Programming rural development funds from a regional perspective

Methodological approach, data & preliminary results

Presentation at the SiAg research seminar

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Julia Schmid

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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

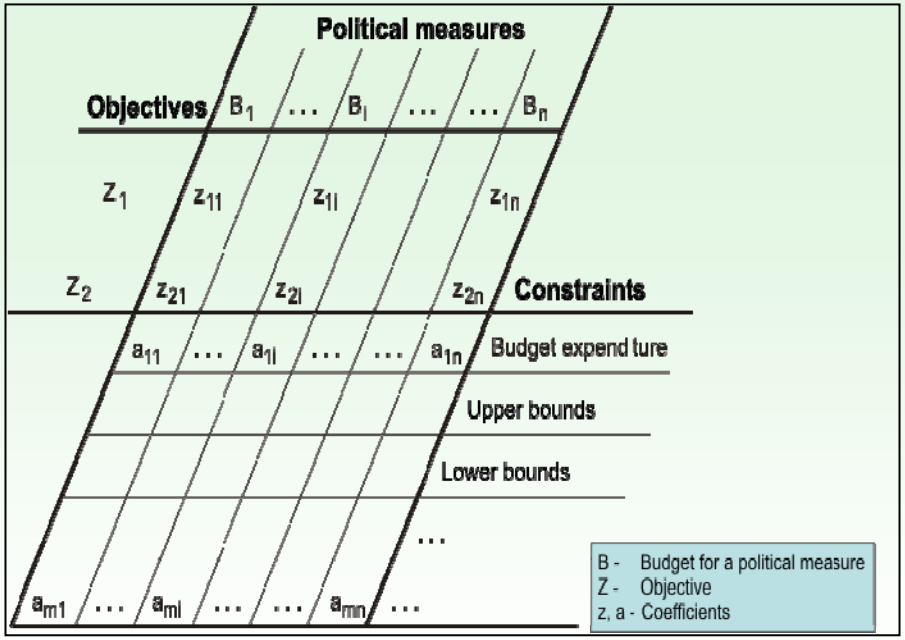
To interactively develop and test a programming approach suitable to guide objective-orientated and transparent RD policy-making

2. Methodological approach

Programming tool

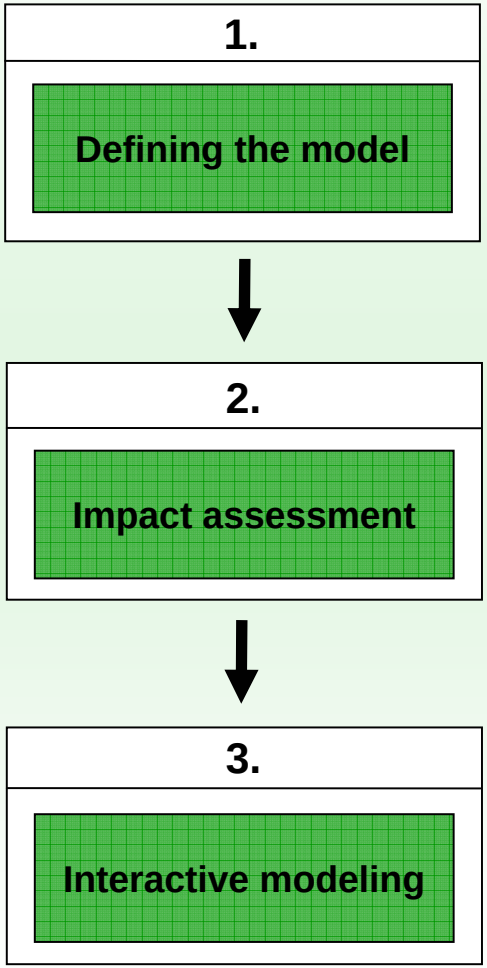
- based on Linear Optimization
- implemented in Excel
- interactively developed and used
- solver-based Visual Basic Applications

➡ Case study
Saxony-Anhalt (S.T.)



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

2. Methodological features



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

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

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.**

$$M := \{1,..., 39\} = A1 \cup A2 \cup A3 \cup R$$

$$A1 := \{1,..., 11\} \qquad A2 := \{12,..., 21\} \qquad A3 := \{22,..., 36\} \qquad R := \{37,..., 39\}$$

