Common Agricultural Policy Impacts on Farm Revenues

R. Elsholz and J. Harsche

Paper prepared for presentation at the 12th EAAE Congress
'People, Food and Environments: Global Trends and European Strategies',
Gent (Belgium), 26-29 August 2008

Common Agricultural Policy Impacts on Farm Revenues

R. Elsholz [1] and J. Harsche [2]

1 Institute of Agricultural Policy and Market Research, University of Giessen, Giessen, Germany

2 Hessen Agentur, Wiesbaden, Germany

Abstract— **The aim of this paper is twofold. Firstly, we investigate the regional distribution of support of EU's Common Agricultural Policy (CAP). Also, we employ structural data of the regions to calculate average farm revenues and to show how support and revenues have developed over time. We analyse the stabilisation effect generated by these transfers. This is investigated for the market price support, the first pillar payments and one agri-environmental program. Secondly, several parameters affecting level of support, development of support and instability of support are analysed, such as natural conditions for farming and regional economic structure. New contributions to the literature are the use of community data and the inclusion of a second-pillar program. The results show that there is an overall stabilisation effect of the EU's CAP but this effect is not equal for all regions. Furthermore, our findings indicate that favourable natural conditions increase the level of support per farm.**

Keywords— Common Agricultural Policy, regional support, rural development.

I. INTRODUCTION

The EU's CAP is characterised by a pool of different instruments to support farmers. Given the heterogeneous conditions both naturally and structurally within agriculture in the EU, individual areas are affected in a very different way. Differences do not only exist between countries. Even within the member states and on regional level structures are often very unequal. Hence, the question how support is allocated over regions is a continuous research area. In recent years, direct payments and environmental programs are heavily emphasised but market price support still remains an important instrument of support. The question how farms in structurally different regions are affected by the various forms of transfers is crucial to evaluate the impact of the CAP at the regional level.

Given this background, the aim of the present paper is to determine the impact of EU's CAP on revenues. This issue has been investigated in several papers in the last decades. Interestingly, there was no clear empirical evidence on the overall impact of the programs. Buckwell et al. [1] find a twofold impact of the CAP at a country level. While the agricultural productivity and thereby farm income has increased due to transfers, payments to preserve the agricultural landscape just go in the opposed direction. The study also concludes that some countries benefit more than others notably France and Denmark.

Tarditi and Zanias [2] find that market price support in regard to income favours, on the one hand, farms that are already better off by economic and production means – on average bigger and more profitable farms. On the other hand, they conclude that market price support hinders structural changes in rural areas, especially in regions which are dominated by small scaled farms and where few off-farm working opportunities exist.

Allanson [3] analyses the redistribution effects of the CAP on income for Scottish farmers. He concludes that the CAP has substantial redistribute effects but also finds strong differences between structurally different farms.

This paper has the objective to shed light on the ongoing debate by analysing the development of agricultural support and the instability of farm revenues at a community level. Therefore, the term regions in the present analysis corresponds to the communities in the federal state of Hesse, Germany,[1] for the analysis in parts 3 to 5 and, on a more aggregated regional level, to the Hessian counties ("Kreise") in the sixth part of this study. To control for the stabilisation effect generated by the different measures and the overall support of EU's CAP a panel data set for the period from 2000 to 2006 of 424 regions is employed. For the analysis in the sixth part, we employ a dataset of the Hessian counties with data from 1986 to 2002. These localised data of agricultural support, the agricultural structure in the regions and geographical patterns allow a more detailed analysis

[1] Germany consists of 16 federal states, whereby Hesse is one of them. Hesse consists of 26 counties; these are consistent with the EU NUTS 3 regions. The 26 counties in Hesse consist of 426 communities.

than the existing literature. The time period from 2000 to 2006 is rather short. Only the effect of the latest CAP reform is considered in this time horizon, but the data are contemporary and also the latest trends in world market prices are included.

The paper is organised as following. In the next section, the methodology of the underlying study is explained. The third part gives an overview how on average agricultural support is allocated in Hesse and how the regions are clustered. In the fourth section, we describe how the overall support and the support from single measures have been derived. This derivation is analysed for the different types of regions as well. In the fifth section, we calculate an index of instability for the measures of support and the effect of the different measures on farm revenues to control for the stabilisation generated by the different measures of support. In section six, we investigate the determinants for the regional level of support, the yearly change of support and the instability of support. The last section concludes our results.

