Distortions in a multi-level co-financing system: the case of the agri-environmental programme of Saxony-Anhalt

Verzerrungen durch Kofinanzierung: Das Beispiel des Agrarumweltprogramms Sachsen-Anhalts

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Abstract

In this paper we analyse the impact of the EU multi-level co-financing system on regional policy-making and priority setting taking the case of the agri-environmental programme of Saxony-Anhalt. The implications of several co-financing scenarios are analysed and compared to respective lump-sum transfers using an interactive linear programming approach. The results reveal how regional choices on agri-environmental measures are influenced by the co-financing system leading to distortions. The extent of these distortions depends on the specific regional preferences and restrictions.

Zusammenfassung

Der Beitrag untersucht den Einfluss der Kofinanzierung innerhalb des Mehrebenensystems der EU auf die regionale Politikgestaltung und Prioritätensetzung anhand des Agrarumweltprogramms Sachsen-Anhalts. Dazu wird ein interaktiver linearer Programmierungsansatz genutzt, mit dem verschiedene Szenarien der Kofinanzierung mit Szenarien verglichen werden, in denen dem Bundesland entsprechende Pauschalbeträge zur Verfügung stehen. Die Ergebnisse zeigen, dass die Entscheidungssituation durch das bestehende System der Kofinanzierung beeinflusst und verzerrt wird. Das Ausmaß der Verzerrung ist abhängig von den spezifischen regionalen Präferenzen und Restriktionen.

Key words

agri-environmental programmes; co-financing; federalism; interactive programming; policy-making

Schlüsselwörter

Agrarumweltprogramme; Kofinanzierung; Föderalismus; interaktive Programmierung; Politikgestaltung

1. Introduction

Within the European Union (EU), a multi-level co-financing system for structural, agricultural and rural development policies has been developed, sharing decision-making and financial responsibilities at different political levels (e.g. EU, Germany and German federal states "Länder") (MEHL and PLANKL, 2001: 173). From a regional perspective this system certainly provides incentives for a higher allocation of funds to specific policy areas. On the other hand regional policy-making may be distorted due to co-financing incentives.

The EU co-financing system has been criticised, in particular based on the economic theory of federalism (MEHL and PLANKL, 2001: 174; POSTLEP and DÖRING, 1996: 27). The criticism is mainly related to the violation of the principle of fiscal equivalence. This principle postulates that there has to be a congruence between those who benefit from measures and those who have to take the financial responsibility (OLSON, 1969: 483; LAASER and STEHN, 1996: 63). A violation of this principle can lead to oversupply as well as undersupply of goods or special services (RUDLOFF, 2002: 242; OLSON, 1986: 123). According to URFEI (1999: 237) and RUDLOFF (2002: 246) most of the agri-environmental programmes violate the principle of fiscal equivalence.

In this paper we discuss the implications of the EU multi-level co-financing system taking the budgeting for the agri-environmental programme in Saxony-Anhalt as a case study. We show how the volume and the allocation of funds for different agri-environmental measures is influenced by this system as compared to an undistorted lump-sum transfer scenario. The paper uses an interactive linear programming approach, which has originally been developed for a case study in Saxony-Anhalt (KIRSCHKE et al., 2004a und 2004b).

2. Regional policy-making in a multi-level system

2.1 The institutional framework

Agri-environmental programmes are funded by the EU since the McSharry Reform in 1992 and the regulations of the AGENDA 2000 strengthened the position of agri-environmental policies. When the case study for Saxony-Anhalt was carried out, the institutional framework of the agri-environmental programmes was defined by the "Council Regulation (EC) No 1257/1999 of 17 May 1999". As a consequence of the mid-term review of the AGENDA 2000, some adaptations were realised with the Luxembourg decisions ("Council Regulation (EC) No 1783/2003 of 29 September 2003").

In the period considered the EU contribution covered 75% of the expenditures for agri-environmental measures in "objective 1 regions" and 50% in the other regions. According to the Luxembourg decisions the financial contribution to agri-environmental measures has been raised to 85% in "objective 1 regions" and to 60% in other regions.

In the federal system in Germany the institutional framework for rural development additionally is subject to the "Joint Action for Improvement of Agrarian Structures and for Coast Preservation (Gemeinschaftsaufgabe Verbesserung der Agrarstruktur und des Küstenschutzes, GAK)". Within the framework of the GAK, federal grants are provided for measures which are based on the "Principles of market-oriented and locally adapted land cultivation (Markt-

und standortangepasste Landbewirtschaftung, MSL)". Federation and federal states share the funding of such measures at the ratio of 60% (federation) and 40% (federal state). Other measures, which are not part of the GAK, do not receive federal grants.

