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DECOUPLING IS NOT EQUAL TO DECOUPLING: STRUCTURAL, INCOME AND EFFICIENCY EFFECTS OF DIFFERENT WAYS TO DECOUPLE DIRECT PAYMENTS

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1 Introduction

Enhancing the competitiveness of agriculture is a central goal of the new Common Agricultural Policy (EU COMMISSION, 2003). To achieve this goal, decoupling of direct payments has been a key element of the CAP next to further price cuts. Decoupled direct payments are to give the farms greater flexibility and to increase their market orientation. Ever since decoupling has been brought into the discussion in the mid-term review of Agenda 2000, it has been the predominant topic in European agriculture. In its January 2003 proposal, the European Commission (EU COMMISSION, 2002) proposed member states to introduce an individual single farm payment based on historical reference payments. Alternatively, member states could opt for regionalised single area payments. However, the final decision taken by the Agricultural Council in June 2003 offered greater choice to individual member states as for specific provisions to decouple direct payments. In particular, the option to decouple only in parts was introduced in combination with the two schemes of the January 2003 proposal. In principal, three general ways of decoupling direct payments have been decided upon. Although all three alternatives are named 'decoupled', the direction of effects is expected to differ substantially, as the discussion on decoupling in Germany has shown. Particularly unclear is the impact of decoupling policies on agricultural structures and structural change.

This paper shall shed some light on these issues. The objective is to work out some fundamental dynamic effects on agricultural structure, production, factor prices, farm incomes, and production efficiency that result from a switch to further decoupled income payment schemes and related detailed regulations. The analysis is carried out using the agent-based model AgriPoliS (**Agri**cultural **Poli**cy **S**imulator) which is a normative spatial and dynamic model of agricultural structures. The model explicitly takes account of actions and interactions (e.g. rental activities, investments, and continuation of farming) of a large number of individually acting farm-agents. Accordingly, AgriPoliS allows endogenizing structural change and it is particularly suited to analyse structural, allocative, and distributive effects of policy changes on the agricultural structure of a small region. Here, we apply the model to the region Hohenlohe, a region characterised by small-scale farming in southwest Germany.

2 Methods and Techniques

In AgriPoliS, farms are modelled as agents, which are entities that act individually by sensing parts of their environment and responding upon it (cf. FERBER, 1999, HAPPE, 2004, BERGER, 2001, BALMANN, 1995 and 1997). The agricultural region modelled in AgriPoliS is interpreted as a GIS-like grid of cells with a fixed size.

The cells represent agricultural land which is either grassland or arable land. On some of the cells, farmsteads are located. They are marked with an X. The total land of a farm consists of both own and rented land. All cells belonging to one farm have the same colour; if the land is owned by a farm, the cell is surrounded by a box.

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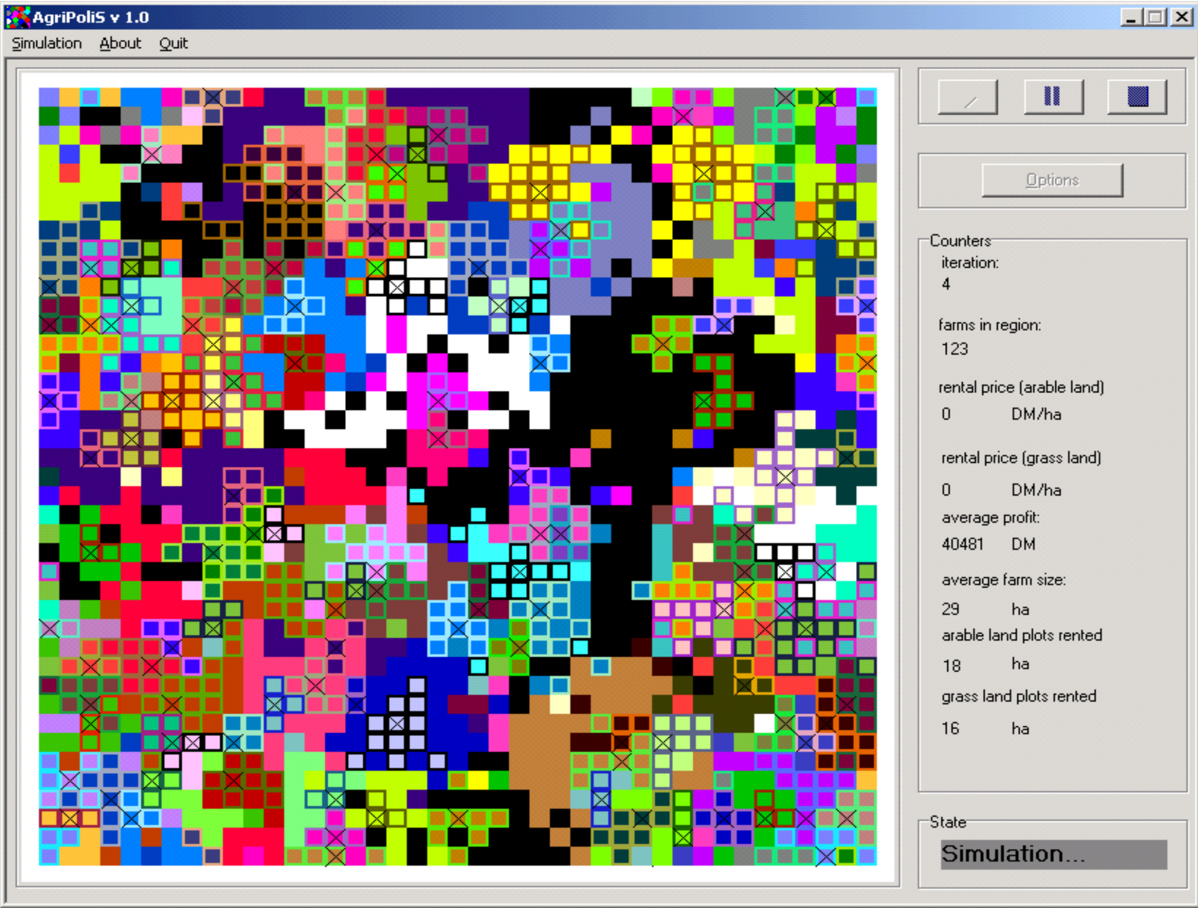
We assume that each farm maximises its household income. To adapt the model to the Hohenlohe region we defined a number of production activities. The chosen 13 activities (pig fattening, pig breeding, turkeys, dairy cows, beef cattle, suckler cows, cereals, sugar beet, rape seed, and permanent grassland) are typical for the region. For production, farms can choose between 29 investment options of different types (buildings, machinery, facilities) and capacities. The latter allows to implement economies of size, i.e. with increasing size, the costs per unit of production capacity decrease and labour is assumed to be used more effectively. Farms can rent land, production quotas, and manure disposal rights. Labour can be hired on a fixed or per-hour basis, vice versa farm family labour can be offered outside the farm. To finance farm activity farms can take up long-term and short-term credits. Liquid assets not used on-farm can be saved. Farms quit if they are illiquid or if opportunity costs of factors owned by the farmer are not covered.