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

$$x^i := x_1^i + x_2^i + x_3^i = \sum_{k=1}^{3} x_k^i \qquad for \quad i \in M$$

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

$$A4 := \left\{ x_2^i \quad for \ i \in M \ \right\}$$

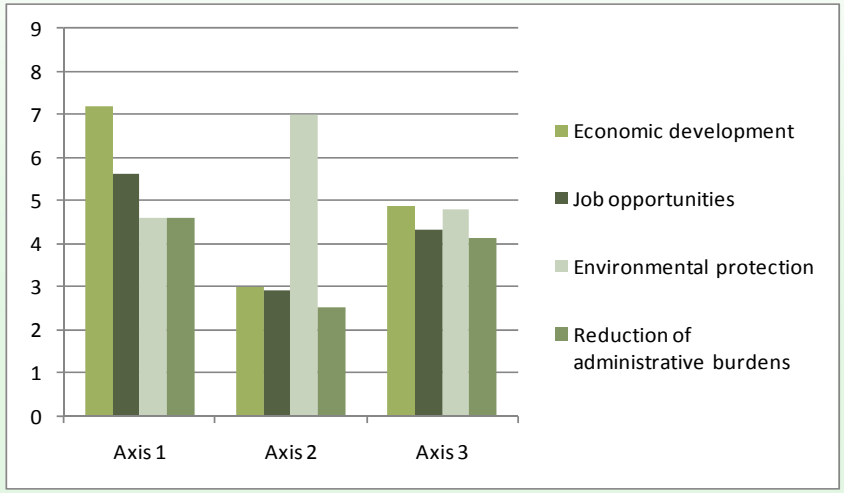
3. Model definition: Objectives

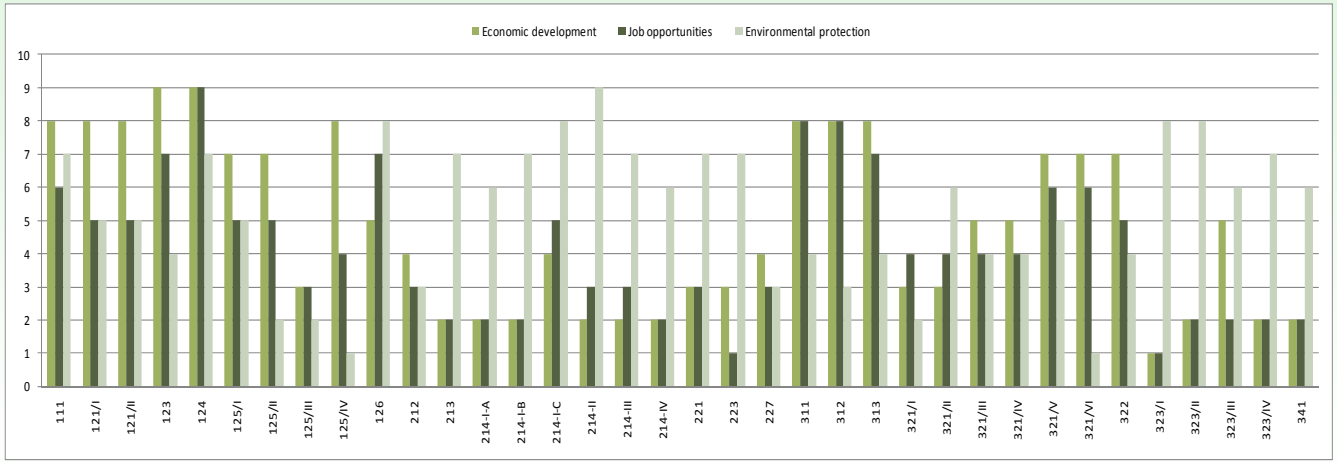
Objectives

- **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?