URFEI (1999: 140) characterised this mixed co-financing system of agri-environmental measures between EU, federation, and federal states as follows:

- The EU has a high financial responsibility and a low impact on the objectives.
- The federation has a strong impact on the objectives and a small share in total financing.
- The federal states have the biggest impact on the objectives, decision-making, and on the development of agri-environmental measures, while the financial responsibility is very small.

When the case study was carried out there were the following conditions in Saxony-Anhalt, which is an "objective 1" region: the EU covered 75%, the federation covered 15%, and Saxony-Anhalt covered 10% of the expenditures on MSL-measures. For the other measures the EU and the federal states shared the expenditures at the ratio of 75% and 25%. The structure of co-financing and the intergovernmental grants are of no direct importance for farmers taking part in agri-environmental programmes. However, there are important implications for the regional budget and regional policy-making as will be shown in the following chapters.

2.2 The linear programming approach

The following analysis is based on an interactive linear programming approach which was developed for supporting budgeting decisions about the agri-environmental programme of Saxony-Anhalt (KIRSCHKE et al., 2004a und 2004b). In order to decide about priorities and to determine budget allocations, relevant political measures need to be chosen, consensus about the most important objectives needs to be reached amongst stakeholders, the impact of measures on the objectives has to be assessed, and relevant restrictions for decision-making have to be considered.

This task can be tackled step by step in discussions with stakeholders and decision-makers using the method of interactive programming. KIRSCHKE and JECHLITSCHKA (2002, 2003) as well as JECHLITSCHKA, KIRSCHKE and SCHWARZ (2007) report how to implement a linear programming approach in MS-Excel© for formulating structural and agri-environmental programmes.

Under the assumption of constant marginal and average coefficients the following linear objective function can be defined:

$$(1) \quad Z_1 = \sum_{i=1}^{n} z_{1i} \cdot B_i$$

with:

Z_1	objective 1
Bi	budgetary expenses for measure i
i = 1, ..., n	Index of agri-environmental measures considered
z_{1i}	constant marginal and average coefficient of the objective function describing the impact of the budgetary expenses for measure i on objective 1.

For considering two objectives, an aggregated objective function can be formulated as follows:

$$(2) \quad Z = (1-\alpha) \cdot Z_1 + \alpha \cdot Z_2$$

with (1-α) and α being weighting factors and $0 \le \alpha \le 1$.

Hence, the programming approach can be formulated as follows:

$$(3) \quad \max_{B_1,\ldots,B_n} Z = (1-\alpha) \cdot \sum_{i=1}^{n} z_{1i} B_i + \alpha \cdot \sum_{i=1}^{n} z_{2i} B_i$$

$$\text{subject to:} \quad \sum_{i=1}^{n} a_{ri} \cdot B_i \begin{Bmatrix} \le \\ = \\ \ge \end{Bmatrix} b_r \quad \text{for r = 1, ..., m and}$$

$$B_i \ge 0 \text{ for i =1, ..., n}$$

where:

r = 1, ..., m	index of restrictions (equations or inequalities)
a_{ri}	coefficient of restriction r for measure i
b_r	right hand side of restriction r.

The idea of interactive programming is to develop and use such a linear programming model in a communication process using the knowledge and the assumptions of relevant actors. The aim is to support the decision-making process and to increase the transparency of underlying assumptions for the results. The approach also helps to facilitate the learning process of actors and policy makers, thus improving the basis for decision-making. The perspective is not to replace decision-making of actors and policy makers coming up with "an optimal policy" (GEURTS and JOLDERSMA, 2001; WALKER et al., 2001; MUNDA, 2004), but to support actors and policy-makers in an effective way.

The modelling approach, used for the calculations in this article, was applied to design the agri-environmental programme of Saxony-Anhalt for the financial period from 2004 to 2008. It has been developed and used in several workshops based on the assumptions of stakeholders and decision-makers in the region. In the following a brief outline of the specific model structure is given which is also illustrated in table 1.

Nine groups of measures have been used as activities in the modelling approach which consist of several single measures each. Thus, the modelling approach was used to consider the strategic situation on an aggregated level. The measures are defined as follows:

- general extensive grassland use (including all grassland of the farm) (M1);
- specific extensive grassland use (single grassland areas and sheep grazing) (M2);
- specific extensive grassland use (single grassland areas and cattle grazing) (M3);
- organic farming (M4).

These measures belong to the group called "Market-oriented and locally adapted land management" (MSL) (MLU, 2003). Another measure is:

- Environmental protective cultivation of special cultures (vegetables, medicinal and spice herbs, pip and stone fruit as well as vine and hop) (M5) (MLU, 2002a).

And finally, special nature conservation measures (VNS – "Vertragsnaturschutz") are considered (MLU, 2002b):

- management of grassland (M6);
- management of ancient orchards (M7);
- management of crop land (M8);
- management of set aside land (M9).