Figure 1: AgriPoliS - graphical user interface



Production and investment decisions are made simultaneously on the basis of a single-period mixed-integer programme. Farm decision making can be called myopic. Regarding output prices, farms follow adaptive expectations. Farms anticipate the impact of policy changes one period in advance and included into the decision making process. If a policy change is expected to cause severe structural effects on key variables (e.g. lower land value due to fully decoupled direct payments) then expectations about the respective variables (e.g. rental prices) are given exogenously. Prices of livestock and cereals underlie a downward trend, prices of variable labour and agri-services are assumed to show a slow, but steady increase. Other prices remain constant.

New investments affect production capacities for the operating lifetime of the investment. Investment outlays are assumed to be totally sunk. Farms are handed over to the next generation every 25th period. For this decision, opportunity costs of farm family labour to increase by 25 %. Accordingly, continuation of farming can be interpreted as an investment decision into either agricultural or non-agricultural training. And finally, farms are differentiated by their management ability. For this we randomly assign each farm a management factor which represents the spread of profitability and compatibility of model farms.

At start-up, the locations of farmsteads as well as the farms' initial endowment with production factors (family labour, machinery, buildings, production facilities, land, production quota, liquid assets, and borrowed capital) are specified. During the following periods these variables are changed as a result of production, rent, and investment activities. Even though farms do not directly interact with each other, they are connected indirectly via factor and product markets.

The land market takes a central position, as farms cannot grow independently of land. Since in Germany the predominant form of farm growth is by renting land, we only consider a land rental market. On this market, land is available either because farms quit the sector or because unprofitable land is let for rent. Each period, free plots are leased to the farms in an iterative auction. For this, each farm determines the plot it wishes to lease and determines a bid depending on the shadow price for land, the number of adjacent farm plots and the distance-dependent transport costs between the farmstead and the plot.[1] The number of adjacent plots and the bid are positively correlated because we assume that economies of size in crop production can be realised with larger field sizes and larger machinery. To reflect other costs associated with renting land such as taxes, administrative costs, labour costs and fees as well as the additional rent of the farm agent from renting a plot, the actual bid made by the farm is reduced by 15 %. Finally, the bids of all farms are compared and the farm with the highest bid receives the respective plot. This process continues until all land is leased or all bids are zero. The renting process alternates between arable land and grassland. Each period the rent paid for a plot is adjusted towards the average rent paid for newly leased plots. This is done to avoid large fluctuations of rents between periods and to take account of trends.

The technological environment is given by technologies of different vintages and technological standards. Over time, technology is assumed to underlie a constant technological progress created in the up-stream sector, but not on the farms themselves. Farm agents are assumed to benefit from technological progress by way of realising additional production cost savings between 1 and 1.5 % when adapting new technologies. The political environment represents the third building block of a farm agent's external environment besides space and technology. Moreover, technologically more advanced investments are considered to have lower labour requirements relative to smaller investments.

3 Model Calibration and Empirical Data Base[2]

To calibrate AgriPoliS to the Hohenlohe region we represent the agricultural structure in the reference year 2000/2001 based on typical farms, i.e., farms one could typically find in the region. SAHRBACHER (2003) developed a procedure, based on BALMANN, LOTZE and NOLEPPA (1998), to simultaneously select typical farms and scale them up to represent a range of regional capacities. The approach identifies typical farms of different types and sizes, on the one hand. On the other, it generates a scaling factor for each typical farm selected. This factor denotes the number of times a typical farm has to be located in the region such that the agricultural structure of the region is represented best.

1 As shadow prices for land can possibly increase with land endowment, it would be reasonable to bid for more than one plot at a time. This poses computational difficulties, though. Therefore, in addition to the shadow price for only one plot we calculate the average shadow price for renting 8 plots at a time, and take the maximum of both as the basis for the rent offer.

