Effects of agricultural policy measures on gross transfers to farmers: Intertemporal and interregional evidence from the CAP

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Abstract
This paper analyses the effects of the Common Agricultural Policy (CAP) on gross transfers over time and across regions. Depending on the type of instrumentation to support agriculture, the volatility of gross transfers differs. While assistance arising from market price supports, regarded as independent from the world market levels, fluctuates intertemporally, direct payments are constant. Empirical findings for the CAP show a reduction of the transfer volatility on grain markets. For beef and veal this effect is not significant, because price support is still large in these markets. If agricultural support is biased in favour of specific commodities, territorial heterogeneity leads to an uneven distribution. By applying a regionalised concept of producer support estimates (PSEs) for the German Federal States, results indicate significant interregional variation of CAP support.

Keywords
CAP, gross transfers, temporal impacts, regional distribution, PSE

JEL Classification
Q11, Q18

1. Introduction

Since its inception in the 1960s, the CAP had experienced merely small changes for decades. Market price support was the main policy measure to subsidise domestic agriculture. Assistance was not equal across commodities, but some gained more than others. Due to increasing budgetary costs and trade negotiations within the GATT, the CAP had to change. In 1992, the so-called McSharry reform shifted partially the CAP instrumentation from market price support towards direct payments. Despite this, market price support remained the most important device to subsidise agricultural producers. Besides, direct payments were 'coupled', because they were related to what a farmer produces[1]. Thus, the production of specific products was further subsidised. The Agenda 2000 reform deepened the McSharry reform and moved more toward direct payments in 1999. Even with the reforms in 1992 and 1999, the CAP has still distorted the agricultural output mix and production. Although market price support was reduced significantly by the CAP reforms, it is still EU's major instrumentation to subsidise domestic farmers. As the leftside of Table 1 indicates, more than half of the assistance to agricultural producers is related to market price support. Direct payments based on area planted or animal numbers have become increasingly important. Today they account for more than one quarter of total support. The rightside of Table 1 shows the distribution of CAP support across key commodities. The percentage PSE, as measured by the Organisation for Economic Co-operation and Development (OECD), is the ratio between total transfers and the total value of production including transfers. It points out that EU agricultural support is biased in favour of some commodities.

Table 1: Agricultural support within the European Union

Composition			***Distribution***	
	1986-88[a]	***2001-03[b]***	***% PSE[c] in 2001-03***	
Market Price Support	*86.0%*	*56.8%*	*Beef and veal*	*74*
Payments based on			*Sugar*	*56*
input used	*5.2%*	*7.7%*	*Sheepmeat*	*53*
output	*5.2%*	*3.7%*	*Milk*	*47*
area planted/animal numbers	*2.8%*	*27.3%*	*Wheat*	*45*
input constraints	*0.7%*	*4.0%*	*Poultry*	*37*
historical entitlements	*0.0%*	*0.6%*	*Oilseeds*	*36*
overall farming income	*0.0%*	*0.0%*	*Pigmeat*	*22*

[a] 1986-1988 EU-12, [b] 2001-2003 EU-15, [c] Producer Support estimate

Source: OECD (2004), Author's calculations.

[1] Following the definitions of Cahill (1993, pp. 2-3), these payments were partially decoupled, because production is less than that would occur if market price support is granted, but greater than what would occur without policy measures. If direct payments do not affect production, the policy measure is fully decoupled.

With its reform in 2003 the CAP continued to abandon price support and further shifted towards direct payments. Since the beginning of 2005 'decoupled' direct payments have come into operation and have mostly replaced the former direct payment scheme. Henceforth, the amount of direct payments a farmer obtains is based on payments he received in the reference period 2000 to 2002. Referring to the OECD classification in Table 1, gross transfers arising from historical entitlements will increase significantly within the next years, due to the conversion of the previously 'coupled' direct payments based on area planted or animal numbers.

Within the last decade, numerous studies examined the impacts of the changing CAP, using various modelling approaches[2]. In doing so, mainly the effects on production were analysed while few studies have focused on intertemporal and interregional effects of gross transfers. A good overview of work relating to redistributive implications of the CAP can be found in Anders et al. (2004). Nevertheless, two studies shall be particularly highlighted. Tarditi and Zanias (2001) investigate territorial and social income redistribution for the time-period 1989-95 by pooling sixty-nine large regions (NUTS 1[3]). Their analysis distinguishes between alternative policy measures, including market price support as well as 'coupled' and 'decoupled' direct payments. They conclude that so far the CAP has transferred income from richer urbanized regions towards poorer regions and agricultural support has been positively correlated to the economic size of farms. A report of the European Spatial Planning Observation Network (ESPON) programme (ESPON 2004) aims at analysing the territorial impacts of the CAP and rural development policies at the NUTS 3 level within the EU. Results indicate that total CAP Pillar 1 support is not targeted at cohesion and corresponding to Tarditi and Zanias (2001) largely proportional to average farm business size. The report infers that information on the regional and territorial dimension of the CAP is still poorly developed and further research is required.