Two objectives have been defined: "Environmental Quality" and "Preservation of Agricultural Labour". In order to assess the coefficients of the objective function, questionnaires have been used in which the stakeholders have been asked to give their estimates on a scale between one (very low impact) and nine (very high impact). The results have been subject to discussion after which the slightly adjusted means of the estimates have been used as coefficients.

The following restrictions have been defined:

- Budget restrictions, like upper and lower bounds for the budget volumes for single measures (table 1, row 6 and 7). The upper bounds for M2 to M5 and M7 reflect the maximum possible budget for each measure, based on the information of decision-makers. For M1, M6, M8, and M9 upper bounds have been set arbitrarily at a high level in order to better identify possible trade-offs between measures.
- A restriction for the available regional budget of Saxony-Anhalt (table 1, row 8). The coefficients of this restriction vary according to the different levels of co-financing. Following the discussions on the workshops for the specific case of agri-environmental planning in Saxony-Anhalt, it was assumed that the amount of external co-financing funds is not limited and thus not binding in the model.
- An upper and a lower bound for the total area of grassland used by measures. The total bound is based on the available grassland area in Saxony-Anhalt; the lower bound takes into account the additional policy objective to support grassland (table 1, row 9 and 10).

Table 1 shows the input matrix of the reference situation. The tentative proposal for a budget allocation and starting-point for the discussions is displayed in row 2. The optimal allocation for $\alpha = 0{,}5$ (formula 3) resulting from the programming approach in the depicted basic situation is displayed in row 3. The upper bounds are binding for the measures M2, M4, M5, and M7, according to the restrictions in Saxony-Anhalt. Furthermore, M3 gets 10.57 Mio. Euro (€), M6 gets 15.51 Mio. €, and the measures M1, M8, and M9 are not financed at all. The upper bound for the regional budget of Saxony-Anhalt is set at 7.73 Mio. €, which is binding, as well as the upper bound for grassland.

3. Implications of the multi-level co-financing system

The budget allocation of the basic model described in the last chapter can now be defined as reference situation in order to analyse the consequences of varying assumptions and different co-financing scenarios. The budget allocation of the reference situation is displayed in figure 1.

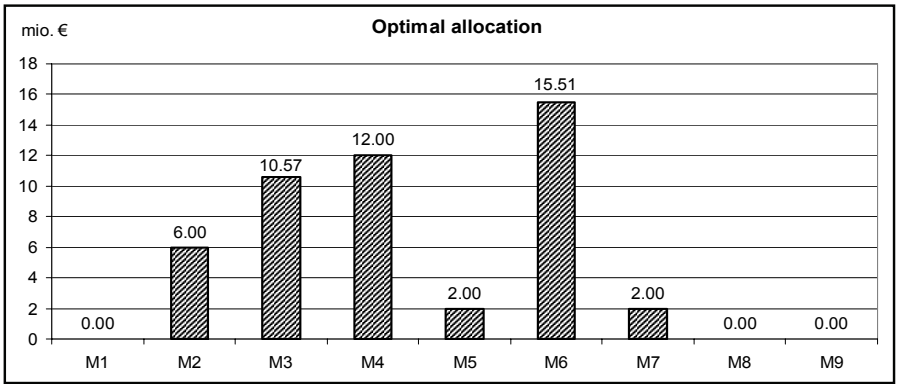
It is clear that the EU multi-level co-financing system extends the financial budget for the agri-environmental programme in Saxony-Anhalt. Figure 2 illustrates a budget allocation of the agri-environmental programme based on regional funds only. For this analysis the coefficients of the regional budget have been set to 1. The lower bound of grassland use has been reduced from 20,000 ha to 5,000 ha, because there is no feasible solution above a bound of 14,000 ha. Without any restriction for grassland use, organic farming (M4) would be the only financed measure. For rising levels of the lower bound of grassland use, however, M4 is increasingly substituted by M2, as this measure

Table 1. Input matrix of reference situation

		Ext.grassl. whole farm (M1)	Ext. grassl. sheep (M2)	Ext. grassl. cattle (M3)	Organic farming (M4)	Spec. crop cultivation (M5)	Environm. manag. grassl. (M6)	Manag. ancient orchards (M7)	Environm. manag. Cropland (M8)	Set aside land (M9)			
1.													
2.	Tentative allocation	23.0 mio. €				1.736 mio. €	20.0 mio. €						Tentative proposal for allocation 2004-2008 (mio. €)
3.	Optimal allocation (Reference situation)	0.000	6.000	10.573	12.000	2.000	15.507	2.000	0.000	0.000			mio. €
4.	Objective: Agr. labour	6.0	6.5	6.0	7.0	5.0	6.0	4.0	3.0	2.9			Objective coefficients for obj. 1 (weight: 0.5)
5.	Objective: Environm. quality	5.0	6.9	6.0	7.0	5.5	7.1	7.0	5.0	5.3			Objective coefficients for obj. 2 (weight: 0.5)
6.	Upper bounds	25.0	6.0	15.0	12.0	2.0	25.0	2.0	8.0	8.0			Upper bounds for single measures (mio. €)
7.	Lower bounds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			Lower bounds for single measures (mio. €)
8.	Regional budget	0.10	0.10	0.10	0.10	0.25	0.25	0.25	0.25	0.25	≤	7.734	Upper bound for regional budget (mio. €)
9.	Grassland upper bound	1785.7	1282.1	1538.5	303.0	0.0	800.0	0.0	0.0	0.0	≤	40000	Upper bound for grassland (ha)
10.	Grassland lower bound	1785.7	1282.1	1538.5	303.0	0.0	800.0	0.0	0.0	0.0	≥	20000	Lower bound for grassland (ha)