2 A detailed description of the upscaling procedure and underlying data is given in HAPPE (2004), SAHRBACHER (2003) and KLEINGARN (2002).

This particular approach requires two kinds of data: first, data about the region representing aggregate regional capacities, and, second, data about farm organisation as well as economic indicators of individual farms in the region from which to select typical farms. Regarding the first requirement, regional statistical data sources were available (e.g. STATISTISCHES LANDESAMT BADEN-WÜRTTEMBERG, 2003). As for individual farm data, farm accountancy data (as collected in the German Testbetriebsnetz) compiling information about farm organisation and economic indicators, provided a suitable data source. Although farms in the farm accountancy data sample are not representative, the sample nevertheless covers the most important farm types in the region. For Hohenlohe, farm accountancy data from 101 full-time and 20 part-time farms were available in the reference year 2000/2001. Considering that about 50 % of all farms in the region are part-time farms, they are underrepresented in the accountancy data sample. Because of this, data from 20 part-time farms from regions similar to Hohenlohe were added to the farm sample to provide as suitable basis for representing non-professional farms.

Applying the mentioned up-scaling procedure to the farm data sample resulted in the identification of 24 typical farms for 2000/2001 (Table A-4). Of these, 19 farms operate as full-time, and five as part-time farms. The scaling factor is given in the last row. The selected farms match the characteristics of agriculture in Hohenlohe quite well. In most cases, deviation is below 5 %.[3] For instance, the selected typical full-time farms weighted by the weighting factors manage 57,350 ha land, in reality it is 57,464 ha. The deviation between the adapted model and real regional statistics is largest for specialised crop farms and farms with less than 10 hectares. The reason is that very small farms are underrepresented in the underlying accountancy data sample. Larger differences exist only when smaller farm sizes and livestock capacities are concerned. On the one hand, this is because of a sample error in the German farm accountancy data sample in which particularly small farms are underrepresented in the sample. Thus, it is particularly difficult to represent the many small non-professional farms. Furthermore, these small farms are predominantly specialised crop farms. This explains the deviation with regard to this farm type. Data on prices, production costs, and technical coefficients are taken from standardised data collections which were published by various German government agencies and organisations (e.g. KTBL, Bayerisches Staatsministerium für Landwirtschaft und Forsten). In a final step, the 2800 model farms which are based on the different farming systems are further individualised with respect to the age and kind of buildings, facilities, machinery, and farm location.

4 Scenarios

The following simulations illustrate possible effects of several decoupled payment schemes on the agricultural structure of Hohenlohe. The full implementation of Agenda 2000 by the end of 2002 is taken as the reference scenario to which AgriPoliS is calibrated. Table 1 lists the alternative policy scenarios. All alternative scenarios describe different ways of decoupling direct payments. In principle, the scenarios considered reflect the three basic decoupling variants possible under the new CAP, although specificalities, such as the German "Kombimodell" are not considered. Each policy scenario is simulated for 25 time periods. During the first four simulation periods, the reference policy 'Agenda 2000' sets the political framework condition, before a policy change to one of the decoupled policies sets in. Although there are altogether 2800 in the region (see previous section), it proves to be technically very demanding to analyse data from 2800 farms simulated over 25 periods. We therefore simulate a fraction of 20 % of the full region. This means that 572 farms are initialised and simulated. In all alternative scenarios we assume that all land belonging to a farm has to be managed at least in a very basic way (cutting once).

[3] Due to space restrictions, the respective table is not shown here. It can be found, however, in HAPPE (2004).

Table 1: Policy scenarios

REF	Agenda 2000	Full implementation of Agenda 2000 in 2002
DECOUPREG50	Fully decoupled single farm payment + low area payment	Each farm household receives an individual decoupled payment based on a historical reference payment. Decoupled payment is granted independent of farming, i.e. it is also paid if a farm leaves the sector. Total payment is split into single farm payment part and area payment part. Decoupled payments are set to 84 % of the decoupled payment in scenario DECOUP.[1)] Low area payment of 50 €/ha that is granted if the plot is cultivated.
REGPREM	Regional single area payment (310 €/ha)	Calculated based on average total payments granted to all farms over the last three time periods before the policy change in the region. Farms can only claim the payment for plots they cultivate. Farms are required to cultivate plots belonging to the farm in a basic way (cutting grass). For land that is not cultivated or abandoned no payment can be claimed.
PARTIAL	Partly decoupled payment	50 % of the total amount of direct payments granted to farms in the reference period remains coupled. The remaining 50 % are decoupled as an individual single farm payment. Payments is split into payment entitlements per hectare which are assumed to be transferred with the plot.[2)]
1) It is equal to the historical reference payment minus 50 €/ha of average UAA before the policy change. 2) It is assumed that all farmed land is eligible for payment.		