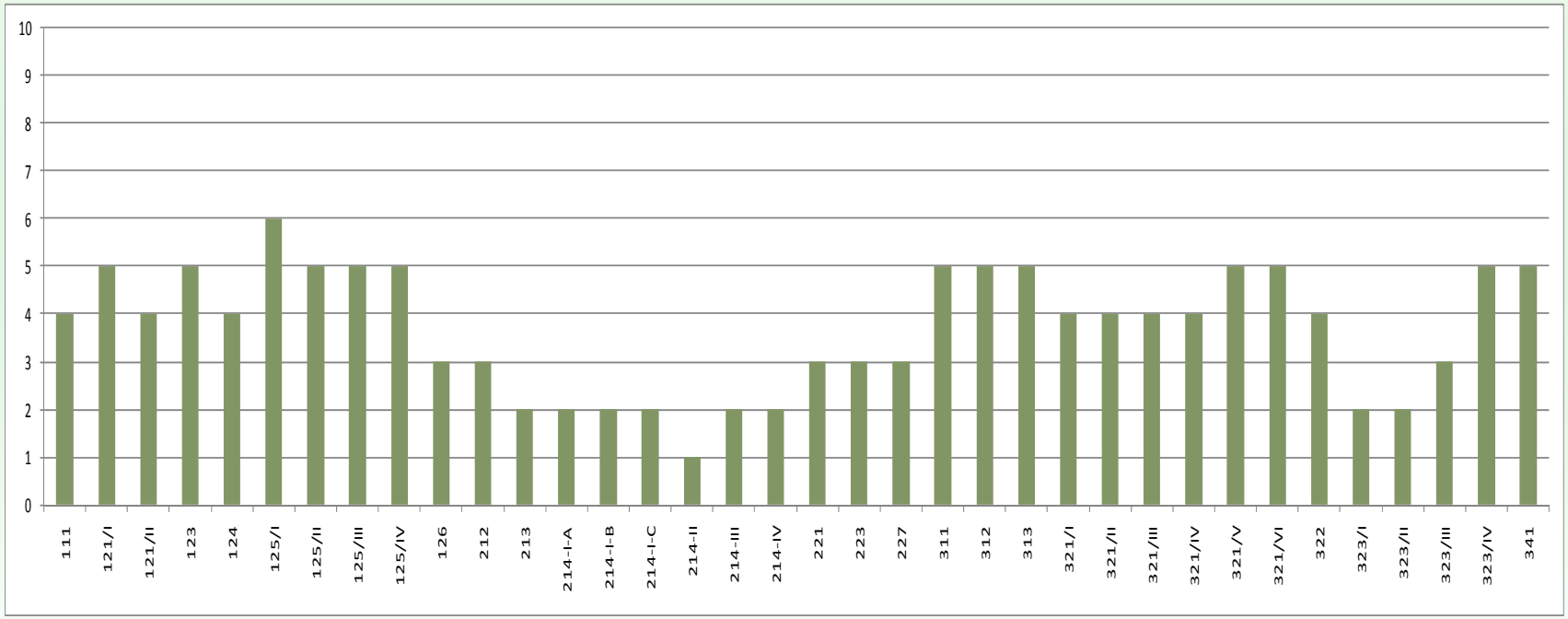
3. Model definition: Impact parameter





3. Generated impact parameter

...with respect to objective four



3. Model definition: Budget constraints

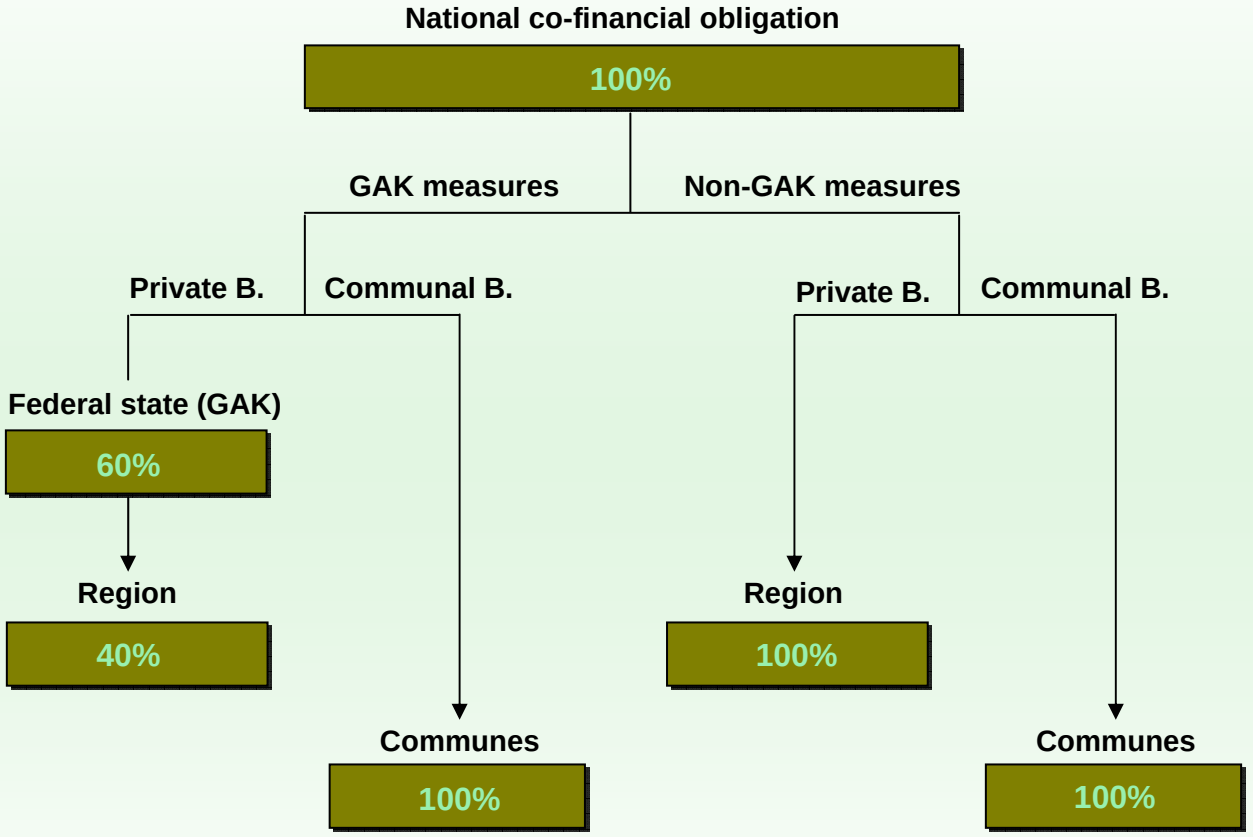
a) Budget constraints on the different administrative levels

		111			121/I			125/II		
EU	(r=1)	0,75	0,80	0,00	0,75	0,80	0,00	0,75	0,80	0,00
Fed	(r=2)	0,00	0,00	0,00	0,15	0,12	0,60	0,00	0,00	0,00
Reg	(r=3)	0,25	0,20	1,00	0,10	0,08	0,40	0,00	0,00	1,00
Com	(r=4)	0,00	0,00	0,00	0,00	0,00	0,00	0,25	0,20	0,00
Oth	(r=5)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

$$\sum_{i \in M} \sum_{k} c_{rk}^{i} \; x_{k}^{i} \quad \leq \quad b_{r} \qquad .$$

with $$\sum_{r} c_{rk}^{i} \quad = \quad 1$$

3. Model definition: Budget constraints



3. Model definition: Budget constraints

Thus: $\left(1 - c_{1k}^{i} = \sum_{r=2}^{5} c_{rk}^{i} \right)$

whereas: $c_{1k}^{i} =$ **axes-specific EU co-financing rate; e.g.:**

$c_{11}^{i} = \delta_{A1} \quad for \quad i \in A1$ $\qquad$ $c_{12}^{i} = \delta_{A4} \quad for \quad i \in M$