II. METHODOLOGY

The method of the investigation is as follows. The instability of agricultural revenues is examined in regard to the different measures of support. The considered measures in this study are the Market Price Support (MPS), the direct payments from the first pillar (DP)[2] and the Hessisches Kulturlandschaftsprogramm (HEKUL), a state based agri-environmental program from the second pillar of the CAP. The data of the latter two are requested from the Hessian Ministry of Agriculture [4]. The data of the MPS are taken from the OECD database of Producer Support Estimates (PSE) [5] in OECD countries in a top-down approach. The OECD database is also used in complementation with data from the Hessisches Statistisches Landesamt (HSL) [6 and 7] to calculate the farm revenues at world market prices as a reference scenario with no support to agriculture. Instability is then analysed by comparing farm revenues at world market prices to different scenarios of support. These scenarios are support to revenues due to MPS, DP, HEKUL or the sum of all support – the CAP.[3] As measurement of instability we apply the coefficient of variation and an instability index of Cuddy and Della Valle [8]. The determinants of regional support are analysed by OLS regressions.

The basis of the underlying concept of this study is the Producer Support Estimate (PSE) of the OECD. Anders et al. [9] show a regionalised concept of the PSE-measure which is a useful tool for analysing the agricultural support and its impact on farm revenues at the regional level. Regional support per farm (PSE_j^N) is estimated by dividing the total support per region (CAP_j) by the number of farms (N) in each region (j).

$$PSE_j^N = \frac{(MPS_j + DP_j + HEKUL_j)}{N_j}. \qquad (1)$$

The MPS is calculated by multiplying the EU per unit MPS - the monetary transfer value per produced tonne (mps^{EU}) - by the quantity (q) of the different agricultural products (i)[4] in a region which is summed to MPS per region (MPS_j):

$$MPS_j = \sum_{i=1}^{i} mps_i^{EU} * q_{ij}. \qquad (2)$$

The farm revenues at world market prices (FR_j^N) are calculated in a analogue way. In each region, the quantities produced are multiplied with the OECD reference price – that is associated with the world market price and divided by the number of farms:

$$FR_j^N = \frac{\sum_{i=1}^{1} p_i^{referenceOECD} * q_{ij}}{N_j}. \qquad (3)$$

So the regional farm revenues and the MPS are measures estimated through the OECD database. This allows analysing the impact of different support scenarios on the instability of farm revenues.[5]

The methodology for the examination of instability is to calculate the variation in the support measures and the farm revenues for the period 2000-2006 on the

[2] The direct payments in this examination refer to the first pillar payments, because the HEKUL is considered as a single measure as well.

[3] CAP refers in the following examination to the sum of the three considered measures of support: the MPS, the DP and the HEKUL.

[4] The study includes 10 products which are: wheat, barley, oats, rye, rape seeds, potatoes, sugar, milk, beef and pig meat.

[5] For a more detailed description see Allanson [10].

basis of the coefficient of variation (CV). To control for possible trends in time, the method proposed by Cuddy and Della Valle [8] is applied as in several other studies [9, 11]. The Cuddy and Della Valle Index (I) is:

$$I = CV\sqrt{1-\overline{R}^2}. \quad (4)$$

With $\overline{R}^2$, the corrected goodness of fit of a time trend regression:

$$Measure = \beta_0 + \beta_t + \varepsilon\ . \quad (5)$$

The Cuddy and Della Valle index is used instead of the CV if the time trend is significant at the 5 % level. The trend (β_t) is calculated for a linear and a log-linear model. If both trends were significant the F-value for the model was used as criteria to choose.

