Measuring the Regional “Third-Mission-Potential” of Different Types of HEIs

Niederrhein Institute for Regional and Structural Research (NIERS)

Angelika Jaeger, Johannes Kopper
Functions of Higher Education Institutions

1) Generation and Accumulation of Academic Knowledge

2) Diffusion of Knowledge via Academic Education

„3rd Mission“
Multiple Contributions to society, e.g. economic, social, cultural contributions

National Innovation System
Regional Innovation System

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† Trippl / Sinozic / Smith 2012, p. 21
Functions of Higher Education Institutions

3rd Mission

→ No clear definition, but several key concepts:

- **Triple helix model**: university-industry-government (Etzkowitz / Leydesdorff 2000)
- **The engaged university model**: university functions adapt to regional needs (e.g. Uyarra 2010)
- **Regional innovation systems concept**: innovation as social process in subsystems of knowledge generation & exploitation, enabled by institutions, supported by interaction (Asheim et al. 2011, Bathelt /Depner 2003)
- **Mode 2 of knowledge production approach**: knowledge generation by interaction of different disciplines and applicability to real-life problems (Gibbons et al. 1994)
- **Entrepreneurial university model**: targeting economic autonomy and knowledge transfer to industry (Clark 2001, Etzkowitz et al. 2000)
- **Regional System Builder**: HEI have socio-economic responsibility to build and support regional systems (Caniels / van den Bosch 2011)
Intermediary Factor of Influence: 3rd Mission Potential

"3rd-Mission-Potential"

Thematic focus on economic processes
Focus on private industry in R&D and education, on cooperation and sustainable relations to industry

Geographic focus on HEI region
Focus on regional engagement, support of regional development processes
Research Objectives

1) Developing an empirical measure for 3rd-Mission-Potential

2) Applying this empirical measure to analyze the German Higher Educations System:

- **Research Question 1**: The activities of which type of HEI - universities of applied sciences (*Fachhochschulen*) or universities (*Universitäten*) - are more focused on private industry employment?

- **Research Question 2**: The activities of which type of HEI are thematically better aligned with structure of private industry employment in the geographical environment, the HEI region?
Developing an Empirical measure for 3rd-Mission-Potential

Analyzing congruence between...

→ **Structure of Education at HEI**
  - Data of German HEI graduates 2011
  - Dissected by study fields, classification of Federal Statistical Office, 4-digit level
  - Considered HEI: public, no religious / private HEI, no special thematic focus; N 1= 100 UAS, N2 = 80 U

→ **Structure of Employment**
  - Privat industry employment (SvB) 2011
  - Dissected by occupations, classification of Federal Statistical Office KIdB 92, 3-digit-level
  - Only sectors with a share of academics> 5% considered, only academics
  - Different geographical levels: Region (NUTS-3, Kreis, in which HEI is located), Federal State (NUTS-1), Nation
  - Distributional key index: study areas are associated with thematically equivalent occupational field
Comparing the „Fit“ of Education Structures of HEI with Data on National Employment

Universities of Applied Sciences

- Languages and cultural studies
- Law, economics and social science
- Mathematics and natural science
- Agriculture, forestry, nutrition science
- Medicine, sport science

Universities

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- Law, economics and social science
- Mathematics and natural science
- Agriculture, forestry, nutrition science
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Employed Academics, 2011

- Graduates of UAS (n=100) in Germany, 2011
- Graduates of U (n=80) in Germany, 2011
First Conclusions

Q.1: The activities of which type of HEI - universities of applied sciences *(Fachhochschulen)* or universities *(Universitäten)* - are more focused on private industry-oriented education?

**H 1:** The congruence between the structures of education of UAS and private industry employment is generally higher compared to the equivalent of U.

→ Approved, but rather according to visual measures
→ For valid approval, a more holistic empirical measure is necessary
Empirical measure for 3rd-Mission-Potential

**Q.2:** The activities of which type of HEI are thematically better aligned with the industry structure in the geographical environment, the HEI region?

**H 2.1:** In comparison to Us. structures, education activities of UAS. are thematically better aligned with the specific private industry structure in the geographical environment.

**H 2.2:** A special focus on regional private industry employment structures can be identified for education activities of universities of applied sciences.
Calculation of a Fit Index

\[ FI_{hi} = \left( 0.5 \times \sum_{j=1}^{m} \left| \frac{Y_{ij}}{\sum_{j=1}^{m} Y_{ij}} - \frac{X_{hj}}{\sum_{j=1}^{m} X_{hj}} \right| \right) \times 100 \]

\[ FI_{hi} = \text{fit index of HEI } h \text{ and considered geographic unit } i \]
\[ Y_{ij} = \text{Employed academics in considered geographic unit } i \text{ in industry/academic field } j \]
\[ X_{hj} = \text{graduates at the HEI } h \text{ in the industry/academic field } j \]
\[ m = \text{industries/academic fields} \]