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

E.g. for r=2:

$$c_{2k}^{i} = \left(1 - c_{1k}^{i}\right) \left(1 - \%\_Com_{k}^{i}\right) GAK_{r\,Fed}^{i} \quad for \; \forall i,k$$

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:

$$\sum_{i \in A1} x_1^i \quad \geq \quad MinEU\_A1 \quad with \quad MinEU\_A1 := EAFRD\_Budget \times \gamma_{A1}$$

3. Model definition: Constraints

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

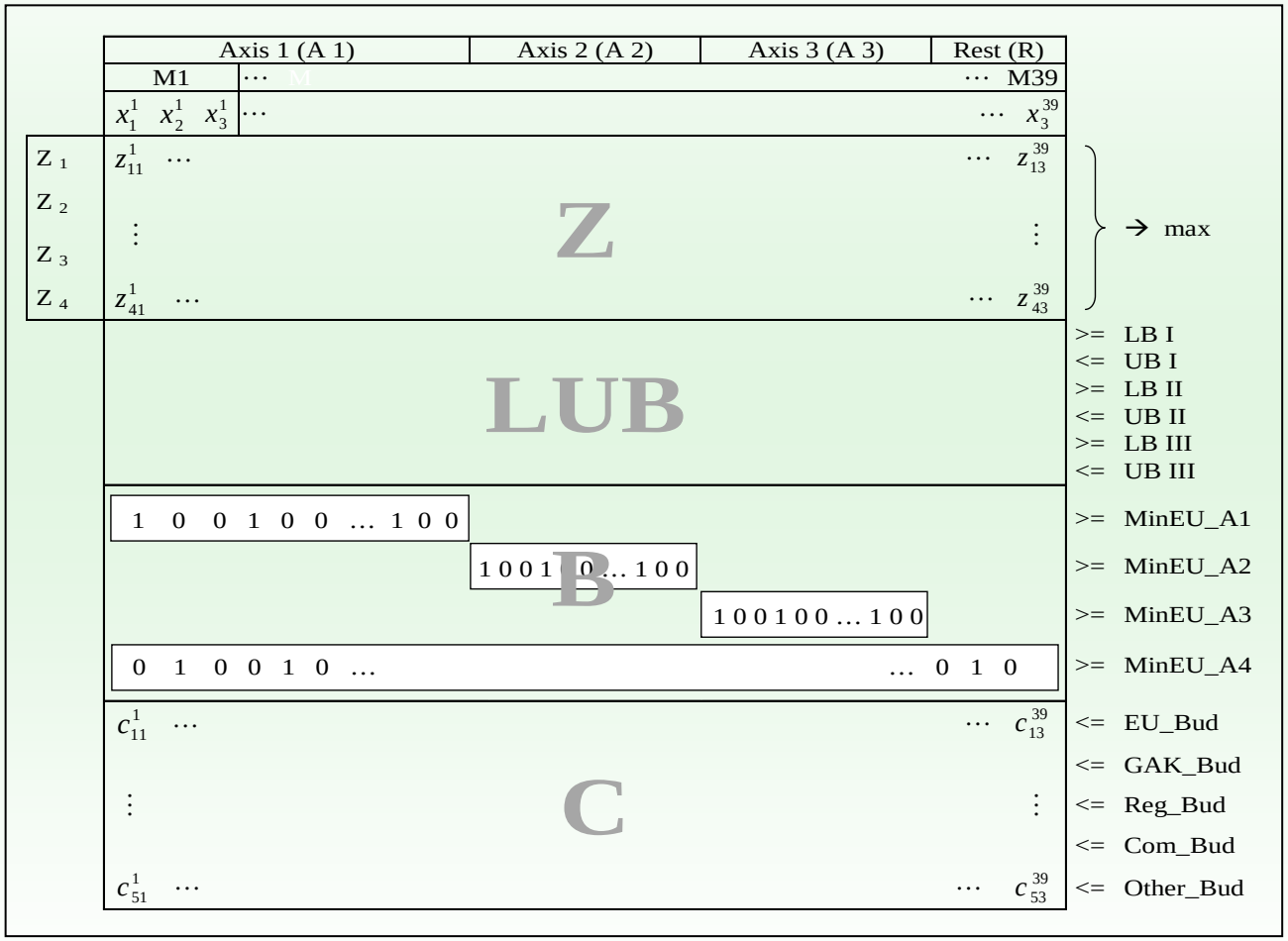
LUB I: $$l^i \leq \sum_k x_k^i \leq u^i \quad for \quad \forall i$$

LUB II: $$l_k^i \leq x_k^i \leq u_k^i \quad for \quad \forall i, \forall k$$

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

with: $$l_{act}^i := (1-\beta) \sum_k x_{k\,act}^i$$ and: $$u_{act}^i := (1+\beta) \sum_k x_{k\,act}^i$$

4. Model definition: Overview



4. Model definition: summary

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

Definition of 4 variables that alter these coefficents 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.