Taking up that position, one objective of this paper is to analyse interregional CAP effects across the German Federal States. Because they are characterised by a large heterogeneity in view of their agricultural structure, identifying the regional dimension of the CAP is of particular interest. While the newly-formed German states are dominated by large-scale farming and crop production, the old states show diversified land coverage and farm sizes. A regionalised PSE approach suggested by Anders et al. (2004) appears to be a useful construct in examining territorial distribution of CAP support. Apart from the interregional dimension, this paper analyses intertemporal effects of the changing CAP on gross transfers and examines whether product specific support tends to become more stable over time.

The paper is organised as follows: Section two discusses theoretically the intertemporal and interregional implications of changing agricultural policy measures with a special view on CAP reforms. It derives two hypotheses in view of CAP support over time and across regions. Section three describes the methodology of measurement and the data used for analysis. The paper then tests the hypotheses developed in section four and presents empirical results. Concluding remarks are offered in the final section.

2. Hypotheses for intertemporal and interregional CAP support

This section develops two hypotheses in view of the changing CAP. While first intertemporal effects on gross transfers are examined, the second part deals with interregional effects.

Depending on the farm program to support agricultural producers gross transfers show different intertemporal volatilities. For purposes of this section, agricultural policy instruments are divided into two categories, market price supports and direct payments. According to the price-support policy of the EU, fixing domestic prices is regarded as independent from the world market price. Direct payments are viewed as lump-transfers and constant over time. Consider that farmers can be supported either by instruments of the first group, by instruments of the second group or by a combination of them. In algebraic form gross transfers *GT* to agriculture are shown in the upper part of Table 2, where

[2] For a recent review of literature in this field see Andersson (2004). An overview over the main modelling approaches is given in Salvatici et al. (2000). Intertemporal aspects of policies on income are analysed in Newbery and Stiglitz (1981).

[3] The nomenclature of units for territorial statistics (NUTS) was introduced by the EU. It provides a hierarchical classification of the Member States territories.

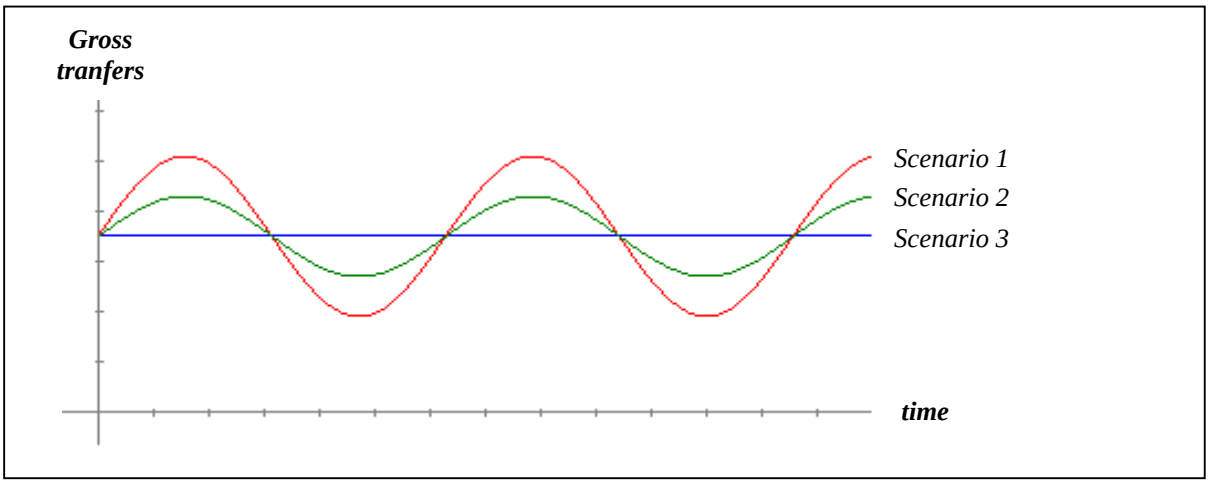
P_d denotes the domestic price, P_w is the world price, Q_d is the level of domestic production and D are direct payments. Table 2 gives three different policy scenarios. Scenario 1 assumes that gross transfers arise only from market price supports. In scenario 2 assistance to farmers consists half of market price support and half of direct payments. And finally, in scenario 3 gross transfers result only from direct payments.

Table 2: Hypothetical compositions of policy measures to support agriculture

Gross transfers		*Market Price support*		*Quantity produced*		*Direct payments*
GT	=	$(P_d - P_w)$	*	Q	+	D
Scenario 1		*100 %*		*constant*		*0 %*
Scenario 2		*50 %*		*constant*		*50 %*
Scenario 3		*0 %*		*constant*		*100 %*

Source: Author's presentation.

