Modelling the impact of EAFRD policies on rural development and structural change

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Outline

- Introduction
- Problem setting
- Methodological approach
- Selected results
- Outlook
Introduction

- State of progress and preliminary findings of SP 10 within SiAg Research Unit
- Relevance of RD policies on structural change
- Interactive programming approach to support policy decision-making for RD policies (“letting the man in” philosophy (Zeleny 1980))
- Case study: Saxony-Anhalt, EAFRD 2007-13
Problem setting

Background

- Increasing importance of policies for rural areas (EAFRD, ERDF, ESF, Cohesion Fund)

- Complex policy-making problem
  - Many actors at multiple levels
  - Multiple objectives with limited operationalization and considerable trade-offs
  - Limited knowledge on policy impacts
  - Co-financing of several budgets
  - Regional differences regarding preferences, measures, impacts, funding

- Current regulatory framework: EAFRD regulation 1698/2005
Problem setting

Basic research question

How can policy-making for rural development and structural change be improved?

Objectives

- To develop a model which captures all mayor elements of the EAFRD framework and allows for a realistic modelling of an entire RDP

- To analyze relevant policy scenarios and their implications w.r.t. policy-driven developments of rural areas
Problem setting

Saxony-Anhalt’s RDP (2007-2013) Overall public funds: 1.246 billion €


Source: Own presentation.
Methodological approach

Interactive programming
- Based on Linear Optimization
- Implemented in Excel
- Interactively developed
- Focus: Budget allocation

\[
\max_{x_1, \ldots, x_n} Z = \sum_{j=1}^{m} \alpha_j \sum_{i=1}^{n} z_{ji} x_i \\
\text{subject to:} \\
\sum_{i=1}^{n} a_{ri} x_i \begin{cases} \leq b_r & \text{for } r = 1, \ldots, k \\ \geq \end{cases}
\]

Source: Modified from Jechlitschka, Kirschke and Schwarz (2007: 198)
Methodological approach

<table>
<thead>
<tr>
<th>Axis 1 (A 1)</th>
<th>Axis 2 (A 2)</th>
<th>Axis 3 (A 3)</th>
<th>Rest (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>…</td>
<td>…</td>
<td>… M39</td>
</tr>
<tr>
<td>$x_1^1$</td>
<td>$x_2^1$</td>
<td>$x_3^1$</td>
<td>… $x_3^{39}$</td>
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<tr>
<td>$z_1^1$</td>
<td>…</td>
<td>…</td>
<td>… $z_{39}^{39}$</td>
</tr>
<tr>
<td>$z_{11}$</td>
<td>…</td>
<td>…</td>
<td>… $z_{39}^{39}$</td>
</tr>
<tr>
<td>$z_{2}$</td>
<td>…</td>
<td>…</td>
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<tr>
<td>$z_{3}$</td>
<td>…</td>
<td>…</td>
<td>… $z_{39}^{39}$</td>
</tr>
<tr>
<td>$z_{4}$</td>
<td>…</td>
<td>…</td>
<td>… $z_{39}^{39}$</td>
</tr>
</tbody>
</table>

\[ Z \rightarrow \text{max} \]

\[ \geq \text{LB I} \]
\[ \leq \text{UB I} \]
\[ \geq \text{LB II} \]
\[ \leq \text{UB II} \]
\[ \geq \text{LB III} \]
\[ \leq \text{UB III} \]
\[ \geq \text{MinEU}_A1 \]
\[ \geq \text{MinEU}_A2 \]
\[ \geq \text{MinEU}_A3 \]
\[ \geq \text{MinEU}_A4 \]
\[ \leq \text{EU}_\text{Bud} \]
\[ \leq \text{GAK}_\text{Bud} \]
\[ \leq \text{Reg}_\text{Bud} \]
\[ \leq \text{Com}_\text{Bud} \]
\[ \leq \text{Other}_\text{Bud} \]

Source: Own presentation.
## Methodological approach

### Selected co-financing matrices

<table>
<thead>
<tr>
<th></th>
<th>111</th>
<th>121/I</th>
<th>125/II</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU (r=1)</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>Fed (r=2)</td>
<td>0.00</td>
<td>0.15</td>
<td>0.00</td>
</tr>
<tr>
<td>Reg (r=3)</td>
<td>0.25</td>
<td>0.10</td>
<td>0.00</td>
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<tr>
<td>Com (r=4)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.25</td>
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<tr>
<td>Oth (r=5)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Methodological approach

Impact parameters (Scale 1-9)

- Economic development
- Job opportunities
- Environmental protection
- Administrative efficiency

Axis 1
Axis 2
Axis 3
Selected results: Optimization potential

Scenario

- Objectives: economic development and employment opportunities (50% each)
- Max. budget changes: +/- 100%
- Current EAFRD framework
Selected results: Optimization potential