5 Results

Figure 2: Average farm size and average sales revenue

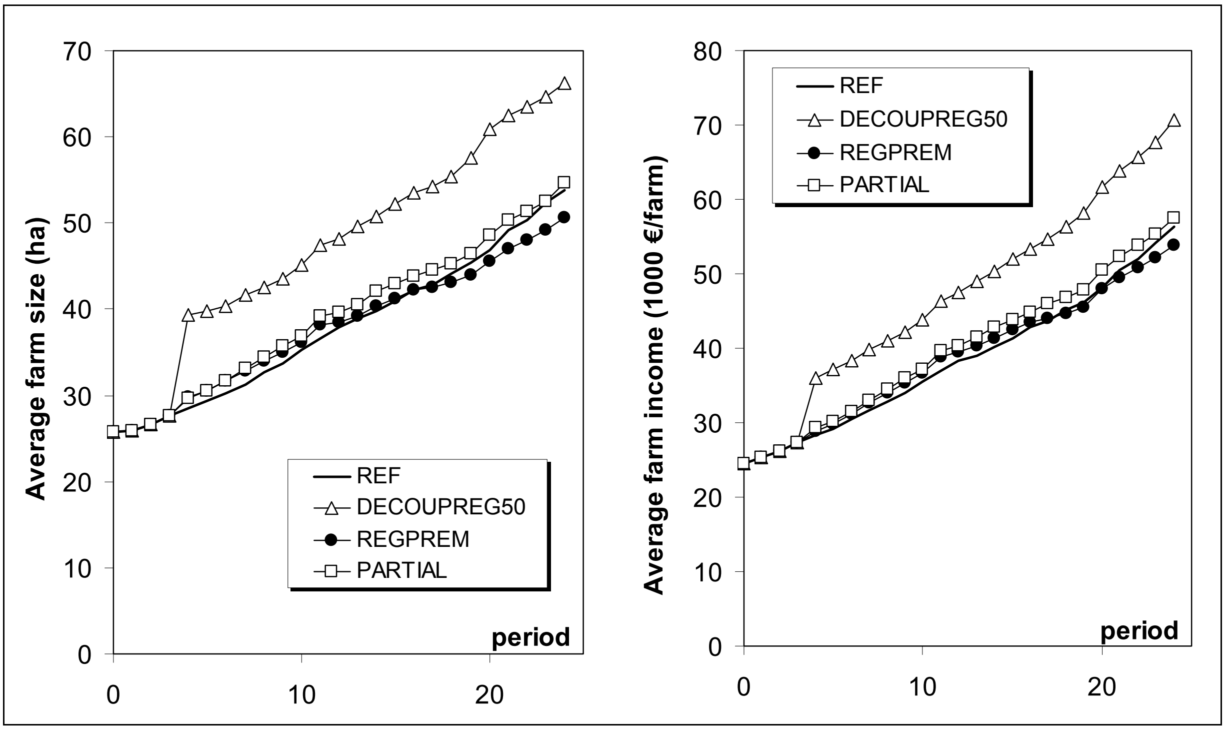
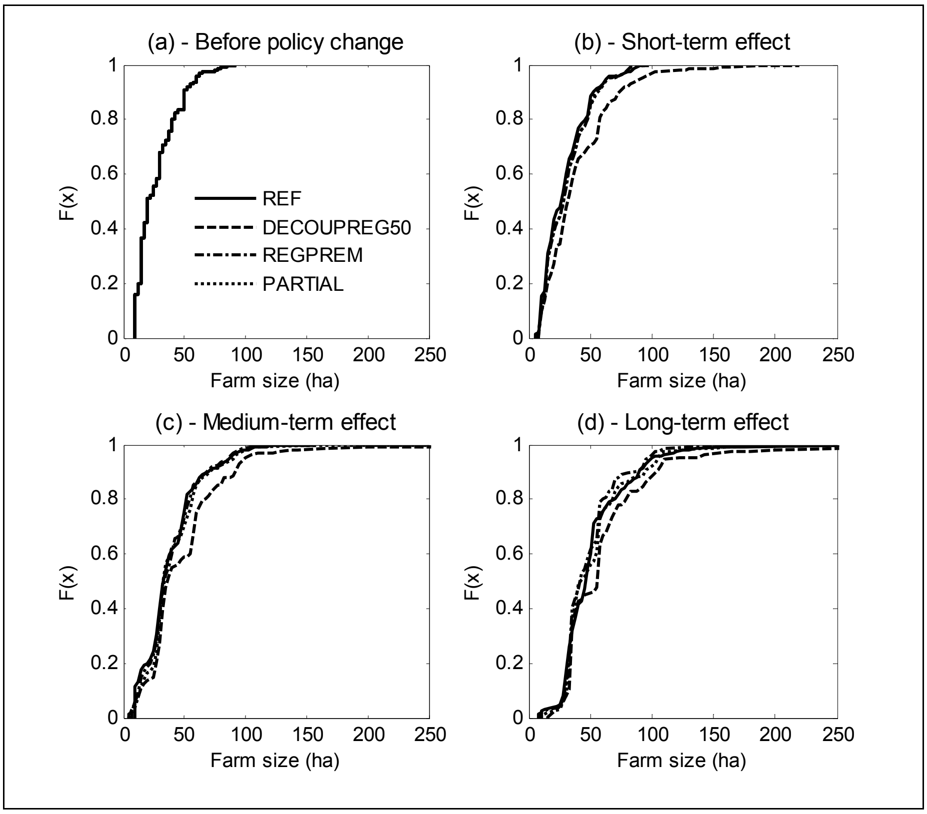


Figure 2 (a) and (b) show the development over time of the average farm size and of average sales revenues in the region. The figures give an impression about the speed of structural change under the defined policy conditions. As the figures show, structural change takes place in all policy scenarios, but a significant shift right after the policy change can only be observed where direct payments are fully decoupled from production and land.

Figure 3, which shows the cumulative distribution of farm size at four points in time, underlines this. It shows that the share of farms above 50 hectares of farmland is persistently higher in scenario DECOUPREG50. However, with the exception of scenario REGPREM, the gap between scenarios closes over time. This means that structural change under Agenda 2000 would have led to a similar farm size distribution in the long run. On the other hand, coupling the payments to farmed land even slows down structural change as compared to the reference scenario.