Assuming a fixed quantity produced, with market price supports, the value of transfers depends on the level of world prices. Hence, due to price volatility on world markets support levels vary over time. By moving from market price supports towards direct payments, transfers become more stable as a result of the lump-sum payments. If support arises only from direct payments, transfers do not fluctuate. Figure 1 gives a graphic representation of the different effects on gross transfers arising from the previously mentioned policy scenarios. While on the left-hand vertical axis the value of transfers is plotted, the x-axis depicts time. Starting from scenario 1 this paper assumes that world prices are volatile. Gross transfers based on market price supports also fluctuate, but inversely to international prices. If world prices are high, support to producers is smaller than with lower international prices. As indicated in Table 2 scenario 2 assumes gross transfers arise half from market price supports and half from direct payments. Figure 1 shows the resulting volatility of gross transfers is reduced. Scenario 3 is depicted by the horizontal line in Figure 1, indicating constant gross transfers over time.



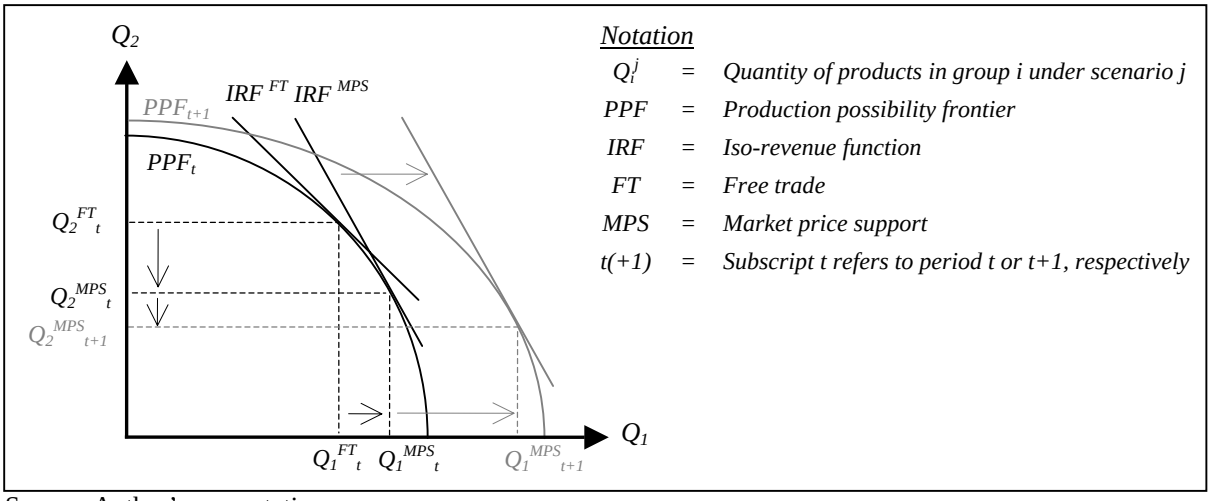
Source: Author's calculations.

Figure 1: Intertemporal effects of agricultural policy measures on gross transfers

For grain as well as beef and veal markets, the CAP shifted partially from market price supports towards direct payments. Following the aforementioned considerations, it is hypothesized that the volatility of transfers has reduced on these markets due to the CAP reforms.

Turning away from intertemporal to interregional effects of the CAP, the crux of the matter is that support was and still is distributed unevenly across commodities. While some receive large assistance, others receive less or no support. This implies that subject to the type of farming within regions, gross transfers arising from the CAP differ. Additionally, the imbalanced support between commodities has effects on the output mix within regions. If selected products in a market receive subsidies while others do not, the production is distorted.

This argument can be clarified utilising as a basic economic tool, the production possibility frontier (PPF). It describes the possible combinations of maximum output that can be attained for a given set of inputs. The optimal output mix is obtained by maximising total revenue. Suppose the agricultural output of a country or region is divided into two groups, where Q_1 and Q_2 denote the vectors of products within each group. Let the possible combinations of Q_1 and Q_2 be given by PPF_t in Figure 2[4].



Source: Author's presentation.

Figure 2: CAP effects on output mix

To identify the revenue maximising output mix an iso-revenue function is derived which is defined as the sum of partial revenue accruing from each output. It is assumed that total revenue is a function of Q_1 and Q_2 and its corresponding price vectors P_1 and P_2[5]. First suppose the agricultural market of the country under consideration faces world prices and no governmental support is granted. The iso-revenue function is given as IRF^{FT} in Figure 2. At that point where the iso-revenue function is tangent to the PPF, the optimal output mix is obtained (cf. Koester 1992, p. 82). The optimal combination of output is given at ${Q_1}^{FT}_t$ and ${Q_2}^{FT}_t$. Suppose now the country under consideration introduces market price support for Q_1 while Q_2 continues to face world prices. Since the slope of an iso-revenue function is defined as the price ratio of Q_1 and Q_2 the iso-revenue function will turn. Here, the slope of the iso-revenue function is $-(P_1/P_2)$ and thus, if P_1 is increased, IRF^{FT} will turn clockwise resulting in a new optimal output mix. This situation is given by IRF^{MPS} in Figure 2. It can be seen that supporting prices of Q_1 increases output to ${Q_1}^{MPS}_t$. Because the set of inputs is given, output of Q_2 decreases to ${Q_2}^{MPS}_t$. Figure 2 shows that policy measures which change the price ratio between commodities result in a distortion of output. For illustration, it was assumed that the policy measure under consideration is market price support. However, it can be shown that each policy measure which changes 'effective prices'[6] will also change the price ratio and distort the output mix.