III. REGIONAL DISTRIBUTION OF FARM REVENUES

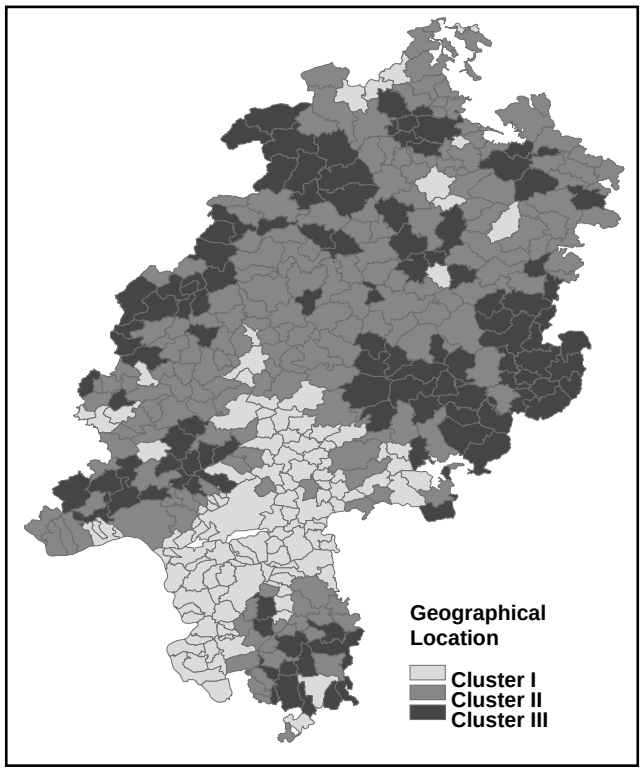
In the following, the distribution of the average agricultural support in Hesse from 2000 to 2006 is analysed for the different policy measures per farm.

The regions are divided into 3 clusters in regard to their average geographical height to control for differences arising from the geographical location (see figure 1). The 120 regions in cluster I have a geographical height below 200 meters. The 192 regions in cluster II have a height from 200 to 360 meters and the 112 regions in cluster III have a height of more than 360 meters. It can be seen from figure 1 that the clusters have a clear geographical orientation. Most regions from cluster I are located in the south while the regions in cluster II and III are not clearly located in Hesse.

This also reflects the geographical landscape in Hesse and is described in Klausing [12] in detail. It is expected that geographical height is an indicator for natural conditions [13]. So, on average farms in cluster I have better natural conditions than those in cluster II and those associated with the poorest natural conditions are farms in cluster III.

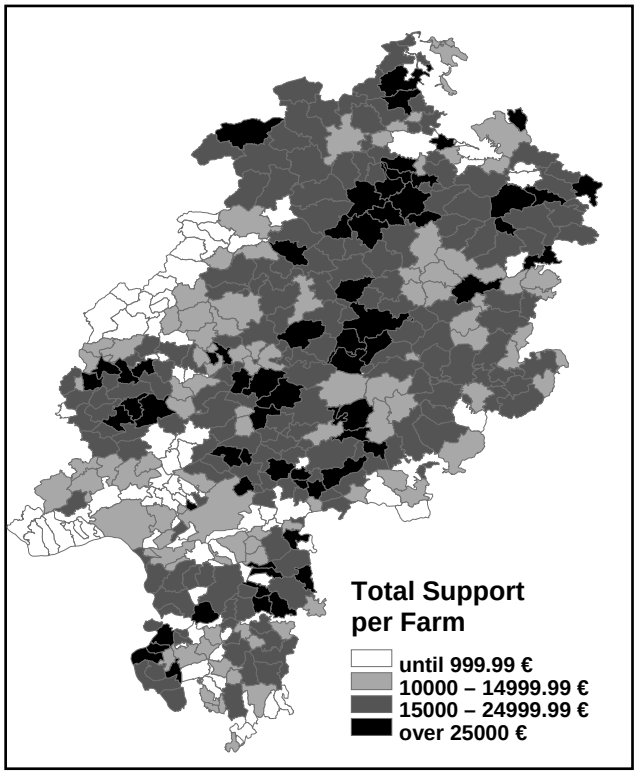
Figure 2 shows the allocation of the average total support per farm and year in the regions from 2000 to 2006 – as considered in this study. Transfers are not geographically concentrated within Hesse. However, there seem to be some peaks in the extent of support (where farms obtain more than 25,000 euros) and

Figure 1: Geographical location of the regions for the selection of the clusters



Source: Own illustration

Figure 2: Average total support in the Hessian regions (2000-2006)



Source: Own illustration

around these peaks the regions show high transfers per farm as well. The regions with the lowest per farm transfers are located in the west of Hesse.

Table 1 shows the average support per farm in Hesse as well as in the different regions and the CV between the regions for different measures. The measures of support are CAP, MPS, DP and HEKUL.

The transfers per farm are allocated very equally in cluster I and cluster II. In cluster III the transfers from the MPS and the DP are the lowest, this is because of the fact the average farm size in these regions are the lowest as well. In regard to this fact it is remarkable that the per farm transfers from HEKUL are the highest ones in the regions in cluster III. Furthermore, the transfers from HEKUL are much lower in cluster I regions than in cluster II regions. This reflects the fact that HEKUL allocates less transfers to favoured regions like in cluster I and more transfers to disfavoured regions as in cluster III. Thus, support from the HEKUL is higher in geographical less favoured regions. This conclusion is consistent with the view of the Hessian Ministry of Agriculture [14].