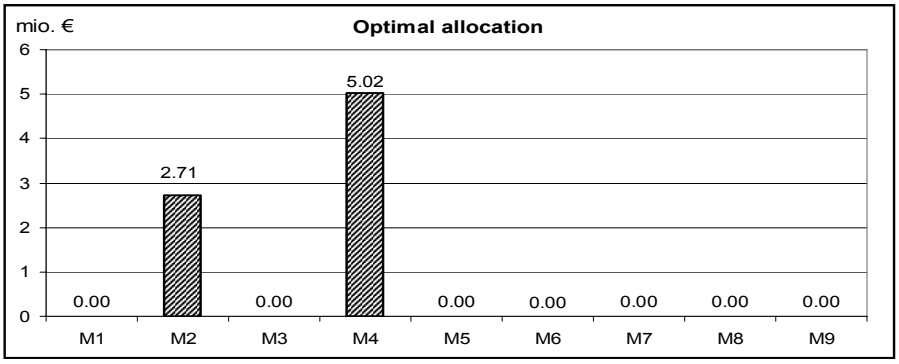
Source: own illustration and calculations

Figure 1. Budget allocation in reference situation



Source: own calculation

Figure 2. Budget allocation without co-financing



Source: own calculation

Table 2. Coefficients of the regional budget restriction after the Luxembourg decisions; scenario A – retaining "objective 1 status" and scenario B – loosing "objective 1 status"

	M1	M2	M3	M4	M5	M6	M7	M8	M9
Scenario A	0.060	0.060	0.060	0.060	0.150	0.150	0.150	0.150	0.150
Scenario B	0.160	0.160	0.160	0.160	0.400	0.400	0.400	0.400	0.400

Source: own calculations

Table 3. Budgetary resources in the scenarios and reference situation

	Regional budget	Transfer from EU	Transfer from federal budget	Overall available budget (sum)
Reference Situation	7.734 Mio. €	36.060 Mio. €	4.286 Mio. €	48.080 Mio. €
Scenario A	7.734 Mio. €	55.881 Mio. €	2.127 Mio. €	65.742 Mio. €
Scenario B	7.734 Mio. €	24.436 Mio. €	8.556 Mio. €	40.726 Mio. €
Scenario: Lump-sum	48.080 Mio. €	0.000 Mio. €	0.000 Mio. €	48.080 Mio. €

Source: own calculations

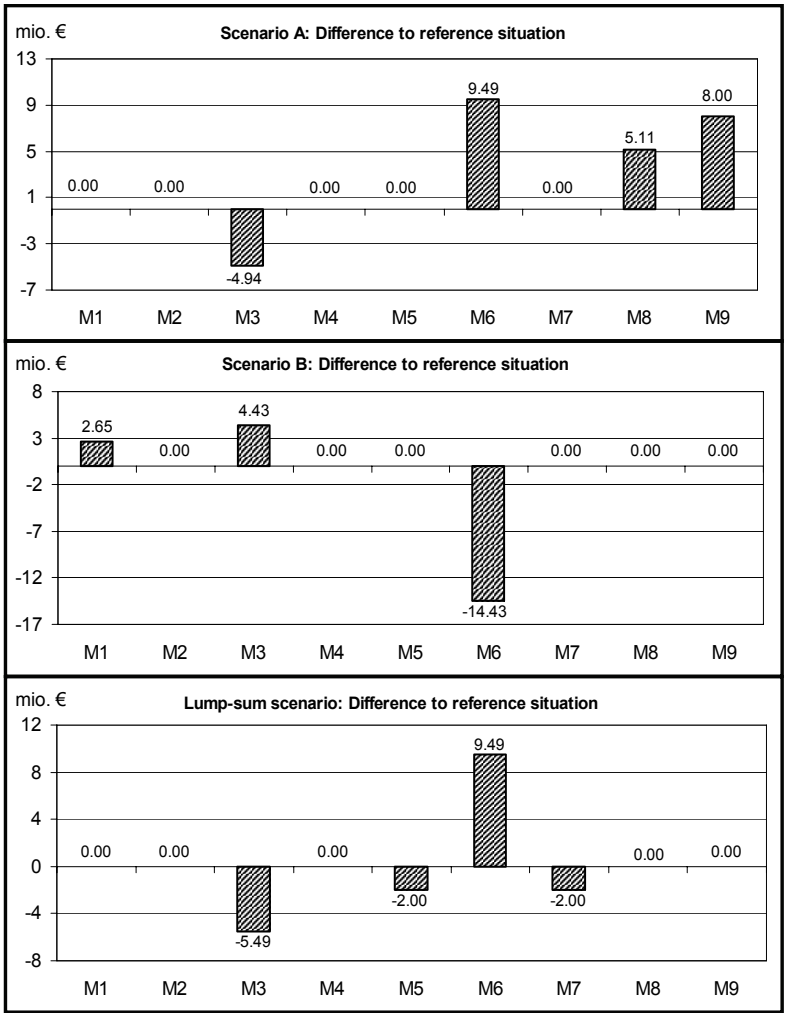
uses more grassland. At a lower bound of 5,000 ha grassland use, M2 receives 2.71 Mio. € and M4 receives 5.02 Mio. €. Hence, co-financing in the EU system not only increases the financing of agri-environmental measures, but leads to more measures being financed.