In the long run, the bias in output mix will likely increase, because the PPF begins to distort apart from the turn of the iso-revenue function. In general, the PPF shifts outward over time due to technical

[4] Neoclassical production theory is assumed.

[5] In algebraic form the iso-revenue function is defined as $R = Q_1 * P_1 + Q_2 * P_2$ where P_1 and P_2 are the vectors of output prices for Q_1 and Q_2, respectively. Rewriting this expression yields $Q_2 = (R/P_2) - (P_1/P_2) * Q_1$. With an increasing distance of the iso-revenue function from the origin, revenue increases also.

[6] The term 'effective price' refers to an article by Jongeneel (2003, p. 316) who proposes a method for incorporating policy measures into output prices.

progress. If some commodities are supported in a market and their profitability is increased, more emphasis is put on technical progress in these products. Thus, the PPF shifts outward unevenly, i.e. there is a bias towards the production of subsidised commodities. The long run PPF is given as PPF_{t+1}. It shows that in period $t+1$ quantity of Q_1 increases to ${Q_1}^{MPS}{}_{t+1}$ while quantity of Q_2 decreases to ${Q_2}^{MPS}{}_{t+1}$.

As regions differ in view of site-related factors[7], their PPFs differ also in curvature and extension from the origin. Through this, the agricultural output mix shows large heterogeneity across regions. If agricultural policy measures, regardless of their nature, are imbalanced between commodities some regions receive more subsidies than others. Hence, 'coupled' direct payments do not reduce the heterogeneous territorial incidence of agricultural support, compared to market price support.

3. Methodology of measurement

This paper adapts the OECD definition for gross transfers to support agricultural producers, namely the PSE. Since 1986 the OECD derives annually several indicators to measure agricultural assistance within its member states. This allows for a comparison of impacts of agricultural policies across countries, but regional effects remain hidden. Following Anders et al (2004), this paper applies a top-down procedure to analyse gross transfers over time and across regions. Utilizing OECD's PSE at the EU level, this paper regionalises agricultural support down to the NUTS 1 level[8]. The OECD's absolute PSE measures the annual monetary value of transfers, both from taxpayers and consumers to support agricultural producers (OECD 1990). Therefore, the PSE is an aggregate measure consisting of various instrumentations regardless of their nature. In algebraic form the absolute PSE is defined as:

$$\text{PSE} = (\text{P}_\text{d} - \text{P}_\text{w}) * \text{Q}_\text{d} + \text{D} - \text{L} + \text{B} \tag{1}$$

where P_d , P_w , Q_d and D are denoted as aforementioned in section two, L are levies on producers and B includes all other forms of budgetary-financed support. To evaluate the amount of transfers per unit of the commodity produced i, gross transfers are divided by its quantity supplied:

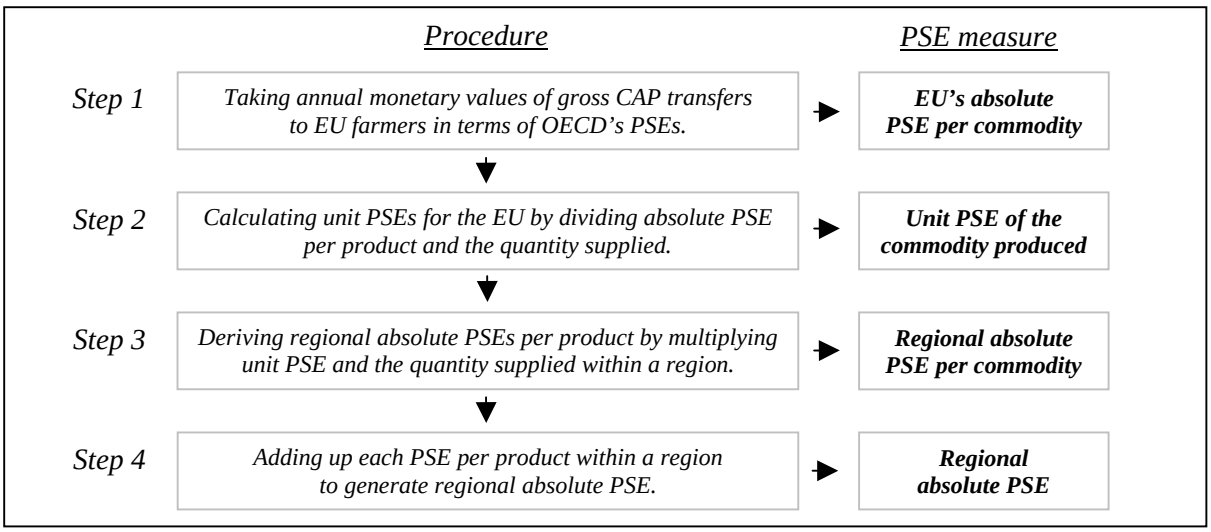
$$\text{PSE}_\text{i}^{\text{unit}} = \frac{\text{PSE}_\text{i}}{\text{Q}_\text{i}}. \tag{2}$$

