Programming rural development funds from a regional perspective

Methodological approach, data & preliminary results

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1. Introduction: General background

- Increasing importance of rural development policies
- Current regulatory framework: EAFRD regulation 1689/2005
- Complex policy-making problem
- Due to e.g.:
  - Multiple objectives with limited operationalization and considerable trade-offs
  - Limited knowledge on policy impacts
  - Complex co-financing structure
1. Introduction: Research question & objective

Basic research question

How should RD programs be set to achieve to achieve the political objectives pursued?

Overall objective

To interactively develop and test a programming approach suitable to guide objective-orientated and transparent RD policy-making
2. Methodological approach

Programming tool
- based on Linear Optimization
- implemented in Excel
- interactively developed and used
- solver-based Visual Basic Applications

Case study
Saxony-Anhalt (S.T.)
2. Methodological features

1. Defining the model

   Workshops with Ministry representatives to discuss and agree on objectives, measures and constraints to be considered

2. Impact assessment

   Two-step Delphi approach. Step 1: Individual expert judgments (one-dimensional 1-9 scale). Step 2: Discussion and agreement on final estimates in a collective workshop

3. Interactive modeling

   Parametric Linear Optimization and solver-based Visual Basic Application in Excel
3. Model definition: Measures

- 39 measures of the current EAFRD program (RDP) in S.T.

\[ M := \{1, \ldots, 39\} = A_1 \cup A_2 \cup A_3 \cup R \]

\[ A_1 := \{1, \ldots, 11\} \quad A_2 := \{12, \ldots, 21\} \quad A_3 := \{22, \ldots, 36\} \quad R := \{37, \ldots, 39\} \]

- Further subdivided into three different financing and implementation modes (EAFRD standard, Leader, Top-ups)

\[ x^i := x^i_1 + x^i_2 + x^i_3 = \sum_{k=1}^{3} x^i_k \quad \text{for} \quad i \in M \]

- Thus, methodological axis four represents a subset of M:

\[ A_4 := \{x^i_2 \mid i \in M\} \]
3. Model definition: Objectives

Objectives

- Z1: Economic development of rural areas
- Z2: Creation of job opportunities in rural areas
- Z3: Environmental protection and nature conservation
- Z4: Reduction of administrative burdens
  “administrative efficiency”

→ Impacts of measures?
3. Model definition: Impact parameter
3. Generated impact parameter

...with respect to objective four
3. Model definition: Budget constraints

a) Budget constraints on the different administrative levels

<table>
<thead>
<tr>
<th></th>
<th>111</th>
<th>121/I</th>
<th>125/II</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>0,75</td>
<td>0,75</td>
<td>0,75</td>
</tr>
<tr>
<td>Fed</td>
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<td>0,25</td>
</tr>
<tr>
<td>Oth</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
</tbody>
</table>

\[ \sum_{i \in M} \sum_{k} c_{r k}^i x_{k}^i \leq b_r \]

with
\[ \sum_{r} c_{r k}^i = 1 \]
3. Model definition: Budget constraints

Overall contribution of the Federal state and the Region depend on the share of communes as beneficiaries.

Overall contribution of the Federal state and the Region depend on the share of communes as beneficiaries.
3. Model definition: Budget constraints

Thus: \[ 1 - c^i_{1k} = \sum_{r=2}^{5} c^i_{rk} \]

whereas: \[ c^i_{1k} = \text{axes-specific EU co-financing rate}; \text{ e.g.:} \]

\[ c^i_{11} = \delta_{A1} \quad \text{for} \quad i \in A1 \quad c^i_{12} = \delta_{A4} \quad \text{for} \quad i \in M \]

... with further specifications of the GAK-status of a measure and the share of communes as beneficiaries:

E.g. for r=2:

\[ c^i_{2k} = \left( 1 - c^i_{1k} \right) \left( 1 - \% \text{ Com}^i_k \right) GAK^i_{r \text{Fed}} \quad \text{for} \quad \forall i, k \]
3. Model definition: Constraints

b) Constraints deduced from the regulatory EAFRD framework

e.g.: Minimum contribution of EAFRD funds to the axes

... in case of axis 1:

$$\sum_{i \in A1} x_i \geq \text{MinEU}_A1 \quad \text{with} \quad \text{MinEU}_A1 := EAFRD\_Budget \times \gamma_{A1}$$
3. Model definition: Constraints

c) Upper and lower bounds (measure-specific and k-specific)

LUB I: \[ l^i \leq \sum_k x_k^i \leq u^i \quad \text{for} \quad \forall i \]

LUB II: \[ l_k^i \leq x_k^i \leq u_k^i \quad \text{for} \quad \forall i, \forall k \]

LUB III: \[ l_{act}^i \leq \sum_k x_k^i \leq u_{act}^i \quad \text{for} \quad \forall i \]

with: \[ l^i := (1 - \beta) \sum_k x_{k\,act}^i \] and: \[ u_{act}^i := (1 + \beta) \sum_k x_{k\,act}^i \]
4. Model definition: Overview

\[ \begin{array}{cccc}
\text{Axis 1 (A 1)} & \text{Axis 2 (A 2)} & \text{Axis 3 (A 3)} & \text{Rest (R)} \\
M1 & \cdots & \cdots & M39 \\
x_1^1 & x_2^1 & x_3^1 & \cdots \\
Z_1 & z_{11} & \cdots & \cdots & z_{13} \\
Z_2 & \vdots & \vdots & \vdots \\
Z_3 & \vdots & \vdots & \vdots \\
Z_4 & z_{41} & \cdots & \cdots & z_{43} \\
\end{array} \]
4. Model definition: summary

All relevant coefficients for the indices i, j, k, r defined

Definition of 4 variables that alter these coefficients when set to alternative states.