Figure 3: Empirical cumulative distribution of farm size at four points in time



Going back to Figure 2, it also shows a certain difference between policy scenarios with respect to the way in which farms grow. Comparing the reference scenario and scenario DECOUPREG50 shows that farm acreage grows quicker than farm revenues. This means that over time production becomes less intensive.[4] In the decoupled scenarios, production is more intensive as both, revenue and farm size, grow at similar pace. However, in these scenarios, fully decoupled direct payments are not the only reason for a more pronounced farm size and revenue growth. Many smaller farms take the fully decoupled payments with a continuation of payments as a chance to quit production altogether. This changes the composition of the farm sample and therefore creates a sample effect.

As it was indicated before, agricultural policies do not only affect the farm structure of a region but also the production structure. Table 2 illustrates how selected production activities change after a policy change. Compared to the reference scenario, suckler cow production ceases immediately after the introduction of payments which are decoupled from livestock production.[5] Dairy production also shows a steady decrease which is more or less independent of the prevailing policy environment. Dairy farms do not re-invest in dairy production or quit farming altogether. Intensive livestock production is more dependent on the policy environ-

4 Extensification is also the result of a slight decrease (less than 1 % p.a.) of some product prices over time.

5 With respect to suckler cows one needs to be careful because profitability strongly depends on the way they are marketed. It is therefore difficult to correctly model suckler cow production in a linear programming model.

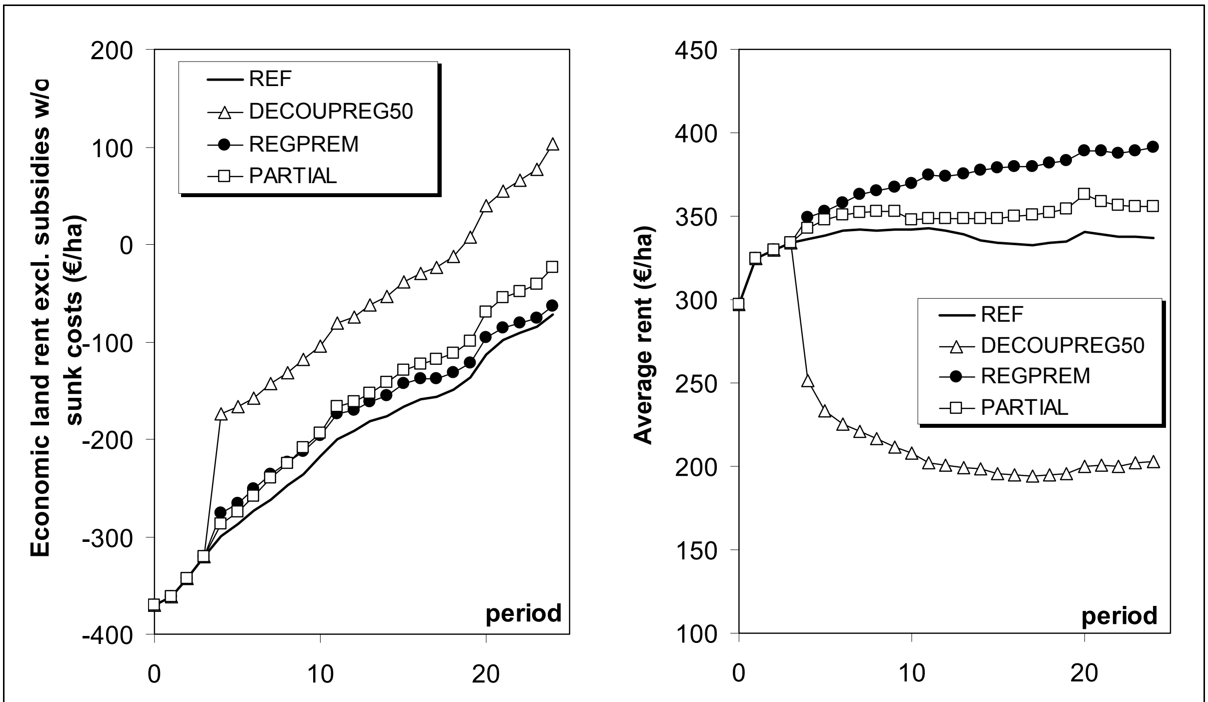
ment. Whereas in the reference scenario, pig production decreases, this could be reversed or slowed down in the decoupled scenarios. A reason for this is the easier accessibility of land due to lower rents. This alleviates manure restrictions.

Table 2: Change of production capacities after policy change relative to reference[1)]

Products	Unit	REF before change	Change relative to reference before policy change (%)							
			REF		DECOUPREG50		REGPREM		PARTIAL	
		t=3	t=4	t=14	t=4	t=14	t=4	t=14	t=4	t=14
Cereals	ha	8,547	0.5	2.5	13.9	19.0	4.2	11.5	3.0	14.0
Rape seed	ha	1,152	-1.6	14.0	-82.6	-96.4	-21.4	-54.7	-20.1	-69.1
Sugar beet	ha	282	0.0	0.0	-17.2	20.3	14.2	18.3	3.5	12.8
Dairy cows	places	2,659	-10.7	-70.0	-9.7	-78.1	-6.8	-59.2	-9.4	-65.4
Suckler cows	places	2,117	4.1	35.5	-95.5	-96.2	-92.0	-92.36	-20.6	-54.5
Beef cattle	places	880	-14.2	-85.5	-100.0	-100.0	-100.0	-100.0	-14.7	-83.9
Fattening pigs	places	19,537	1.2	21.3	66.1	121.0	4.0	-10.4	1.2	20.4
Sows	places	27,547	2.5	22.0	0.0	4.2	4.6	33.8	4.9	31.3
Turkeys	places	85,000	17.7	100.0	76.5	70.6	23.5	58.8	2.5	41.2