After the Luxembourg decisions new co-financing scenarios arise, as the Communitys' contribution to agri-environmental programmes was raised by 10%, i.e., to 85% in "objective 1 regions" and to 60% in the other regions. In the following, the consequences of this new level of co-financing for Saxony-Anhalt will be analysed in two different scenarios: in scenario A, Saxony-Anhalt keeps its status as an "objective 1 region", whereas in scenario B Saxony-Anhalt loses this status. Additionally, a lump-sum scenario is calculated assuming a situation in which Saxony-Anhalt receives the budget volume of the reference situation (48.08 Mio. €) as a lump-sum. For analysing the scenarios, the coefficients of the regional budget restriction have to be adjusted respectively. In the lump-sum scenario the coefficients of the regional budget are set to 1. The coefficients of scenario A and B are displayed in table 2.

In scenario A the EU co-financing share is 85%. The MSL measures are additionally co-financed from the federation by 60%; hence, only 6% of the total expenditures for M1 to M4 have to be covered from the regional budget. The higher level of co-financing in this scenario lowers the difference of external co-financing between MSL and other measures from 15 to 9 percentage points as compared to the reference situation (compare with table 1, row 8). For scenario B, the loss of "objective 1" status, the coefficients are calculated respectively. In this case, the difference of external co-financing between MSL and other measures rises from 15 to 24 percentage points. All other parameters remain unchanged in the scenarios and equal those of table 1. Figure 3 displays the resulting budget allocations. In addition, table 3 shows the use of resources.

In scenario A, the EU budget increases by 19.821 Mio. €, while the federal budget decreases by 2.159 Mio. € in comparison to the reference situation. The overall budget rises by 17.662 Mio. € to 65.742 Mio. €, while the regional budget remains constant at 7.734 Mio. €. Due to the higher level of EU co-financing after the Luxembourg decisions, the losses of external grants for each regional Euro going into other measures than to MSL measures are reduced. Hence, the opportunity costs for shifting money to VNS measures decrease. Therefore, 4.94 Mio. € from M3 go into the VNS measures M6, M8, and M9. The budget of M6, which has higher objective coefficients than M3 (table 1, row 4 and 5),

Figure 3. Difference of the budget allocation to the reference situation in the considered scenarios



Source: own calculations

is increased by 9.49 Mio. €. M8 now receives a budget of 5.11 Mio. € and M9 of 8 Mio. €, as the upper bound for grassland is binding and these measures do not use any grassland (table 1, row 9).

In scenario B, the overall budget decreases by 7.354 Mio. €, while the regional budget of Saxony-Anhalt again remains constant. This change of the amount of external funding results from a decrease of the EU budget by 11.624 Mio. € and an increase of the federal budget by 4.270 Mio. €. In comparison to the reference situation, the budget of M6 decreases by 14.430 Mio. €, while the budget of M3 increases by 4.430 Mio. € and the budget of M1 increases by 2.650 Mio. €. In this situation the importance of MSL measures rises, as the federation is co-financing 60% of the regional share for MSL measures. The previously financed M6 becomes too costly and is substituted by MSL measures even though these measures have lower objective coefficients (table 1, row 4 and 5).

As a result, Saxony-Anhalt is faced with two opposite strategic options arising for the case that the "objective 1" status is kept or lost after the decisions of Luxembourg. If the federal state retains "objective 1" status, VNS measures would gain priority. If the "objective 1" status is lost, MSL measures would be strengthened diminishing the decline of external EU co-financing.

