GC IMPACT ON TOURISM
REGIONAL ECONOMIC IMPACTS OF CLIMATE CHANGE ON WINTER TOURISM IN AUSTRIA

Franz Prettenthaler¹, Nadja Vettes², Herbert Formayer², Clemens Habsburg-Lothringen¹, Patrick Haas²

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INTERNATIONAL AND INTERDISCIPLINARY WORKSHOP

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¹JOANNEUM RESEARCH – Graz
Institute of Technology and Regional Policy (InTeReg)
²University of Natural Resources and Applied Life Sciences, Vienna
OUTLINE

➔ Motivation and Problem Statement
  • Vulnerability Concept & Adaptation Policy

➔ Methods

➔ Results
  • Economic Cluster Analysis
  • Climatological Cluster Analysis

➔ Future Work/Outlook

➔ Summary
MOTIVATION AND PROBLEM STATEMENT

→ Economic vulnerability to demand shocks arising from weather and climate variability

→ Investigate how weather related demand shocks impact the vulnerable tourism sector and other related sectors

→ Combination of climatological and economic research

→ Regional climate change → regional economic impacts

→ Scrutinize the vulnerability concept for adaptation policy
Vulnerability Concept useful for adaptation policy?

Pragmatic working definition

CONCEPT OF REGIONAL ECONOMIC VULNERABILITY (Tourism)

<table>
<thead>
<tr>
<th>EXPOSURE</th>
<th>SENSITIVITY</th>
<th>ADAPTIVE CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Relative Height (sea level)</td>
<td>• Employment concentration in the tourism sector</td>
<td>• Economic diversity (HH-Index)</td>
</tr>
<tr>
<td>• Precipitation regime</td>
<td>• Invested capital (proxy: Hotels, conveying capacity)</td>
<td>• Economic strength (equity capital ratio)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Risk transfer mech.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Technical adaptation options</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Alternative tourist attractions</td>
</tr>
</tbody>
</table>
METHODS

- Definition of indicators (vulnerability concept)
- Economic Cluster Analysis
  - groups of communities whose socio-economic and geographical characteristics point at similar vulnerability to external shocks on the tourism sector
  - Focus 1st step: sensitivity + exposure-connected variables
- Climatological Cluster Analysis
  - Percipitation regions
  - Focus 2nd step: exposure
- 3rd step: include adaptation
Cluster analysis – definition of indicators

- variables utilized

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
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<tr>
<td>Share of overnight stays in the winter season Ø 2000-2005</td>
<td></td>
</tr>
<tr>
<td>Concentration of Employment in the tourism sector</td>
<td></td>
</tr>
<tr>
<td>Tourism density (overnight stays/inhabitant) Ø 2000-2005</td>
<td></td>
</tr>
<tr>
<td>Highest elevation</td>
<td></td>
</tr>
<tr>
<td>Max. conveying capacity</td>
<td></td>
</tr>
</tbody>
</table>
Share of overnight stays in the winter season

- 0% - 16%
- 17% - 32%
- 33% - 49%
- 50% - 65%
- 66% - 81%
- 82% - 97%
Concentration of Employment in the tourism sector

-1.0 - 0.0
0.1 - 1.0
1.1 - 2.5
2.6 - 5.0
5.1 - 10.0
10.1 - 11.5
Tourism density (overnight stays per inhabitant)
Maximum conveying capacity (number of lifts)

- 1 - 12
- 13 - 23
- 24 - 33
- 34 - 44
- 45 - 55
Maximum conveying capacity (pers./h)

Persons/hour
- 100
- 1,000
- 10,000
- 100,000
RESULTS – 1st step

→ **Cluster Analysis 1**
  - Focus on tourism in general (both seasons)
  - Later step: find alternatives or possible new attractions

→ **Cluster Analysis 2**
  - Focus on winter tourism
  - Division in two groups of communities
  - Criterion: ski-lift infrastructure
  - Allows for more detailed information

→ **Climatological Cluster Analysis**
  - Focus on winter half-year
Cluster Analysis 1