In spite of decreasing total revenues in the region, the efficiency of agricultural production, measured as the economic land rent, increases significantly in all policy scenarios (Figure 4(a)).[6] Though this occurs to a large extend as the result of natural technical progress and of natural structural change, decoupling contributes as well significantly to an increased average efficiency. Fully decoupled payments lead to a strong and immediate increase in efficiency initiated mainly by a re-allocation of production factors right after the policy change.

Figure 4: a)Average economic land rent and b) average rent paid for leased land



The increasing economic rents of the different scenarios (Figure 4(a)) do not correspond with the rents paid by the farms for rented land (Figure 4(b)). Particularly scenario DECOUPREG50 which represents a decoupled farm premium shows a sharp contradiction. While productivity

6 The economic land rent is defined as total income plus rent expenditure minus opportunity costs of labour and capital. Depreciations of facilities (sunk costs) that are no longer used when a farm quits the sector are not considered. The strong positive trend of the economic land rent should not be overestimated since we did not consider such general external developments like increased wages and deteriorating terms of trade of the agricultural sector.

increases sharply, the rental prices for land fall dramatically by about 50 % shortly after the policy change. This shows that the lower shadow prices for land resulting from decoupled payments are transferred quickly into lower rents.[7] Vice versa, scenario REGPREM which couples payments to land leads to higher rental prices while the efficiency increase is only modest. The coupling to land use increases the shadow prices, particularly of grassland, as the kernel density estimates in the appendix (Figure A-6, Figure A-7) show.

If sunk costs of leaving farms are taken into account, the strong re-allocation immediately after the policy change in scenario DECOUPREG50 generates high adjustment costs (Table 3). Even though economic land rent is highly negative in policy DECOUPREG50 right after the policy change, throughout the remaining periods of the simulation a significant increase can be observed. Thus, despite of high adjustment costs in the short-run, in the medium and long-run efficiency gains in policy DECOUPREG50 as expressed by the capitalised value of economic land rent including sunk costs are significantly higher (-136 €/ha) than in the other policies in which adjustment takes place more gradually. In Table 3, economic land rent is calculated as an average of the whole region, which abstracts from the actual economic land rent of individual farms.

Table 3: Comparison of economic land rent with and without sunk costs excluding support

Economic land rent	REF	DECOUPREG50	REGPREM	PARTIAL
	(€/ha)			
Before policy change (t=3)	-430	-430	-430	-430
without sunk costs	*-319*	*-319*	*-319*	*-319*
Immediately after change (t=4)	-388	-1,121	-428	-420
without sunk costs	*-299*	*-174*	*-276*	*-287*
Short-term effect (t=6)	-336	-178	-312	-324
without sunk costs	*-274*	*-157*	*-251*	*-259*
Medium-term effect (t=14)	-194	-79	-176	-190
without sunk costs	*-176*	*-53*	*-15*	*-141*
Long-term effect (t=24)	-104	40	-93	-91
without sunk costs	*-73*	*102*	*-64*	*-23*
Capital value of economic land rent incl. sunk costs (base: t=3)[1)2)]	-4,021	-2,478	-3,672	-3,575
Ave. annual economic land rent incl. sunk costs[3)]	-221	-136	-201	-197

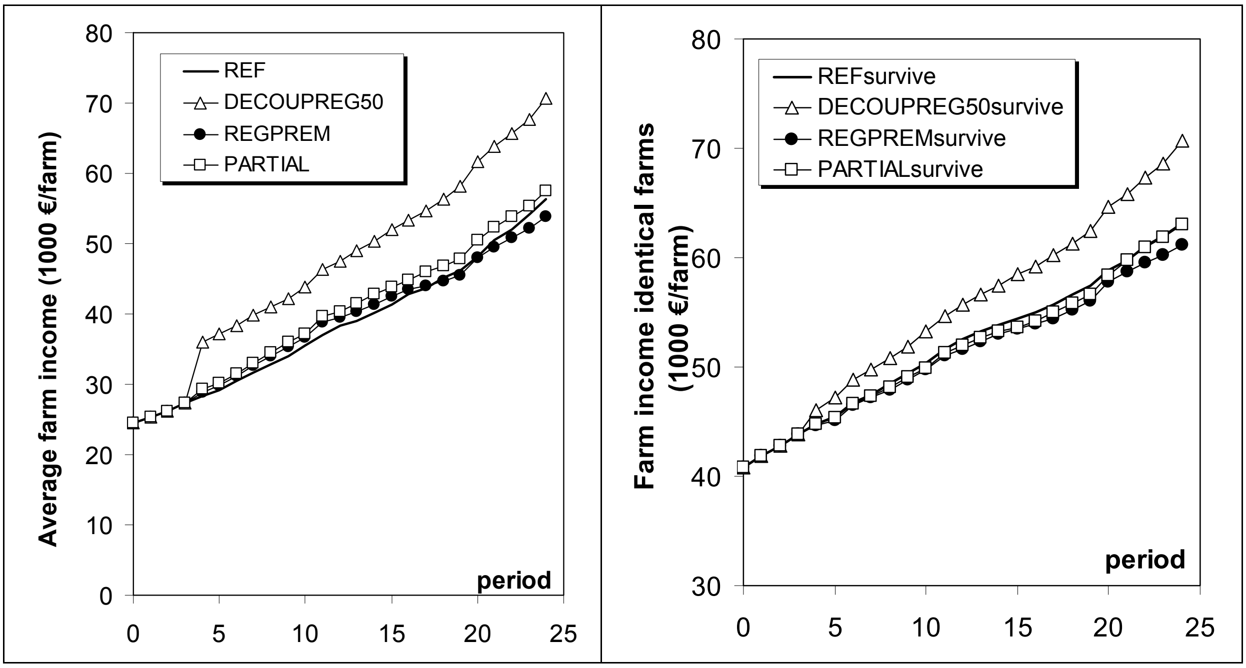
1) Interest: 5.5 %; 2) Under the assumption that policy is not terminated; 3) Computed from capital value of economic land rent.