To derive agricultural support flows for a disaggregated regional level, Equation (2) is the starting point. By multiplying the unit PSE and the quantity supplied within a specific region, its total amount of agricultural support can be calculated:

$$\text{PSE}^\text{R} = \sum_{\text{i}=1}^{\text{n}} (\text{PSE}_\text{i}^{\text{unit}} * \text{Q}_\text{i}^\text{R}) \tag{3}$$

where superscript R denotes the region under consideration. Applying Equation (3), this paper estimates gross transfers arising from agricultural policies for thirteen German Federal States[9]. The analysis covers the period from 1986 to 2003. Moreover, the dataset employed in this paper has been obtained from the Zentrale Markt- und Preisberichtsstelle and the Statistical Yearbook for the Federal Republic of Germany. PSEs per region are derived from a total of nine commodities, that account for almost 75 per cent of EU agricultural support. Appendix I shows the commodities and regions under consideration. The OECD lists the commodities wool and eggs as well as the aggregate 'other commodities', additionally. As the data for eggs or wool produced are not available at the level of the Federal States, these products are not considered in the analysis. However, eggs and wool account for a relatively small portion of total PSE. The regionalised concept of PSEs is summarised in Figure 3.

[7] Here, site-related factors denote a wider definition beyond natural conditions alone (e.g. slope of the land, temperature, and available water capacity of the soil) factors like the average farm and field size.
[8] Alternatively a bottom-up approach is possible. This implicates large and consistent data on the regional level which is often poor. An application of this approach can be found in the EPSON report (2004, pp. 68-88).
[9] Due to lack of data, the three city states Berlin, Bremen and Hamburg are not accounted for.



Source: Author's presentation.

Figure 3: Regionalisation of the PSE indicator

The method of regionalisation can be viewed as a four-step-top-down procedure starting from the EU's absolute PSE. Because the OECD lists in its annual report absolute PSEs per commodity for a range of key products, it is possible to calculate unit PSEs. In the third step these unit PSEs are multiplied by the quantities supplied within the region under consideration. Adding up each of these PSEs per product, results in an indicator of CAP gross transfers into a region. To compare these values across regions with different sizes, three different basic units were taken. As indicated in Table 3, the level of support is calculated per hectare (Equation (4)), per agricultural labour (Equation (5)) and per farm (Equation (6)) where A^R is the agriculturally used area, L^R is the number of agricultural labour and F^R is the number of farms within the region under consideration.

Table 3: Measurement concepts of support

Gross transfers per hectare	Gross transfers per agricultural labour unit	Gross transfers per farm
(4) $PSE^R_{ha} = \frac{PSE^R}{A^R}$	(5) $PSE^R_L = \frac{PSE^R}{L^R}$	(6) $PSE^R_F = \frac{PSE^R}{F^R}$

Source: Author's presentation.

4. Empirical Results

The data in this analysis covers the period from 1986 to 2003. Therefore, it refers to both, the 'traditional' CAP, relying heavily on market price support, as well as the 'new' CAP with gross transfers partly based on direct payments. As section two indicates, it is assumed that the changes in EU agricultural markets have reduced support volatility over time. In this regard, the central aspects of the CAP reforms in 1992 and 1999 affect the markets for grains and beef. Support prices were cut to some degree (by a total of 50 and 35 per cent for grain and beef, respectively) while 'coupled' direct payments were launched to compensate for price reduction. To test whether this new instrumentation already stabilises gross transfers to EU farmers' product specific support on a per unit basis is derived. By utilising Equation (2), unit PSEs for wheat, 'other grains' as well as the product category beef and veal are calculated. That followed, the sample is split into two subgroups, characterising one period where gross transfers arise almost solely from market price support, and on the other hand one period where besides to price support, direct payments were granted. Descriptive statistics for the period from 1986 to 2003 are presented in Table 4. It shows total CAP support per ton for wheat, other grains as

well as beef and veal, expressed as unit PSEs. On average, the total value of transfers per ton of wheat produced is 105.30 Euro, whereas other grains receive a total value of 82.43 Euros per ton. This indicates biased support and distorts grain markets. The total value of transfers to beef and veal is on average 2207.75 Euros per ton. Besides, Table 4 lists the minimum and maximum values of the unit PSEs. There exists a large range for agricultural support per ton of the commodity produced. The main reason for this volatility in gross transfers is due to its large portion relying on market price support. The dispersion of gross transfers per unit expressed as the coefficient of variation is almost four percentage points higher for wheat than for other grains. Similar to wheat the unit PSEs for beef and veal disperse about 20 per cent relative to its mean.

Table 4: Unit PSEs for selected agricultural commodities for the period from 1986 to 2003[a]

	Wheat	Other grains	Beef and veal
Mean	*105.30*	*82.43*	*2207.75*
Range	*53.82 - 138.02*	*52.22 – 104.22*	*1463.83 - 3106.40*
Coefficient of Variation	*20.5 %*	*17 %*	*21.8 %*

[a] in Euros per ton

Source: Author's calculations.