In the lump-sum scenario, there are only four measures in the optimal solution of the programming approach - M2, M3, M4 and M6. Compared to the reference situation, the budget of M3 is reduced by 5.49 Mio. €, the budgets of M5 and M7 are reduced to zero, while the budget of M6 is increased by 9.49 Mio. €. The result indicates that in the absence of any co-financing scheme M6 would receive the highest priority as compared to the measures M3, M5 and M7.

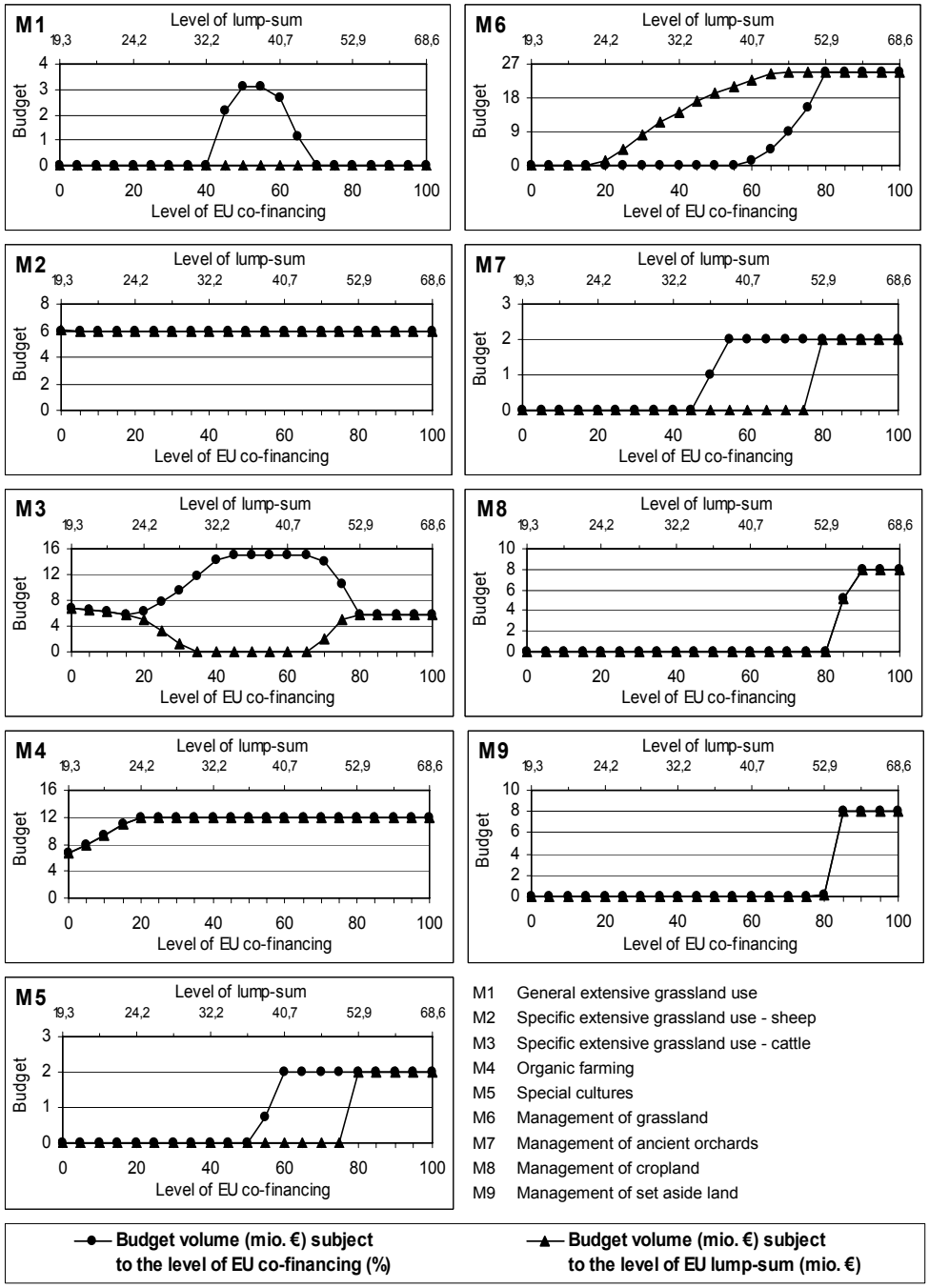
4. Multi-level co-financing distortions

It has been shown in the last chapter that a multi-level co-financing scheme has a strong impact on the regional budget allocation. In order to examine the relationship between the co-financing level and the budget allocation more closely, a parameterisation of the EU co-financing level is carried out comparing the results with the budget allocations of a respective lump-sum scenario with the same total budget volume. This comparison allows to assess the distortions of the current multi-level co-financing system. For this purpose, we parameterise the level of EU co-financing between 0% and 100%. We proceed by gradually changing the coefficients of the regional budget (table 1, row 8) in steps between 0 and 1 for M5 and VNS measures. Respectively, the coefficients are changed between 0 and 0,4 for MSL measures, corresponding to a co-financing level from the EU between 0% and 100%. For each level of EU co-financing a lump-sum scenario is calculated with an equivalent overall budget. In the lump-sum scenarios the coefficients of the regional budget are set to 1.