Taking into account that rental prices for land are at a high level unless direct payments are fully decoupled, it could be expected that high rental prices have negative effects on farm incomes in case of policies REGPREM and PARTIAL, especially since at the outset the share of rented land is about 60 %. However, Figure 5 (a) illustrates that the average effect on farm incomes is marginal compared to the reference. As for scenario REGPREM, the result implies that the direct payment for grassland introduced with a single area payment on average compensates for possible income losses due to higher rental prices. More significant, though, is the impact of a fully decoupled single farm payment. One could argue that this interpretation is also the result of a sample effect as the composition of the farm sample changes over time and depending on the policy. However, an analysis of the farms surviving under all policy conditions (Figure 5 (b)) shows that these farms can generate persistently higher farm in-

7 In reality this process can be expected to last longer as lease contracts usually define a period of cancellation. However, it has to be noticed that rental contracts often include clauses that allow for the adjustment of rent payments to reflect changes in overall supply and demand on the land market.

comes in any case. Hence, farms with a growth potential high enough to guarantee the farm business to operate also in the long-run, benefit most from fully decoupled payments.

Figure 5: (a) Average profits of all farms and (b) average profits of surviving farms



7 Conclusions

The central results of the policy simulations are:

- If payments are no longer attached to production, but to land use only (scenario REGPREM), this results in little change in production structure compared to the reference. Efficiency and profits, on average, are only affected in a minor way. An exception is the rental price for grassland, which experiences an increase over time as well as a re-distribution of payments between farms in the region.
- Fully decoupled direct payments granted independent of agricultural production show to have landslide effects. Shadow prices for production factors such as land fall dramatically because of the change in policy. Thus, farms spend less on leasing land and look for alternative uses of the complementary factors labour and capital. This accelerates structural change. To prevent that marginal land will fall completely out of use, a basic land management premium of 50 € per ha is enough to prevent land from falling idle.
- As for the winners and losers of a policy change towards decoupled income payments, the model results produce a clear answer. Considering that farms maximise household income, both unprofitable farms and farms with a growth potential benefit from fully decoupled payments (DECOUPREG50). Unprofitable farms profit because farms are rewarded for leaving the sector, despite significantly lower opportunity costs of land. This takes away some strain on the land market, as more land is available for lease. The remaining farms have the opportunity to lease land at lower prices and to realise size effects more easily. As these farms' share of leased land is already higher at initialisation, farms remaining in the sector earn additional incomes from lower rental prices. Losers of policy DECOUPREG50 will be land owners, as a fall in rental prices is reflected in lower land values. This, however, has consequences for the use of land as a security, which in return could endanger the stability of capital-intensive produc-

tion activities. Moreover, it would make it more difficult for farms to exploit the growth potential that results from the decoupling.

The results obtained with AgriPoliS are subject to a number of assumptions that influence the behaviour and interactions of farm agents, and hence model results (see for details HAPPE, 2004). Nevertheless, the majority of the findings are plausible from a theoretical and empirical point of view and are consistent with other studies, e.g. BERTELSMEIER (2004). But there remain a number of questions, which cannot be answered by our approach. As much as fully decoupled payments granted independent of farming make sense from an economic point of view, their general acceptance by society can be questioned as it will be difficult to justify why farmers should still receive payments if they quit farming (SWINBANK and TANGERMANN, 2000). Food quality and environmental aspects which form the so called 'second pillar' of agricultural policy making have also been left out. But it can be expected that these policies have an indirect effect on agricultural structures and production efficiency, too. From a purely economic point of view the results presented in this paper support the demand for a decoupling of payments. Agricultural economists have repeatedly advocated this over the past 25 years (e.g. KOESTER and TANGERMANN, 1976; SWINBANK and TANGERMANN, 2000; ISERMEYER, 2002). If implemented at reasonable financial terms and time horizons, and if certainty about the future existence of the policy scheme exists, then a decoupled payment scheme could provide a chance for both policy makers and active farmers to win in the end.