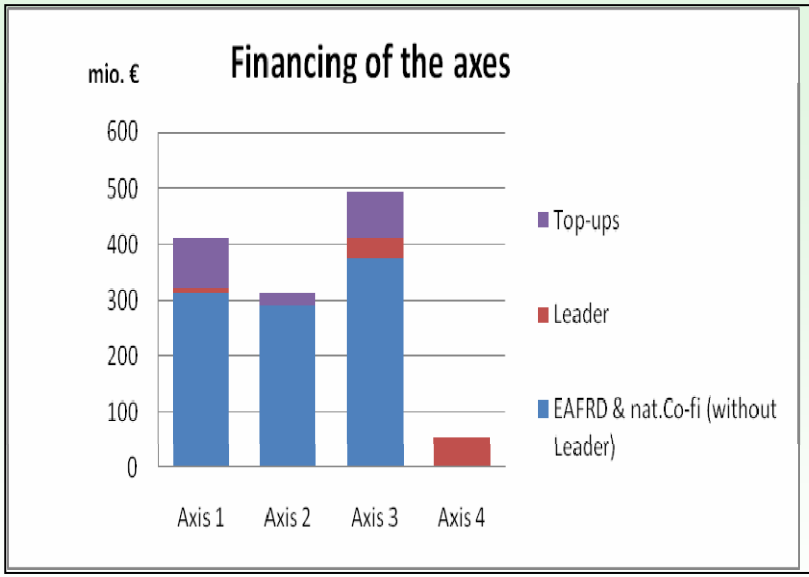
Furthermore:

- 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 €

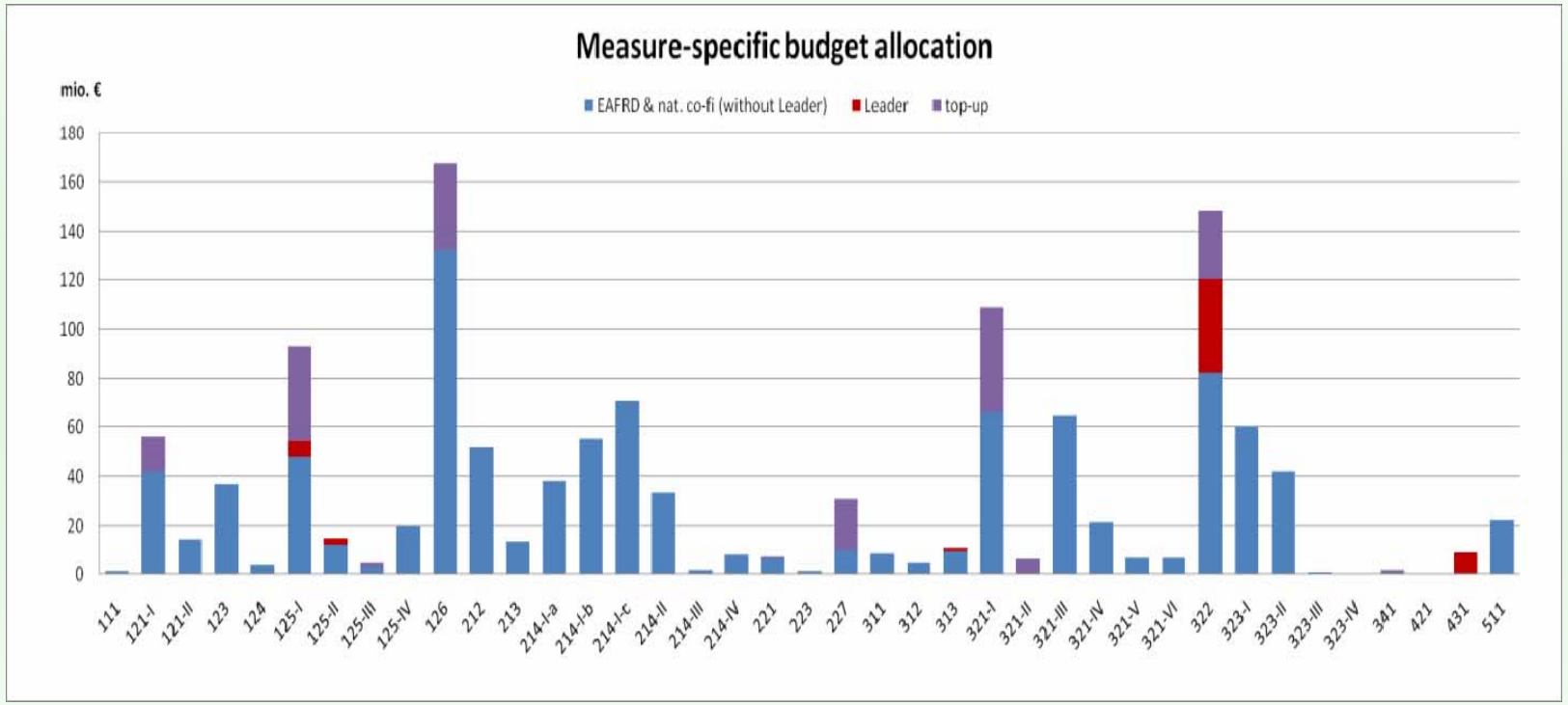
EAFRD funds	809,02 mio. €		
Fed. Co-fi	73,23 mio. €	Fed top-up	85,03 mio. €
Reg. Co-fi	114,79 mio. €	Reg top-up	105,46 mio. €
Com. Co-fi	55,09 mio. €		



