific data about staff & some countries has to be re-checked.

[H2] Mid-size universities are most efficient in a size-related comparison. → Approved in this dataset.

[H3] Different strategies for HE objectives can be found among European universities. → Profiling is working, between countries and within countries.

[H4] The DEA fixed weightings feature shows severe disadvantages for fixed weightings e.g. in performance-based funding schemes.
University Efficiency Research …

… The role of university hospitals in reporting output numbers is highly discussed and could be validated in further research (correlation analysis).

… Interestingly the 370 universities sorted by doctorates awarded seemed to match existing league tables for Europe – correlation research seems very promising: possibly the number of PhD graduates is a sufficient indicator for excellence in higher education – this would severely ease ranking operations and seems plausible as most university objectives are connected to PhD completions.
Thank you for your patience and interest.

Contact: Phone +49 201 183 4943
matthias.klumpp@pim.uni-due.de

http://www.helena.wiwi.uni-due.de
Förderkennzeichen 01PW11007