2.375 Austrian communities

Cluster Analysis

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<table>
<thead>
<tr>
<th>No Tourism</th>
<th>Summer/all-year</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>no/day tourism</td>
<td>summer tourism</td>
<td>tourism-dependent</td>
</tr>
<tr>
<td>low alt.</td>
<td>all-year tourism</td>
<td>winter tourism</td>
</tr>
<tr>
<td>high alt.</td>
<td></td>
<td>Top 9 winter resorts</td>
</tr>
</tbody>
</table>
## Cluster Analysis 1

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<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>no/day tourism</td>
<td>no/day/ city tourism low</td>
<td>no/day/ city tourism high</td>
</tr>
<tr>
<td>723</td>
<td>616</td>
<td>358</td>
</tr>
</tbody>
</table>

![Map showing tourism clusters](image-url)
RESULTS – 2nd step

→ Cluster Analysis 1
  • Focus on tourism in general (both seasons)
  • Later step: find alternatives or possible new attractions

→ Cluster Analysis 2
  • Focus on winter tourism
  • Division in two groups of communities
  • Criterion: ski-lift infrastructure
  • Allows for more detailed information

→ Climatological Cluster Analysis
  • Focus on winter half-year
Cluster Analysis 2 – focus on winter

2.375 Austrian communities

Winter sports infrastructure – ski-lifts

<table>
<thead>
<tr>
<th>Comm. with ski-lifts</th>
<th>Comm. without ski-lifts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cluster Analysis</strong></td>
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<tr>
<td>Concentration of Employment in tourism</td>
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<tr>
<td>Sea level + Difference of max./min. sea level</td>
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<tr>
<td>Max. conveying capacity cable cars/tow lifts</td>
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<td>Sea level upper/lower terminus</td>
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</tbody>
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<tr>
<th>No/city/summer</th>
<th>Hiking with winter</th>
<th>All-year</th>
<th>Tourism-dep.</th>
<th>Winter</th>
<th>Top winter resorts</th>
<th>No tourism</th>
<th>Summer/all-year higher alt.</th>
<th>Summer</th>
<th>Spa tourism, Top summer resorts</th>
</tr>
</thead>
</table>

Tourism density summer/winter (overnight stays per inhabitant) Ø 2000-2005
Concentration of Employment in tourism
Sea level + Difference of max./min. sea level
Max. conveying capacity cable cars/tow lifts
Sea level upper/lower terminus
Cluster Analysis 2 – focus on winter

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<th>No/city/summer tour.</th>
<th>Hiking with winter season</th>
<th>All-year tourism</th>
<th>Tourism-dependent</th>
<th>Winter tourism with summer s.</th>
<th>Top Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>167</td>
<td>149</td>
<td>162</td>
<td>66</td>
<td>66</td>
<td>15</td>
</tr>
</tbody>
</table>
RESULTS – 2nd step

- Cluster Analysis 1
  - Focus on tourism in general (both seasons)
  - Later step: find alternatives or possible new attractions

- Cluster Analysis 2
  - Focus on winter tourism
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  - Allows for more detailed information

- Climatological Cluster Analysis
  - Focus on winter half-year
Precipitation regions in the winter half-year in Austria

Legend
- Northern Stau
- Wald-Mühlviertel
- South-east
- North-east
- West
- Southern Stau
- Rax-Schneeberg

Inhalt: Seibert et al., 2006
Layout: Formayer 2006
FUTURE WORK/OUTLOOK

→ Selection of representative regions (communities)
→ Daily snow model, run at 3 different sea levels → situation of the skiing slopes
→ Determine the associated shifts in demand
→ Quantify the direct impacts on the regional tourism sector
→ Quantify the indirect impacts on the economy of the entire region (Macroeconomic effects on level of federal states)
→ Consider adaptation options
→ Focus on summer tourism
Is Vulnerability a useful concept after all?

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<td>Interface to climate models</td>
</tr>
<tr>
<td><strong>SENSITIVITY</strong></td>
</tr>
<tr>
<td>Characteristics that determine macroeconomic effects</td>
</tr>
<tr>
<td>There is more to it than short term GRP deviation</td>
</tr>
<tr>
<td><strong>ADAPTIVE CAPACITY</strong></td>
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<td>Highest relevance for policy response</td>
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High policy relevance for identifying priorities

Determine policy interventions