Because the McSharry reform was fully implemented in 1996, the given time series is divided at that year[10]. That is the period from 1986 to 1996 characterises the 'traditional' CAP while subsequent years refer to the 'new' CAP. Descriptive statistics indicate that for all three commodities the variance in unit PSEs is larger for the traditional CAP than for the new CAP. This supports the hypothesis of a reduced volatility in gross transfers. To test for variance equality an F-statistic is derived. The condition of normal distribution for the subgroups is satisfied. The F-test tests the null hypothesis that the variances in both subgroups are equal. The alternative hypothesis is that the variance of unit PSEs of the traditional CAP exceeds the corresponding variance of the new CAP. The F-statistic is given by

$$F = \frac{\sigma_L^2}{\sigma_S^2} \tag{7}$$

where σ_L^2 denote the variance of that period with the larger variance and σ_S^2 with the smaller, respectively. Table 5 presents the results of the F-statistics. It shows that for wheat and other grains the variance of the unit PSEs is significantly larger for the period of the traditional CAP than for the period of the new CAP. However, for beef and veal the null hypothesis can not be rejected. This implies that the variances in gross transfers for beef and veal do not differ significantly between the two periods.

Table 5: F-statistics for testing variance equality between unit PSEs arising from different policy measures

	Wheat	Other grains	Beef and veal
F-statistic	*9.07***	*5.48**	*2.32*

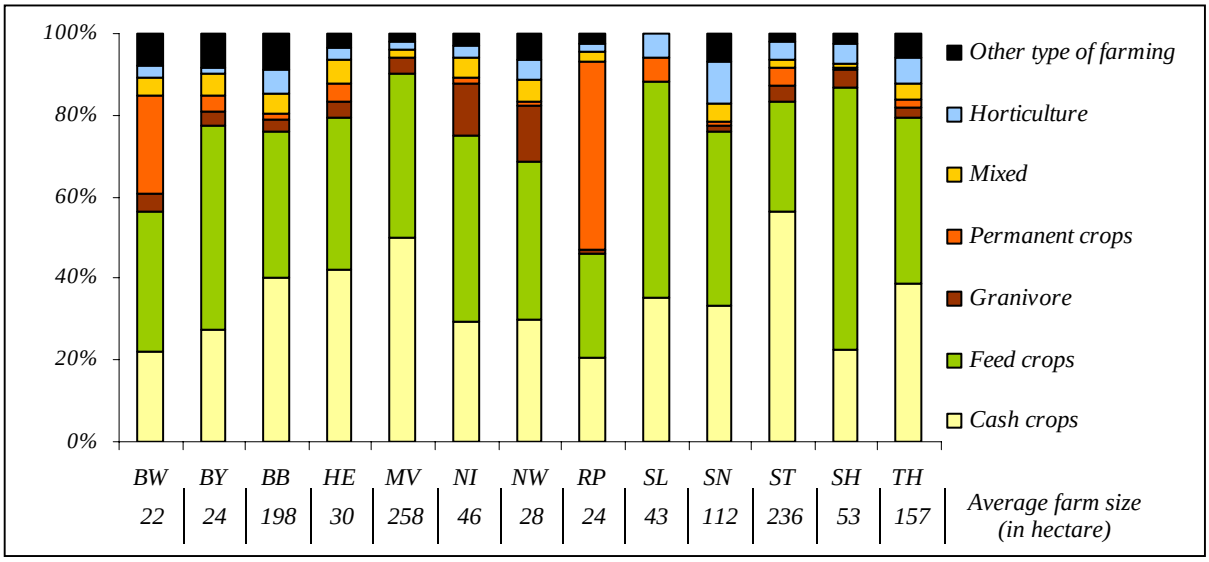
** (*) Statistically significant at the 99 % (95 %) level.

Source: Author's calculations.

[10] This split is somewhat arbitrary and could have taken place earlier. It is possible to trisect the sample and analyse the effects for the 'pre McSharry period', the 'post McSharry period' as well as the 'post Agenda 2000 period'. However, trisecting would lead to small subsamples.

The hypothesis of reduced support volatility due to the changes on EU agricultural markets holds for grain**,** but not for beef and veal markets. This is consistent with the fact that the CAP reforms draw domestic grain prices nearer to world market levels than domestic prices for beef and veal.

The second hypothesis developed in this paper states, that due to its heavy weight on some products, CAP support differs in its territorial incidence. To test for this, gross transfers arising from EU agricultural support are calculated for the German Federal States. The regions under consideration show major differences in their agricultural structure. E.g. the newly formed German states in the east are dominated by large scale farming. On the contrary, the regions in the south-western part of Germany show small-scale farming. In the north-western regions medium-scale farming can be found. In view of output mix, the newly formed German states are dominated by crop production, whereas the old West German states are heterogeneous. Figure 4 identifies the large variety within the regions under consideration regarding the type of farming.