With the exception of HEKUL variation of the transfers has dropped substantially compared to the variation of the overall transfers per region (these results are not reported here) as indicated by the CV for the different measures in table 1.

Table 1: Average regional support per farm in Hesse (2000-2006)

Transfers	PSE_j^N (thousand €)			
Measure	CAP	MPS	DP	HEKUL
Mean Cluster I	16.50	9.00	7.19	0.44
Cluster II	16.47	8.87	7.00	0.62
Cluster III	14.95	8.86	5.15	0.94
Hesse	15.95	8.89	6.39	0.74
Coefficient of Variation	49.11	59.24	69.59	115.96

Hesse indicates the value for all 424 regions. The Coefficient of Variation is given as a percentage measure and calculated in regard to all regions.
Source: Own calculations

IV. DEVELOPMENT OF FARM REVENUES

In this section, we focus on changes in agricultural support since 2000 to control for development in a time horizon and to control for structural differences in regard to the different geographical conditions of the farms. The latter issue addresses the question how farms in structural different regions are affected by changing measures of the CAP.

The development of the support is negative. Support to farmers on per farm base decreased on average by 914 euros each year. The MPS contributed the major part of this reduction with 718 euros per farm. These developments are statistically significant as indicated in table 2.

The transfers from the DP and the HEKUL decreased, as well. However, the development for the clusters is twofold. Farms in cluster I and II had to face a reduction of support of around 1,000 euros. In contrast, farms in cluster III only obtained a loss of support of 576 euros. Interestingly, the MPS to farms in cluster III has been reduced by 587 euros but, in contrast, the DP have increased by an annual amount of 13 euros. This is remarkable because the DP in cluster II and I decreased by 304 euros respectively 172. The farm revenues without support increased by 907 euros on average, this increase is higher for regions in cluster I and II and lower for cluster III. The overall development of the revenues supported by the CAP is a reduction of 6 euros per farm in Hesse. While farms located in cluster II regions obtain 124 euros less per year, farms in cluster I regions obtain nearly no change and farms in cluster III regions obtain an increase by 188 euros each year. So the development is quite different for the three clusters considered in this examination.

The findings in this section indicate that in Hesse the support of agriculture has decreased over the last 7 years. If the geographical location is taken into account, there is clear evidence that regions are affected in a different way. Farms in cluster I and II had to accept a much more significant reduction in support than those in cluster III.

In contrast to the support the farm revenues without transfers increase for all regions and all clusters. The overall effect of the reduction in support and the increase in revenues is negative for Hesse. In the clusters the picture differs a little.

Table 2: Yearly absolute changes in agricultural support and revenues in Hesse and the clusters per farm (2000 – 2006)

Development	Transfers (€)				
Measure	**CAP**	**MPS**	**DP**	**HEKUL**	
Mean					
Cluster I	-965.63**	-786.83***	-171.84	-8.17	
Cluster II	-1078.43***	-752.23***	-304.49	-11.75	
Cluster III	-575.99**	-587.07***	13.31	-2.22	
Hesse	-913.78***	-718.39***	-183.00	-8.16	
Regional Max	9115.98	4361.71	8827.89	1769.50	
Regional Min	-11499.50	-5905.92	-9205.96	-1965.50	
Development	Revenues per farm(€)				
	Support by				**without Support**
Measure	**CAP**	**MPS**	**DP**	**HEKUL**	
Mean					
Cluster I	1.86	180.66	795.65	1074.45**	967.49**
Cluster II	-124.46	201.74	649.48*	927.70***	953.97***
Cluster III	187.78	176.70	777.08*	749.03**	763.77**
Hesse	-6.23	189.16	724.56**	908.09***	907.56***
Regional Max	17714.21	13088.40	16384.50	10694.94	10750.03
Regional Min	-12663.83	-11737.06	-13237.06	-8252.84	-8301.63

***, (**), (*) indicates statistical significance with a level of 99 %, (95 %), (90 %).
Source: Own calculation.

For farms in Cluster II the overall effect is negative. While farms in cluster I are nearly not affected, for farms in cluster III the overall effect is positive. That means that in regions with a geographical disfavoured location farm revenues have increased under the support of the CAP, while in favoured regions they have not.