**Alpha:** Weights assigned to the objectives

→ To compose several distinct objective functions; trade offs

**Beta:** Allowed deviance from the current allocation

→ To facilitate the DMs familiarization with the model
4. Model definition: summary

**Gamma:** Minimum contribution rates of EU-funds to the axes
- To account for changing priorities set by the EU

**Delta:** EU co-financing rates for the axes
- Changes all co-financing parameter at once; Can be used to analyze policy scenarios such as the loss of the convergence-status of S.T.

Furthermore:

- Development of a particular user interface
- Central worksheet to set all input parameter
4. Model specification: Baseline

Overall budget assigned to the 39 measures: 1,246 billion €

- EAFRD funds 809,02 mio. €

**Financing of the axes**

<table>
<thead>
<tr>
<th>Axis</th>
<th>Leader</th>
<th>Top-ups</th>
<th>EAFRD &amp; nat.Co-fi (without Leader)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>234,81</td>
<td>80,90</td>
</tr>
<tr>
<td>2</td>
<td>45,22</td>
<td>231,53</td>
<td>202,25</td>
</tr>
<tr>
<td>3</td>
<td>80,90</td>
<td>280,70</td>
<td>280,70</td>
</tr>
<tr>
<td>4</td>
<td>40,45</td>
<td>45,22</td>
<td>45,22</td>
</tr>
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</table>
4. Model Specification: Basline
5. First results

\[ \alpha_1 = \alpha_2 = 0 \quad \text{and} \quad \alpha_3 = \alpha_4 = 0 \quad , \quad \beta = 100\% \]

\[ \gamma_{A1} = \gamma_{A3} = 0.1 \quad \text{and} \quad \gamma_{A2} = 0.25 \quad \text{and} \quad \gamma_{A4} = 0.05 \]

\[ \delta_{A1} = \delta_{A4} = 0.75 \quad \text{and} \quad \delta_{A2} = \delta_{A4} = 0.80 \]

\[ b_1 = 809,017; b_2 = 158,257; b_3 = 220,366; b_4 = 55,085; b_3 = 3,509 \]
5. First results

Measure-specific changes w.r.t. current allocation (%)
5. First results
6. Concluding remarks and outlook

Concluding remarks

- First model runs reveal relatively large optimization potentials
- Comprehensive results with respect to entire budget volume assigned to a measure
- Additional specifications needed (e.g. k-specific bounds for Leader implementations)
- Unstable solutions with respect to k-specific financing modalities
6. Concluding remarks and outlook

Outlook

- Careful revision of generated impact parameter (against other empirical findings & sensitivity analysis)
- Possibilities to account for “stability problem”? Solution?
- Further “step-by-step familiarization” with the model
- Further development of the models user interface
- Preparation for interactive modeling sessions with the Ministry
Thanks for your attention!
Backup: Co-financing modalities

Source: Grajewski and Mehl (2008)
**Backup: Scorecard**

<table>
<thead>
<tr>
<th>Defined objectives</th>
<th>Contribution to objectives</th>
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<tbody>
<tr>
<td>Economic development of rural areas</td>
<td>1, 2, 3 = Low</td>
</tr>
<tr>
<td>Creation of job opportunities in rural areas</td>
<td>4, 5, 6 = Medium</td>
</tr>
<tr>
<td>Environmental protection and nature conservation</td>
<td>7, 8, 9 = High</td>
</tr>
<tr>
<td>Administrative efficiency</td>
<td>Remarks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non changeable cells</th>
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<th></th>
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<th></th>
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<tbody>
<tr>
<td>Speedometer</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>Leader</td>
<td>Normal</td>
<td>Leader</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title of measure</th>
<th>Economic development of rural areas</th>
<th>Creation of job opportunities in rural areas</th>
<th>Environmental protection and nature conservation</th>
<th>Administrative efficiency</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxx</td>
<td>5</td>
<td>2</td>
<td>8</td>
<td>9</td>
<td>4</td>
</tr>
</tbody>
</table>

The evaluator estimates that the measure on average contributes 5 to the target "economic development of rural areas". However, if the measure is implemented by a Leader group a higher contribution to the target is estimated.

The evaluator assumes that the measure provides a high contribution to the target "environmental protection and nature conservation". This is independent of whether the measure is implemented by a Leader group or not.

The evaluator has the opinion that the measure is very efficient to administer, i.e. the measure does not require a high administrative effort. If the measure is implemented by a Leader group the administrative efficiency is reduced substantially.

Please enter all remarks that could be helpful in understanding your evaluation. In the given case this could be, e.g., why the measure provides a higher contribution to the target "economic development of rural areas" if it is implemented by a Leader group. Also it could be helpful if you briefly illustrate your estimation of the administrative efficiency. Please include as many details as you like. You may also answer in note form.