Minimum contribution of EAFRD funds to the axes

Axis 1	234,81	>=	80,90
Axis 2	231,53	>=	202,25
Axis 3	280,70	>=	80,90
Axis 4	45,22	>=	40,45

4. Model Specification: Basline



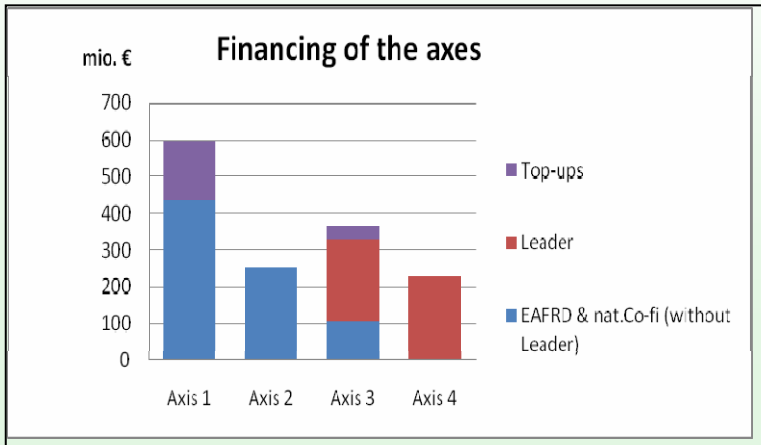
5. First results

$\alpha_1 = \alpha_2 = 0 \quad and \quad \alpha_3 = \alpha_4 = 0 \quad , \quad \beta = 100\%$

$\gamma_{A1} = \gamma_{A3} = 0{,}1 \quad and \quad \gamma_{A2} = 0{,}25 \quad and \quad \gamma_{A4} = 0{,}05$

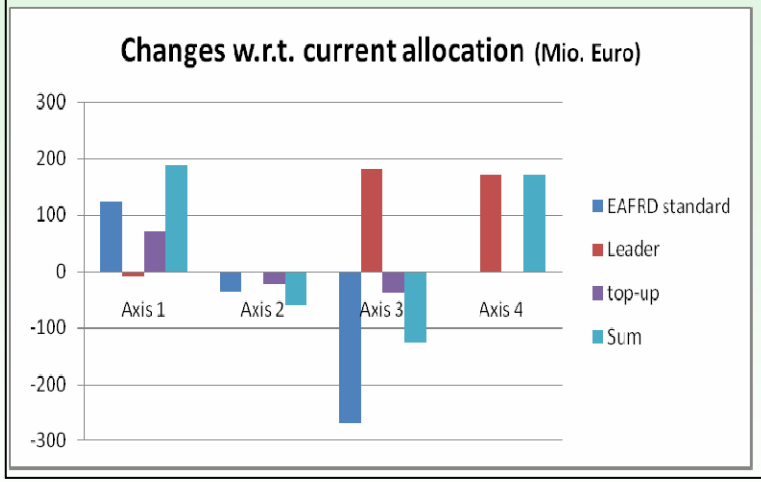
$\delta_{A1} = \delta_{A1} = 0{,}75 \quad and \quad \delta_{A2} = \delta_{A4} = 0{,}80$

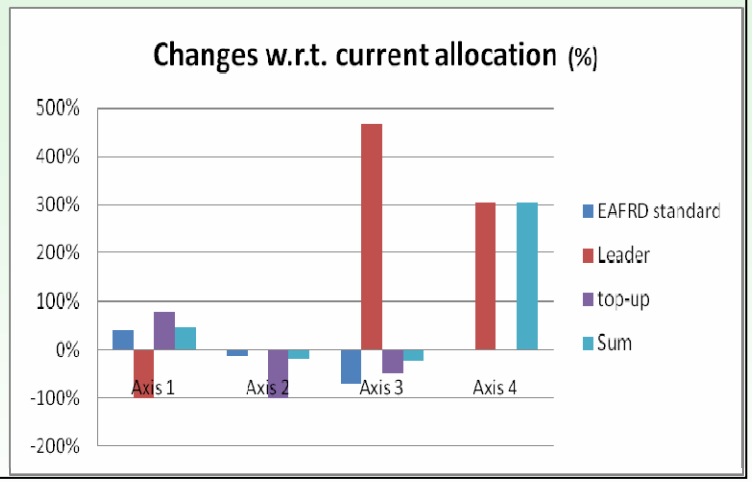
$b_1 = 809{,}017; b_2 = 158{,}257; b_3 = 220{,}366; b_4 = 55{,}085; b_5 = 3{,}509$