V. INSTABILITY OF FARM REVENUES AND THE IMPACT OF EU'S CAP

During the last decades farmers in the EU had to face uncertainty from the markets for agricultural products in a minor way. They were only partly affected by changes in world market prices as there was a substantial protection by the different policy measures – in international comparisons this is undoubtedly the case [15]. However, the extent of the stabilisation generated by the EU policy measures is the objective of this section.

The instability index is 13.48% for the CAP in Hesse, as indicated in table 3. The transfers from the MPS are much more stable across regions as support by DP and support by the HEKUL scheme. Farms in cluster I obtained the most unstable support in regard to the other clusters.

The instability generated by the policy support per farm is 13.36% in Hesse. The instability of revenues per farm without support is higher and not so scattered – on average the index is 15.74%. The findings indicate that the stabilisation of revenues generated by the MPS is the highest and the DP could not generate a stabilisation at all. In contrast the support of the DP leads to more unstable revenues. However, for the clusters the picture differs from the overall results. Farms in cluster I face the highest instability of all clusters for revenues supported by the different measures. The instability for revenues supported by the CAP is the lowest for farms in cluster II. The farms also have a lower instability for all the different scenarios of support.

The findings from this section are that the DP is the most unstable measure of support on average and in all clusters – meaning for farms with a different geographical location. This is corresponding with the higher level of instability generated by the DP, because the highest index of instability is generated in the scenario where the DP is the only measure of support. The HEKUL generated on average a stabilisation effect for farm revenues. The MPS generated the highest stabilisation effect on revenues – even higher than the effect of the overall CAP. This result is valid for Hesse and for the different clusters. There is no stabilisation effect generated by the CAP for farms in cluster I regions.

Table 3: Intertemporal CV (in percentage) for agricultural policy measures and revenues per farm (2000-2006)

Instability	Transfers (€)				
Measure	**CAP**	**MPS**	**DP**	**HEKUL**	
Mean					
Cluster I	26.43	34.20	49.44	37.58	
Cluster II	15.33	16.04	37.45	28.28	
Cluster III	14.14	17.81	41.23	22.17	
Hesse	13.48	21.50	41.95	28.24	
Regional Max	102.03	145.22	93.02	110.11	
Regional Min	3.63	3.51	5.67	5.24	
Instability	Revenues per farm (€)				
	support by				**without support**
Measure	**CAP**	**MPS**	**DP**	**HEKUL**	
Mean					
Cluster I	16.71	11.39	20.66	16.24	16.23
Cluster II	11.73	10.01	17.30	14.91	15.44
Cluster III	12.40	10.07	20.28	16.01	16.68
Hesse	13.36	10.37	18.95	15.53	15.74
Regional Max	99.26	50.65	66.89	57.61	43.02
Regional Min	3.65	3.11	7.61	7.86	7.94

Source: Own calculation

VI. DETERMINANTS OF THE REGIONAL PRODUCER SUPPORT

Furthermore, we identify determinants for producer support in differently structured regions. These investigations are based on some theoretical considerations on spatial allocation of agricultural activities. With regard to the spatial model of Thuenen, we assume that farmers operating in regions close to urban centres offering an extensive demand volume are more marked-oriented. Therefore, they depend less on governmental support than farmers located in remote areas.

Additionly, some aspects of New Economic Geography are considered [16]. According to this, we assume that in regional agglomerations of agriculture there exist spatial spill over effects and accelerating forces influencing agricultural sector and its value added chain respectively the level of producer support.

In this study, we use an OLS-estimation model based on 17 years´ panel data to work out interrelations between producer support and several independent variables. The data base used includes cross-section data across the 26 counties in Hesse for the period from 1986 to 2002. We have estimated regression models for three dependent variables: The level of support, the yearly change of support and, finally, the instability of support. Focussing on agricultural as well as generally economic aspects, four independent variables are analysed. We distinguish between two regional dummy variables: **Low mountain regions** characterised by low agricultural yields and **favoured regions** with advantageous climate, soil and landscape conditions. Favoured regions in the State of Hesse also show relatively large farms and a small proportion of part-time farming. In order to consider the regional density of farming business, we investigate the number of **agricultural employees** per thousand inhabitants. The general economic performance in a region is measured by the **gross-value added** per capita (**GVA** ^{C}). For each region, this indicator is considered related to two variables: First, as **GVA** ^{C} in the regarded region and, second, as an average of **GVA** ^{C} in the respective neighbour regions weighted by population. These two variables give us a clue whether a region is characterised by a strong economic prosperity and whether it is located in an urban agglomeration.