Figure 4 displays the resulting budgets at every EU co-financing level and for the respective lump-sum scenario. The figure shows that there is no difference in the budget volumes for the measures M2, M4, M8, and M9 between the co-financing and the lump-sum scenario. M2 receives the budget volume of the upper bound (6 Mio. €) at any level of EU co-financing and the respective lump-sum. M4 does not reach the upper bound at lower levels of EU co-financing and the lump-sum scenario, due to the lower bound for grassland use of 20,000 ha (compare with the results of figure 2). Above a 20% EU co-financing level and the respective lump-sum financial volume, M4 is fully financed at the upper bound. The reasons for the high priority of M2 and M4 in both scenarios are the high objective coefficients.

Despite the lowest objective coefficients, M8 and M9 are financed at high levels of EU co-financing and the respective lump-sum scenario. These measures are the only ones not using any grassland; hence, above about 80% of EU co-financing and the respective lump-sum volume they receive the additional financial volume, as the upper bound for grassland is binding.

Figure 4. Parameterisation of EU co-financing and lump-sum



Source: own calculations

For the measures M1, M3, M5, M6, and M7 there is a difference in funding between the co-financing and the lump-sum scenarios. M5 and M7 are not financed for lower budget volumes in both scenarios. They switch to the upper bound above about 50% EU co-financing level, whereas the same switch occurs under lump-sum scenarios only at higher financial volumes. The figure shows a similar picture for M6. Therefore, for these measures the multi-level co-financing system increases the incentives at lower budgets. With respect to M1 and M3 these measures would not be financed at all (M1) or at lower levels (M3) under the lump-sum scenarios, whereas they receive a considerable priority under the co-financing scenarios for specific co-financing levels. M1, thus, receives a budget between about 40% and 70% of EU co-financing. For M3, from a EU co-financing level from about 20% to 80%, the budget is raised to the upper bound of 15 Mio. €.

In order to analyse the interrelations between the measures more closely, figure 5 illustrates the parameterisation of the EU co-financing level and of the corresponding lump-sum scenario of selected measures within one diagram. M2, M4, M8, and M9 are not displayed in this figure, as there is no difference in the budgets measures between the co-financing and the lump-sum scenario. The budgets of the remaining five measures are represented in per cent of the respective upper bounds.

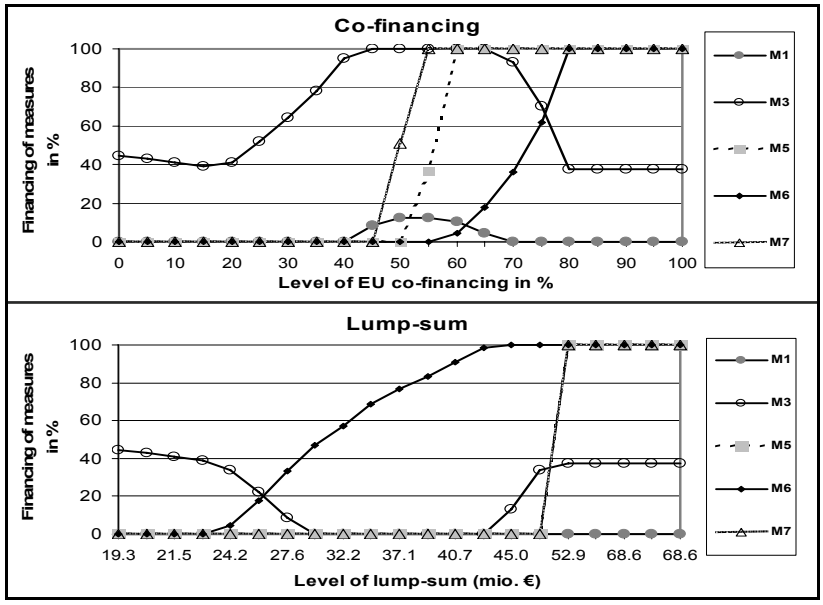
For the co-financing scenario, the figure shows a clear trade-off between the VNS measure M6 on the one hand and the MSL measures M1 and M3 on the other hand in the range of about 55% to 80% of EU co-financing level. Starting from a 55% EU co-financing level, with increasing external funding M3 is substituted by M6. For M5 and M7 there is no trade-off with respect to the other measures and between the measures themselves and the picture is more simple. As discussed for figure 4, these measures switch from zero to a 100% financing level at around 50% EU co-financing.

The results of the lump-sum parameterisation also show a clear trade-off between M6 and M3 but this trade-off already occurs at lower financial volumes. M6 starts to be financed with a total financial budget of about 22 Mio. € and above. When the measure reaches its upper bound at a total financial volume of about 45 Mio. €, M3 starts to be financed again and M5 and M7 are financed as well.