Source: Author's calculations with data from the Statistical Yearbook for the Federal Republic of Germany.

Figure 4: Share of different farming systems within the German Federal States in 2001[11]

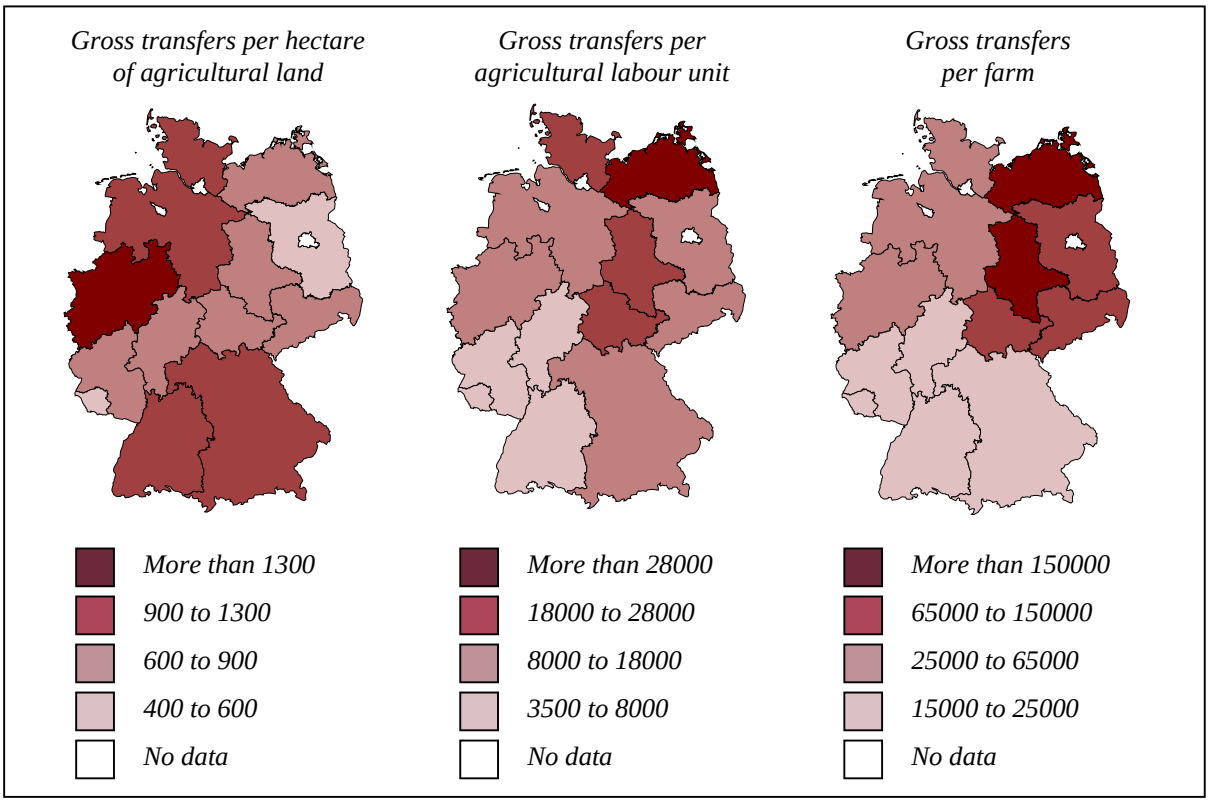
The abbreviations of the regions can be found in Appendix I. Figure 4 shall not be discussed in detail, but indicating the range, farm types differ across German regions. Aside from the farming systems, it also shows the average farm size for the regions under consideration. It ranges from 22 to 258 hectare while significant differences exist between the old West German states and the former GDR states. As a result, economies of scale are at variance and average costs differ across regions.

This paper takes support per hectare, per agricultural labour unit and per farm as units for analysis. Figure 5 shows the distribution of gross transfers to agriculture arising from the CAP. It points out different levels of support across regions. In Germany CAP support per hectare varies from about 400 to more than 1300 Euros per hectare, indicating a large territorial dispersion. Large support levels per hectare occur in the north-west and south of Germany. Referring to acreage, livestock products receive higher levels of support in comparison to crops. As a result, regions with high livestock densities, e.g. cattle, receive larger gross transfers per hectare than regions with smaller livestock densities. Significant correlation coefficients were found between support levels per hectare and cattle per hectare as well as milk production per hectare (at the 99.9 and 99 per cent level, respectively). However, a significant negative correlation coefficient was found between support levels per hectare and average farm sizes across the regions (at the 95 per cent level). This supports the observation that on smaller farms mainly the production of cattle and milk dominates.

Gross transfers per agricultural labour unit are shown in the middle map of Figure 5. Per labour unit, CAP support within Germany spreads from 3500 Euros to more than 28000 Euros. Higher levels of support per agricultural labour unit seem to be proportional to regions with larger farm sizes,

[11] The thirteen regions are listed in alphabetical order.

indicating a significant correlation (at the 99.9 per cent level). Thus, particularly in the newly formed German states the PSE per agricultural labour unit is high. But also the regions with medium-scale farming tend to receive higher levels of gross transfers per labour unit.