Descriptive statistics are shown in table 4. Data on regional agricultural structure and economic performance are available from Hessisches Statistisches Landesamt.

The regression results are presented in table 5. First of all, 28 % of the regional variation of the support per farm can be explained by the considered variables. The other two models, concerning the yearly change and the instability of support, show an R^2 of 0.22 respectively 0.45. Parameter coefficients illustrate varied effects.

Table 4: Independent variables included in the regression model

Independent Variables	Unit	Min.	Max.	Average	Stand. Dev.	Coeff. of var.
Favoured region	abs. number	0	1	0.38	0.49	129.00
Low mountain region	abs. number	0	1	0.27	0.45	168.01
Agricultural employees	rel. number	1.55	27.57	9.33	6.49	69.58
GVA ^{C}	1,000 Euro	13.81	56.64	21.68	9.83	45.33
GVA ^{C} - spatial	1,000 Euro	14.52	38.01	22.78	7.70	33.80

Source: Own calculations.

Table 5: Results of the regression models

Dependent Variables	PSE ^{N}		Abs. change of PSE ^{N}		CV in time for PSE ^{N}	
Corr. R^2	0.28		0.22		0.45	
F-test	2.893***		2.431*		5.094***	
Independent Variables	Coeff.	T-Value	Coeff.	T-Value	Coeff.	T-Value
Constant	8.988	2.103**	-0.131	-0,964	7.164	0.978
Favoured region	3.607	2.241**	-0.117	-2.281**	2.490	0.903
Low mountain region	0.543	0.322	-0.029	-0.549	-2.746	-0.952
Agricultural employment	0.317	2.239**	0.004	0.964	-0.167	-0.687
GVA ^{C}	0.041	0.487	$-0.250*10^{-3}$	-0.093	0.324	2.235**
GVA ^{C} - spatial	0.020	0.204	$-0.482*10^{-3}$	-0.158	0.167	1.104

***, (**), (*) indicates statistical significance with a level of 99 %, (95 %), (90 %).
Source: Own calculations.

Regarding the level of support per farm, favoured regions in terms of natural conditions receive an extraordinary support volume. This outcome is coincident with our results in section 3 and may be interpreted by several arguments concerning farm size, factor productivity and production mix.

First, farms located in favoured regions in Hesse like Wetterau plain are much bigger than farms located in disfavoured regions like, for instance, hilly Lahn Dill region, namely in terms of utilized agricultural area, numbers of employees and capital endowment (machinery equipment, buildings etc.). Second, in combination with favoured natural conditions the more extensive factor endowment enhances farmers to realize a higher productivity in several agricultural production systems such as arable cropping and dairy farming.

Support per farm increases with a rising density of agricultural employees, as well. This may be explained by the argument that an intense regional agglomeration of farming business causes an positive effect on agricultural value added and also on level of governmental support.

However, farming conditions in favoured regions result in a particularly significant decline in support per farm during the period 1986 to 2002. Because of main fields of production, obviously, farms situated in such regions have been affected very strongly by agricultural price reductions caused by CAP reforms during that period. The average gross value added (GVA ^{C}) which illustrates regional economic performance has a positive impact on the instability of support per farm. Given the fact that farmers operating in urban centres depend very much on market forces, fluctuation of regional market volume also implies variation of producer support.

VII. CONCLUSION

In this paper we show that agricultural support per farm in Hesse varies in regard to the location of the regions under study. Besides, we find clear evidence that agricultural transfers per farm reduced on average over the period from 2000 to 2006 by 914 euros per year. In contrast, farm revenues at world market prices increased by nearly the loss of the support. These findings are quite significant for Hesse and all three types of regions analysed in this study. All single measures decreased on average and in the clusters as well, with the exception of cluster III – the regions with the highest altitude. These regions obtained an increase of DP.

We furthermore investigated the instability index of the measures of support and their stabilisation effect on farm revenues. We find that the regions in cluster I, associated with the best natural conditions, faces the most unstable support as well as the most unstable revenues with the different scenarios of protection. For farms in cluster II and III regions we found the highest stabilisation – the largest decrease in the instability index – if the scenario with no support is compared to the scenario under the CAP.