In order to analyse to what extent the multi-level co-financing system distorts the financing of measures as compared to an equivalent lump-sum scenario, figure 6 displays the values of the objective function for both scenarios at different co-financing levels and lump-sum financial volumes respectively.

As can be seen in figure 6, the values of the objective function are lower under the co-financing scenario than under

Figure 5. Trade-off between measures

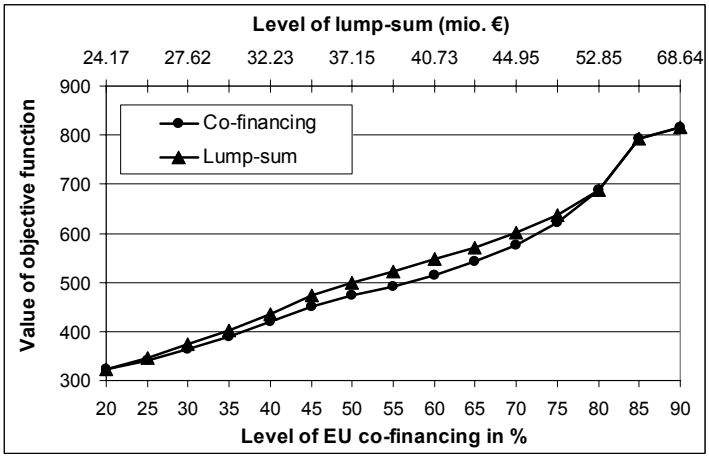


Source: own calculations

the lump-sum scenario in the interval between about 20% and 80% of EU co-financing. At low and at high levels of external grants there is no difference in the budget allocation between the lump-sum and the co-financing scenarios, as the bias in favour to MSL measures is only relevant within the range between about 20% and 80% EU co-financing. At high EU co-financing levels the difference in co-financing between MSL and VNS measures becomes so small, that there is no distortion under the co-financing scenario. At low financial volumes, the lower bound for grassland causes the same choice of measures for both scenarios; and there is no distortion in the multi-level co-financing system.

The findings show that budget allocation and priority setting for the agri-environmental programme in Saxony-Anhalt would be different and would lead to higher "objective achievement", if Saxony-Anhalt received federal and EU grants as a lump-sum. In the case study considered, the difference in the values of the objective function between the EU co-financing system and the lump-sum scenarios would amount to up to 6% for an EU co-financing level of 60%. Hence, the objective achievement could be increased by this amount in an undistorted financing system. This is considerable, but not as high as might have been expected. This is mainly due to the specific restrictions in the case study, like the upper bounds and grassland restrictions, and the objective coefficients assumed.

Figure 6. Values of the objective function



Source: own calculations

5. Conclusions

The influence of different mixed co-financing schemes on regional policy-making has been considered exemplarily using the results of an interactive programming approach for the case of designing the agri-environmental programme of Saxony-Anhalt. The implications of co-financing have been discussed for several policy scenarios.

First, the current EU co-financing system for agri-environmental programmes certainly provides an extended financial budget for these programmes.

Second, the mixed co-financing changes priority setting and the allocation of funds between measures. It is obvious that a region can maximise benefits from external grants by shifting money into measures with higher external co-financing levels. Furthermore, the results draw a more detailed picture showing that the impact of mixed co-financing in the German system on regional policy-making will decline when the EU co-financing level is increased, due to a reduced difference of the external co-financing level between measures. Respectively, the impact increases when the EU co-financing level is reduced. For the case of Saxony-Anhalt two opposite strategic options were discussed. If the "objective 1" status is lost, MSL measures gain a higher priority. If on the other hand Saxony-Anhalt retains the "objective 1" status, VNS measures gain a higher priority due to an increased co-financing level.

Third, if Saxony-Anhalt receives EU and federal grants as a lump-sum, giving the chance of undistorted policy decision-making, the values of the objective function are higher in all scenarios than with co-financing.

It can be assumed that local actors have a good knowledge about the impact of agri-environmental measures in a region and also better represent local preferences for the provision of public goods than upper political levels. Therefore, the lump-sum scenario shows a best and undistorted allocation of funds from a regional point of view. The results are congruent with the principle of "fiscal equivalence" and the demand for extended and unbiased local responsibility (OSTERBURG and STRATMANN, 2002: 276). The case study of the agri-environmental programme of Saxony-Anhalt underlines the general problem of decision-making and co-financing in a multi-level political system (OATES, 1999: 1122).

The model used for the case study in Saxony-Anhalt reflects the specific conditions and constraints of this region. The strength of the interactive programming

approach is to support decision-making in a straightforward and transparent way, using knowledge and assumptions of actors and decision-makers. The approach could be adjusted and extended for other case studies according to the needs of relevant decision-makers.

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