Minimum contribution of EAFRD funds to the axes

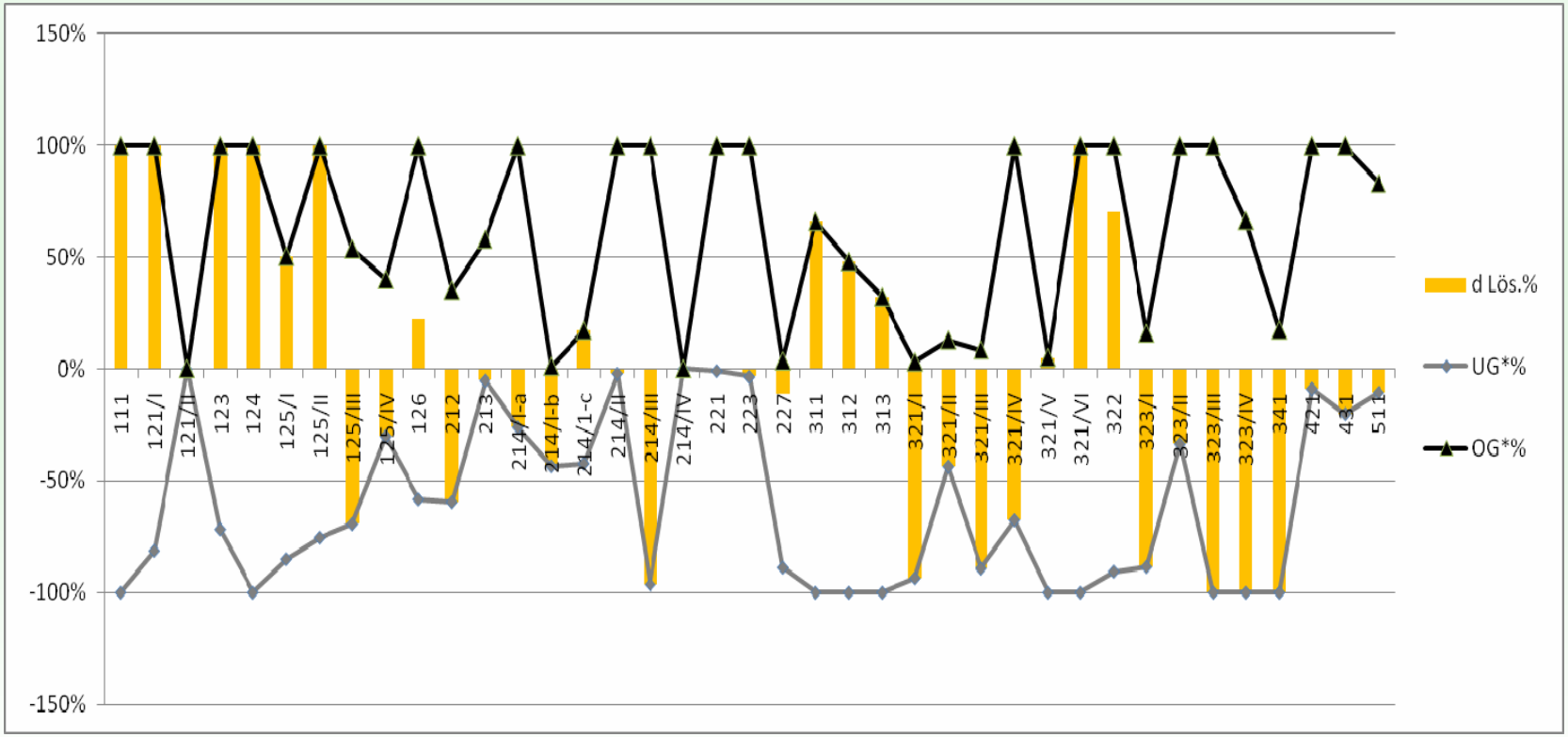
Axis 1	**334,18**	**>=**	**80,90**
Axis 2	**202,25**	**>=**	**202,25**
Axis 3	**80,90**	**>=**	**80,90**
Axis 4	**176,88**	**>=**	**40,45**