Source: Author's calculations with data from OECD, various issues, Zentrale Markt- und Preisberichtsstelle, various issues and the Statistical Yearbook for the Federal Republic of Germany.

Figure 5: Gross transfers to German agricultural producers in 2003 (Euro)

The map on the right hand side of Figure 5 shows gross transfers per farm. It ranges from 15000 Euros, in regions located in the south-western part of Germany, to more than 150000 Euros in the newly formed German states. Gross transfers per farm are highly associated to its economic size and significant correlation was found (at the 99.9 per cent level). In sum, Figure 5 indicates the different incidence of gross transfers across the regions under consideration. However, depending on the unit support is measured, gross transfers vary. Table 6 shows the coefficients of correlation between the different measures of support, utilised in this paper.

Table 6: Correlation between measures of gross transfer

	PSE per hectare	PSE per agricultural labour unit	PSE per farm
PSE per hectare	1.00	0.07	-0.26
PSE per agricultural labour unit		1.00	0.91***
PSE per farm			1.00

*** Statistically significant at the 99.9 per cent level.

Source: Author's calculations.

While gross transfers per hectare is not correlated to the other indicators, there exists a significant correlation between gross transfers per agricultural labour unit and per farm.

The analysis above shows significant heterogeneity in view of the gross transfers arising from the CAP. While some regions are beneficiaries in view of support per hectare, they can be at disadvantage e.g. in view of support per labour. But, some regions in the mid-western part of Germany receive small transfers, independent from how support is measured. In Appendix II the regions are ranked according to their gross transfers per hectare, per agricultural labour unit and per farm. Due to the heavyweight on specific commodities, some regions with a large livestock density receive more support on a per hectare basis than others. On the other hand, regions dominated by large-scale and/or arable farming receive large transfers per farm and per agricultural labour unit, respectively.

5. Conclusion

The paper has explored two issues relating to intertemporal and interregional impacts of the changing EU agricultural policy. First, the intertemporal incidence of gross transfers arising either from price supports or direct payments was analysed. The empirical results appear reasonable and indicate a reducing volatility of CAP support over time for grain markets. Because price support in meat markets is still large, the dispersion of support for beef and veal has not been affected significantly. Second, this paper identified the uneven distribution of CAP support across regions. However, these results depend largely on the indicator of support. Assistance per hectare is proportional to cattle density and milk production within a region. Assistance per agricultural labour unit is associated with the economic size of farms. Between the two measures 'support levels per farm' and 'support levels per agricultural labour unit'**,** significant correlation was found. Germany shows large gross transfers per farm and per agricultural worker in its newly formed states. These regions are characterised by large-scale farming with a focus on crop production. Support levels per hectare are large in the north-west and south of Germany where cattle densities and milk production are high.

The fundamental changes of the CAP in 2003 will again affect the distribution of gross transfers. By a further abandonment of market price supports and replacing the former direct payments with a single payment based on historical reference, CAP support tends to become less volatile in the future. In view of the regional distribution of gross transfers, the CAP reform of 2003 will have different effects, depending on which model is implemented at the national level. While the 'standard model' is more likely to maintain the current distribution of gross transfers, the 'regional model' has redistributive effects.

Finally, the limitations of this analysis must be stressed. This paper focussed on the intertemporal and interregional incidence of the changing CAP on gross transfers. In doing so, the effects on farmers' revenue or income remain hidden. To account for them would be a much more complicated task and is far beyond the scope of this article. Further research is encouraged to address these issues.

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Appendix I: List of regions and product variables

	Regions		Product variables
1	Baden-Württemberg (BW)	1	Wheat
2	Bayern (BY)	2	Other grains including
3	Brandenburg (BB)		Triticale
4	Hessen (HE)		Maize
5	Mecklenburg-Vorpommern (MV)		Rye
6	Niedersachsen (NI)		Oats
7	Nordrhein-Westfalen (NW)		Barley
8	Rheinland-Pfalz (RP)	4	Rapeseed
9	Saarland (SL)	5	Sugar Beets
10	Sachsen (SN)	6	Milk
11	Sachsen-Anhalt (ST)	7	Beef and Veal
12	Schleswig-Holstein (SH)	8	Sheepmeat
13	Thüringen (TH)	9	Pigmeat Poultry

APPENDIX II: Regions' rank according to different indicators of gross transfers

	BW	BY	BB	HE	MV	NI	NW	RP	SL	SN	ST	SH	TH
Rank according to													
PSE per hectare	*5*	*4*	*13*	*7*	*8*	*3*	*1*	*11*	*12*	*10*	*9*	*2*	*6*
PSE per labour	*12*	*9*	*7*	*11*	*1*	*5*	*6*	*13*	*10*	*8*	*2*	*3*	*4*
PSE per farm	*10*	*9*	*4*	*11*	*1*	*7*	*8*	*13*	*12*	*5*	*2*	*6*	*3*