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Appendix

Table A-4: Characteristics and frequencies of typical farms (reference year 2000/2001)

	Full-time farms																			Part-time farms				
Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Specialisation	SG	SG	SG	SG	SG	SG	SG	SG	GL	GL	GL	GL	GL	GL	SC	SC	MI	MI	MI	SG	SG	GL	SC	MI
Land [ha] [a]																								
Total	55	20	50	35	32.5	15	35	55	30	90	32.5	37.5	15	30	77.5	30	20	50	42.5	17.5	25	15	10	10
Arable land	55	20	50	35	32.5	15	35	55	12.5	57.5	10	10	10	22.5	77.5	30	20	50	27.5	17.5	25	10	10	5
Grassland	-	-	-	-	-	-	-	-	17.5	32.5	22.5	27.5	5	7.5	-	-	-	-	15	-	-	5	-	5
Rented land	32.5	0	37.5	7.5	7.5	2.5	17.5	35	10	67.5	17.5	25	5	5	52.5	15	-	-	25	2.5	5	5	-	10
Equity capital [1000 €]	905	457	714	949	687	427	518	980	455	773	558	516	208	493	322	449	681	1,121	239	454	444	326	326	38
Family labour [1000 h]	4.1	2.9	3.1	3.5	3.5	2.6	3.1	3.2	1.7	3.9	3.3	2.7	2.6	2.6	2.6	1.9	2.3	4.1	1.8	3.4	3.0	3.0	1.9	3.2
Livestock [head]																								
Beef cattle	-	-	-	-	-	-	-	-	-	-	10	10	-	-	-	-	-	-	-	-	-	15	-	-
Suckler cows	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-	-	-
Dairy cows	-	-	-	-	-	-	-	-	25	65	40	30	10	14	-	-	-	-	-	-	-	-	-	7
Sows	110	45	128	128	130	55	80	200	-	-	-	-	-	22	50	-	150	75	50	25	-	-	-	-
Fattening pigs	800	-	260	160	-	-	-	25	-	-	-	-	-	-	-	140	-	-	25	30	430	-	-	-
Turkeys	-	-	5,500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Milk quota [1000 litres]	-	-	-	-	-	-	-	-	143	371	228	171	57	80	-	-	-	-	-	-	-	-	-	-
Scaling factor	49	178	83	42	67	94	13	72	140	41	111	101	122	63	52	20	110	140	109	183	59	295	449	263

Notes: SC: Specialised field crop farm; GL: Grazing livestock farm; SG: Specialised granivore farm; MI: Mixed farm

a) Land endowment is adjusted to fit plot size of 2.5 ha assumed in AgriPoliS

Source: SAHRBACHER (2003) based on MLR (2002)

Figure A-6: Kernel density estimates of arable land and grassland rental price

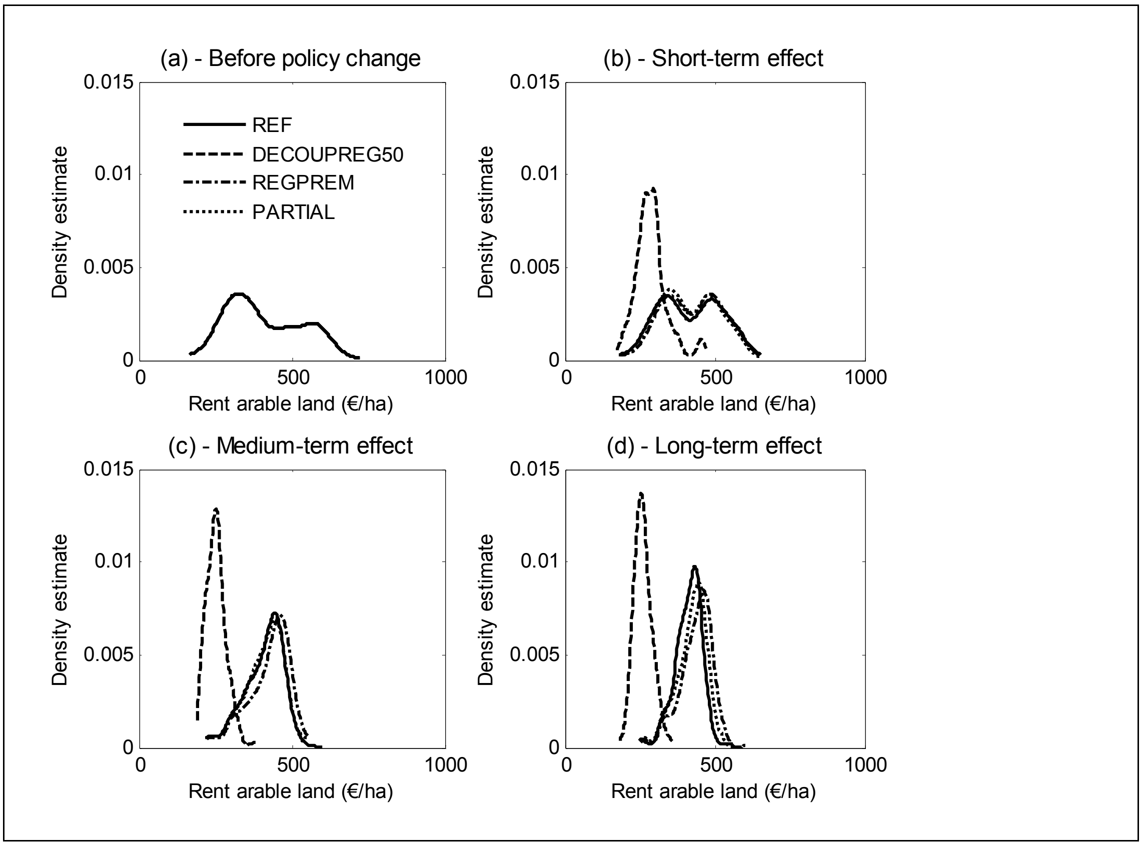

Figure A-7: Kernel density estimates of arable land rental price