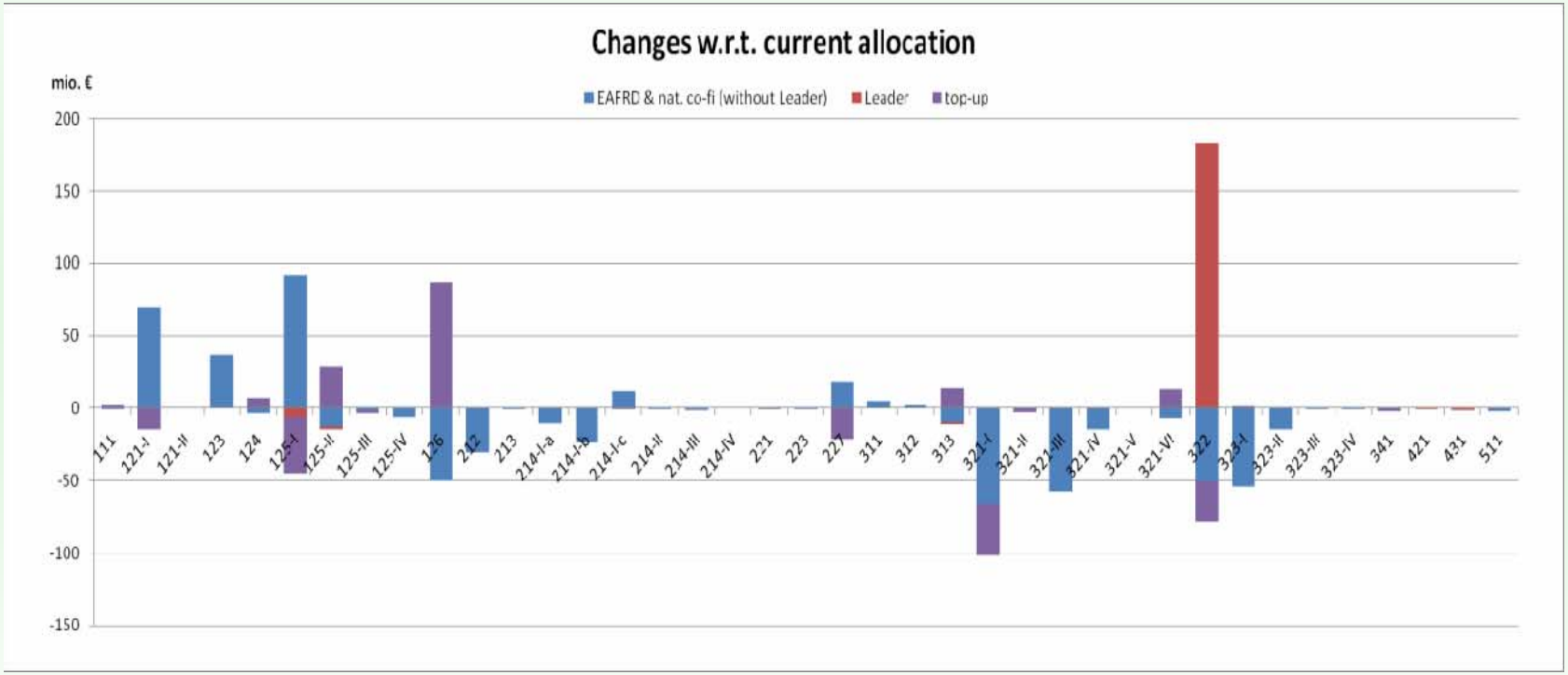


5. First results

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

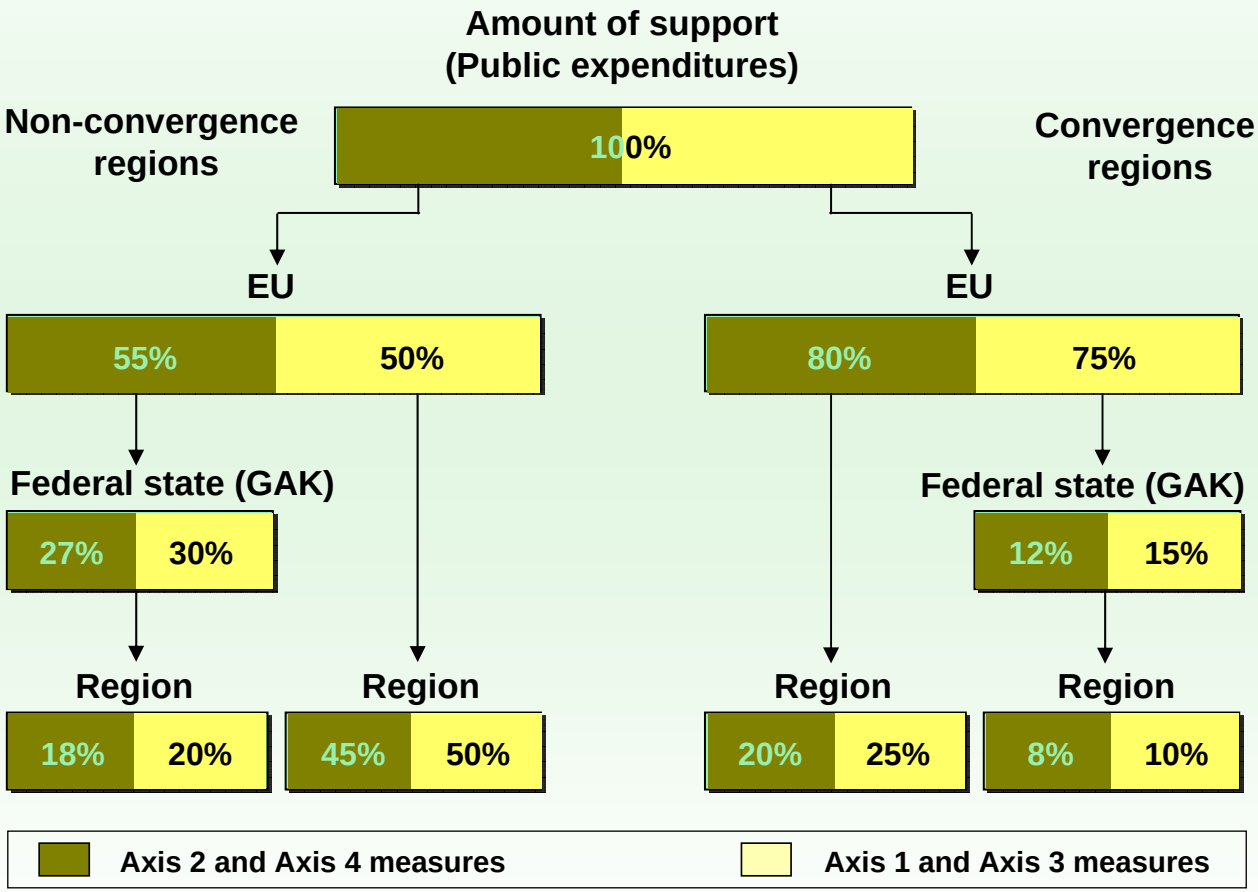
6. Concluding remarks and outlook

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