In section 6, we elaborated several parameters affecting level of support, yearly change of support and instability of support, such as natural conditions for farming and regional economic structure. In the context of the results presented in section 3, the results of our regression model illustrate, in particular, that farms located in favoured regions get an extraordinary expansive support.

Regarding the political objectives of convergence and cohesion, the outcomes of our study may bear remarkable points for discussion. For example, this is the case for the result that support per farm is higher in favoured regions than in disfavoured regions. The European Commission argues that such disparities should, in the long run, be diminished. However, farmers located in these regions and local politicians might not agree with this. Such inter-ferences of Commission's policy objectives and proposals, on the one hand, with the interests of regions, on the other hand, are also transferable to conflicts between single member states and the Commission. Namely, countries characterised by a very productive and developed agricultural sector such as France and Denmark are, obviously, not interested in a reduction of their benefits from agricultural policy. This affects also preferences for different policy instruments because such countries will prefer price support instead of direct payments.

The major conclusions drawn from this study are, first of all, that the EU's CAP generates stabilisation of farm revenues. Secondly, the extent of stabilisation varies in regard to different geographical locations of the farms in Hesse. Thirdly, while the HEKUL, a second-pillar program, and the MPS stabilise farmers revenues, the DP do not. The latter of these results is valid for Hesse and all three considered clusters illustrating natural conditions. Fourthly, we find that farms located in favourable regions significantly obtain more support as others controlling for agricultural employment effects and economic conditions.

ACKNOWLEDGMENT

The study is part of the project "Regional Interests of Disfavoured and Favoured Agricultural Regions in Different Options of Agricultural Market Policy" (D1) of the Sonderforschungsbereich 299, "Land use options for peripheral regions". Funding by Deutsche Forschungsgemeinschaft is gratefully acknowledged.

REFERENCES

1. Buckwell, A., J. Blom and P. Commins (1997). Towards a common agricultural and rural policy for Europe. European Commission, Directorate-General for Economic and Financial Affairs, no. 5.
2. Tarditi, S. and G. Zanias (2001). Common Agricultural Policy. In: Hall R., A. Smith and L. Tsoukalis (editors), Competitiveness and cohesion in EU policies. Oxford University Press, 179 – 216.
3. Allanson, P. (2007). Classical Horizontal Inequities in the Provision of Agricultural Income Support. Rev. Agr. Econ., Vol 29, no. 4, 656 – 671.
4. Hessisches Ministerium für Umwelt, ländlichen Raum und Verbraucherschutz (Hessian Ministry of Agriculture), Financial data on agricultural support in Hesse.
5. OECD, Database. Producer and Consumer Support Estimate 1986 – 2006.
6. Hessisches Statistisches Landesamt (HSL), Hessische Gemeindestatistik. Wiesbaden, various issues.

7. Hessisches Statistisches Landesamt (HSL), Hessische Kreiszahlen. Wiesbaden, various issues.
8. Cuddy, J. and P. Della Valle (1978). Measuring the instability of time series data. Oxford Bull. Econ. Statist., 40 (1), 79-85.
9. Anders, S., J. Harsche, R. Herrmann and K. Salhofer (2004). Regional income effects of producer support under the CAP. Cah. Econ. Sociologie Rurales 73:103 – 122.
10. Allanson, P. (2006). The redistributive effects of agricultural policy on scottish farm incomes. J. Agr. Econ. Vol 57, no. 1, 117-128.
11. Koester, U. (1982). Policy Options for the Grain Economy of the European Community: Implications for Developing Countries. Research report no. 35, International Food Policy Research Institute.
12. Klausing, O. (1987). Die Naturräume Hessens. Schriftreihe der Hessischen Landesanstalt für Umwelt, Heft 67, Wiesbaden.
13. Robinson, G. (2004). Geographies of agriculture: globalisation, restructuring and sustainability.
14. Hessisches Ministerium für Umwelt, ländlichen Raum und Verbraucherschutz (Hessian Ministry of Agriculture) (2007). Jahresagrarbericht 2007.
15. OECD, Agricultural Policies in OECD Countries: Monitoring and Evaluation, various issues.
16. Krugman, P. (1991). Increasing Returns and Economic Geography. J. Polit. Economy, 99: 483-499.

- Authors: Rüdiger Elsholz and Johannes Harsche
- Institute: Institute of Agricultural Policy and Market Research
- Street: Senckenbergstr. 3
- City: Giessen
- Country: Germany
- Email: ruediger.elsholz@agrar.uni-giessen.de