<table>
<thead>
<tr>
<th></th>
<th>Current allocation</th>
<th>Optimal allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EARFD co-financing (total)</strong></td>
<td>246.61</td>
<td>246.15</td>
</tr>
<tr>
<td>thereof federal state</td>
<td>73.23 (29.7%)</td>
<td>85.42 (34.7%)</td>
</tr>
<tr>
<td>thereof region</td>
<td>114.79 (46.6%)</td>
<td>102.13 (41.5%)</td>
</tr>
<tr>
<td>thereof communes</td>
<td>55.09 (22.3%)</td>
<td>55.09 (22.4%)</td>
</tr>
<tr>
<td>thereof others</td>
<td>3.51 (1.4%)</td>
<td>3.51 (1.4%)</td>
</tr>
<tr>
<td><strong>Top-up (total)</strong></td>
<td>190.49</td>
<td>190.95</td>
</tr>
<tr>
<td>thereof federal state</td>
<td>85.03 (44.6%)</td>
<td>72.83 (38.1%)</td>
</tr>
<tr>
<td>thereof region</td>
<td>105.46 (55.4%)</td>
<td>118.12 (61.9%)</td>
</tr>
</tbody>
</table>

Source: Own calculation.
## Selected results: Budget cuts


<table>
<thead>
<tr>
<th>Budget Type</th>
<th>Optimal allocation</th>
<th>Scenario A1 (Reg. budget: -25%)</th>
<th>Scenario A2 (Reg. budget: -50%)</th>
<th>Scenario A3 (Reg. budget: -75%)</th>
<th>Scenario B Loss of convergence region status</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAFRD budget</td>
<td>809.02</td>
<td>809.02</td>
<td>809.02</td>
<td>565.19</td>
<td>484.51</td>
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<tr>
<td>Fed. budget (total)</td>
<td>158.26</td>
<td>158.26</td>
<td>131.05</td>
<td>51.22</td>
<td>158.26</td>
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<tr>
<td>Reg. budget (total)</td>
<td>220.25</td>
<td>165.19</td>
<td>110.12</td>
<td>55.06</td>
<td>220.25</td>
</tr>
<tr>
<td>Com. Budget</td>
<td>55.08</td>
<td>55.08</td>
<td>55.08</td>
<td>55.08</td>
<td>55.08</td>
</tr>
<tr>
<td>Other budget</td>
<td>3.51</td>
<td>3.51</td>
<td>3.51</td>
<td>3.51</td>
<td>7.02</td>
</tr>
<tr>
<td>Nat. co-financing</td>
<td>246.15</td>
<td>246.15</td>
<td>246.15</td>
<td>164.87</td>
<td>440.61</td>
</tr>
<tr>
<td>Top-ups (total)</td>
<td>190.95</td>
<td>135.89</td>
<td>53.62</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>Total available budget</td>
<td>1246.12</td>
<td>1191.05</td>
<td>1135.99</td>
<td>1080.93</td>
<td>966.47</td>
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<tr>
<td>Total bud used</td>
<td>1246.12</td>
<td>1191.05</td>
<td>1108.78</td>
<td>730.06</td>
<td>925.12</td>
</tr>
<tr>
<td>Budget not used</td>
<td>0.00</td>
<td>0.00</td>
<td>27.21</td>
<td>350.87</td>
<td>41.35</td>
</tr>
</tbody>
</table>

Source: Own calculation.
Selected results: Budget cuts


Source: Own calculation.
Outlook

- Interactive programming can be a powerful tool for policy decision-making support
  - to guide and handle complexity
  - to guide rural development policies
  - to avoid oversimplification and arbitrariness in policy-making
  - to analyse the implications of RD policy-making on structural change

- Work in progress!
  - Model specification to be extended
  - Interpretation of results
  - Dealing with multiple solutions
  - Scenario calculations with decision-makers

- SiAg Phase 2
  To provide and test a master programming framework for integrative rural development and structural change (Impact analysis, programming tool, strategy development)
Outlook

Structure of the programming tool, SP 10, SiAg Phase 2

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Policy measures</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAFRD</td>
<td>Z₁</td>
<td>Z₁₁</td>
</tr>
<tr>
<td>ERDF</td>
<td>Z₂</td>
<td>Z₂₁</td>
</tr>
<tr>
<td>ESF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Constraints**
  - W.r.t. EAFRD
  - W.r.t. ERDF
  - W.r.t. ESF

- **Policy measures**
  - EAFRD bloc
  - ERDF bloc
  - ESF bloc

- **Budget expenditure**
  - Upper bounds
  - Lower bounds

- **Upper bounds**
- **Lower bounds**

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Dieter Kirschke  | Humboldt-Universität zu Berlin, Chair for Agricultural Policy  | 14th EAAE Seminar  | April 16, 2010, Berlin
Backup: Mixed co-financing system

Source: Modified from Grajewski and Mehl (2008)
Backup: Interactive modelling approach

What constitutes an interactive modelling approach?
- Active involvement of DMs / Joint elaboration of the decision field
- Iterative procedure (dialogue phases and phases of computation)
- Improvement of the decision-making quality and improved structuring and transparency of the problem instead of finding one optimal solution to provide recommendations for direct courses of action

Why focusing on interactive modelling?
- To avoid „black-box“ character of modelling („real decision-making support“)
- To consider the end users‘ needs in all stages of the modelling exercise
- To use the expertise of DMs esp. in highly complex decision situations

Recommendations from the literature
- Use of simple, clearly arranged and flexible models
- Sensitivity analysis should be at centre stage
Backup: Impact parameters
Backup: Optimal solutions for activities