→ Concept very similar to approach to determine the localization coefficient
HEI-Region Fit Indices on Different Geographical Levels

| HEI-region-fit indices to determine the fit between employment and the HEI’s educational curriculum | \( \varnothing \) fit index |
|---|---|---|
| National level | Federal State level (NUTS-1) | Regional level (NUTS-3) |
| Universities of applied sciences (n=100) | 52.43 | 52.78 | 53.78 |
| Universities (n=80) | 60.61 | 60.98 | 59.52 |
| All HEIs (n=180) | 56.06 | 56.43 | 56.33 |
Fit Index – Histograms for regional level

**Fit Index Universities - Histogram**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fit Index Value</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Good “fit”</td>
<td>40.00</td>
<td>60.00</td>
<td>80.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Low “fit”</td>
<td>40.00</td>
<td>60.00</td>
<td>80.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>

**Fit Index Universities of Applied Sciences - Histogram**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>0</th>
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<td>0</td>
<td>5</td>
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<td>15</td>
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<tr>
<td>Good “fit”</td>
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<td>80.00</td>
<td>100.00</td>
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<tr>
<td>Low “fit”</td>
<td>42.00</td>
<td>60.00</td>
<td>80.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>
HEI-Region Fit Index on regional level:
Top 10: Good fit between HEI and regional industry

<table>
<thead>
<tr>
<th>Universities</th>
<th>Fit-Index (NUTS-3)</th>
<th>Universities of Applied Sciences</th>
<th>Fit-Index (NUTS-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 TH Aachen</td>
<td>31,95</td>
<td>Duale Hochschule Baden Württemberg, Stuttgart (FH)</td>
<td>29,40</td>
</tr>
<tr>
<td>2 U Magdeburg</td>
<td>33,77</td>
<td>FH Ingolstadt</td>
<td>29,88</td>
</tr>
<tr>
<td>3 Karlsruher Institut für Technologie</td>
<td>37,71</td>
<td>H Bremen</td>
<td>35,66</td>
</tr>
<tr>
<td>4 TU Ilmenau</td>
<td>38,06</td>
<td>H für Technik und Wirtschaft Saarbrücken</td>
<td>36,97</td>
</tr>
<tr>
<td>5 TU Darmstadt</td>
<td>41,61</td>
<td>FH Kaiserslautern</td>
<td>37,14</td>
</tr>
<tr>
<td>6 U Paderborn</td>
<td>42,68</td>
<td>H Zittau/Görlitz (FH)</td>
<td>38,27</td>
</tr>
<tr>
<td>7 U Duisburg-Essen</td>
<td>42,75</td>
<td>FH Südwestfalen</td>
<td>38,83</td>
</tr>
<tr>
<td>8 Internationales Hochschulinstitut</td>
<td>43,24</td>
<td>FH Kiel</td>
<td>38,93</td>
</tr>
<tr>
<td>9 U Lüneburg</td>
<td>43,94</td>
<td>FH Dortmund</td>
<td>38,96</td>
</tr>
<tr>
<td>10 U Mannheim</td>
<td>44,01</td>
<td>FH Nürnberg</td>
<td>38,97</td>
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Fit Indices on Different Geographical Levels

- **National level**
- **Federal level**
- **Regional level**

<table>
<thead>
<tr>
<th>Level</th>
<th>Universities</th>
<th>Universities of applied sciences</th>
<th>All HEIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>National level</td>
<td>60.6</td>
<td>59.5</td>
<td>56.1</td>
</tr>
<tr>
<td>Federal level</td>
<td>61.0</td>
<td>52.4</td>
<td>56.4</td>
</tr>
<tr>
<td>Regional level</td>
<td></td>
<td>53.8</td>
<td>56.3</td>
</tr>
</tbody>
</table>
Conclusion

- Task sharing between universities and universities of applied sciences

- The curriculum of UAS is more aligned to the employment structure of private industry than the U‘s curriculum

- In comparison to U structures, the education activities of UAS are thematically better aligned with the specific private industry structure in the geographical environment.

- Nevertheless: According to chosen research approach, UAS do not have a stronger geographical focus on regional industry employment than on national industry employment.
  - They do not have a special focus on regional activities
Future Outlook

Yes, the developed fit index was further tested…
• Statistical tests: Levenes test, Mann-Whitney-U-Test → significant difference between the two distributions (→ paper)
• Model variation: different forms of employment (→ paper)

... but should also be applied as valuable basis for further research:
• Panel data instead of cross-section analysis
• How does 3rd mission potential influence 3rd mission activities (e.g. regional knowledge transfer)?
• How does HEI-region fit index influence innovation, economic growth, etc.?
Thank you for your attention!
Literature


Potential Factors of Influence on Regional Knowledge Transfer

Potential Factors of Influence on Knowledge Transfer Success

Knowledge-based Impacts

Socio-cultural Effects

Knowledge Transfer

Intermediary Factors

University-sided Factors of Influence

Regional Factors of Influence

Expenditure based impacts

HEI

Region

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