Flattening and redistribution of the CAP direct payments for the EU27 regions

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Abstract: The paper presents key results regarding a possible reform of the Common Agricultural Policy direct payments, based on a scenario analysis by the CAPRI (Common Agricultural Policy Regionalized Impact) modelling system. Combining aggregate programming models at the NUTS 2 level with a global spatial multi-commodity model, it enables depicting the impacts of different policy and economic scenarios from regional to the global scale. The paper discusses simulated impacts on farm income and agricultural markets from implementing the European flat rate hectare payment corrected for the purchasing power disparities across the Member States while reducing the overall budget outlays for direct payments by 50% and dismantling the remaining coupled support to ruminants. The results are an outcome of a comparative static analysis against a reference scenario which assumes the Health Check policy in 2020. The model results suggest a drop of the agricultural gross value added by 9% at the aggregate EU27 level compared to the reference scenario. Impacts differ between the Member States groups, Member States and regions, depending on the share of premiums in the income from agriculture, specialization and competitiveness of production. The largest reduction is projected for the suckler cow herd, dropping by 6% compared to the reference scenario. The drop is caused by removing the coupled support and affecting mostly the herds in Spain and France.

Key words: agriculture, Common Agricultural Policy (CAP), sector modeling, mathematical programming

The Common Agricultural Policy (CAP) is in the budgetary terms the most prominent policy arena of the European Union (EU), reflecting its highly integrated character at the EU level. Historically, it was strongly geared towards food security by providing economic incentives for the increased agricultural output. These incentives also supported the economic integration of the EU through economic advantages for more rural regions and Member States who benefitted less from the integration of other sectors. The current layout and distribution of the CAP support across the Member States and regions are strongly conditioned on the past evolvement of the CAP through a sequence of reform steps often based on complex compromises in the European Council. These past reforms reflect a larger set of policy aims, in parts diverging, such as reducing budget outlays, easing compromises in multi-national trade negotiations, improving transfer efficiency of agricultural subsidies, decreasing unwarranted externalities of intensive agriculture, more budget stability or contributing to regional development. Distributional effects rank high in the current public debate about comprehensive reform proposals of the CAP, a focus brought forward by those players fearing to lose the most or feeling disadvantaged by the current policy layout. The fair distribution of CAP support mostly concern direct payments, due to their large share on the overall CAP budget and their immediate farm income effect.

The debate about a reformed CAP for the medium-term financing period 2014–2020 (The CAP towards… 2010) is more open, wide-spread and diverse compared to earlier ones. International trade obligations, continuous demands from stakeholders and certain EU Member States to reduce the costs of the CAP, and the collectively recognized need to justify the CAP anew (OECD 2003; Yrjölä and Kola 2004; Begg et al. 2008; Bureau and Mahé 2008) have resulted in a wide range of policy proposals in the last years, coming from stakeholders, research, as well as from the civil society (Baldock et al. 2010). One of the rather probable options of further reform steps is full decoupling of direct payments combined with more uniform per ha payment rates. The political outcome of the reform process will largely depend upon the

ongoing EU budget debate for the next mid-term financing period, on the division of power between the Member State countries and possible external pressures, such as the international trade obligations.

This paper outlines and evaluates one comprehensive CAP post 2013 reform scenario, focusing on farm income and market impacts on the European agriculture. Using the CAPRI modelling system (Britz and Witzke 2008), the introduction of the reduced European flat rate payment, corrected for the purchasing power disparities across Member States in 2020, in combination with a 50% reduction of the EU wide budget for the single-farm payment is compared with a continuation of the 2008 Health Check provisions. The analysed reform scenario thus reflects some key proposals emerging from the recent public debate concerning the long term future of the CAP (Hervieu 2010; Matthews 2010a), especially regarding the reduction of budget outlays for direct payments and decreasing the rather large differences in these payments across the EU Member States.

CAPRI is a comparative static partial equilibrium model of the European agriculture and a reference modelling tool used by the European Commission for the ex-ante impact assessment of economic and policy changes on the agriculture of EU27, Norway and the candidate countries for EU accession at regional level (Support to agricultural ... 2009). The CAPRI modelling system is also applied in the preparation of the official economic forecasts for the European agriculture (Support to agricultural ... 2009). In our analysis, its application is motivated mostly for two reasons. Firstly, due to its NUTS 2 resolution, it is able to depict regional differences in payments rates and the consequences of changing them based on rather detailed regional non-linear programming models. And secondly, the iterative link of these regional models with the global market model comprised in CAPRI allows a consistent analysis of market feedback and impacts.

Our comprehensive regional impact analysis covers production effects and economic indicators for the most important crops and livestock products and production activities in the EU, presenting results for different aggregate groups of EU Member States (EU27, EU15, EU10, EU2)[1], individual EU Member States (MS) and at the level of NUTS 2 regions.

MATERIAL AND METHODS

CAPRI modelling system

CAPRI[2] consists of two interlinked (sub)modules: an agricultural supply module and a market module; the latter encompasses a global multi-commodity model for key agricultural products and a young animal market module. The two modules are solved iteratively until convergence based on sequential calibration.

The agricultural supply module is composed of aggregate[3] programming models at the level of NUTS 2 regions, assuming profit maximization. There are around 250 such models for the EU27, Norway and the Western Balkans countries[4], and they are solved independently at fixed prices of outputs and inputs. Around 50 production activities according to Economic Accounts for Agriculture (EAA) are covered in the models.

The model depicts CAP premium schemes in high details, includes NPK balances and feeding activities covering nutrient requirements of animals. In addition, further constraints relate to land – differentiated by arable and permanent grass land, set-aside obligations, production balances and production quotas.

The objective function maximizes regional income from agriculture, defined as the sum of agricultural regional gross value added in producer prices and the income from direct payments plus a non-linear cost function, partly econometrically estimated. Costs matching the definition of the definition of the Gross Value Added (GVA) are either attributed to individual activities, assuming thus a Leontief technology, or captured by constraints (feeding, fertilization). It should however be noted that all crop activities as well as dairy cow and beef fattening are presented by a high and low yield variant, thus allowing for endogenous intensity adjustment.

The non-linear cost function captures the impacts of those factors not explicitly captured by constraints or the linear term of the objective function. The latter reflects revenues from outputs and variable costs whereas land is captured by constraints. An inviting interpretation in line with the assumption of profit maximizing is hence that the non-linear terms provide a dual representation of how capital and labour impact allocative decisions.

[1]EU27: all 27 EU Member States; EU15: 15 »old« Member States; EU10: »new« Member States (accession to the EU in 2004); EU2: Romania and Bulgaria.

[2]The description of the applied modelling approach is summarized and adapted from Britz and Witzke (2008).

[3]Aggregate in the sense, that all the observed production activities in the region are covered in the models.

[4]An alternative version, operational since 2010 and not available at the time of our analysis, breaks down consistently each NUTS 2 region of the EU27 with the exemption of Bulgaria and Romania up to 10 farm types (Gocht and Britz 2011).

The implementation in CAPRI evolved from Positive Mathematical Programming (Howitt 1995), and thus allows the calibration of the regional models to the reference point (see subchapter Scenarios). The non-linearities allow for interior solutions and smoother and thus more credible simulation response compared to linear programs. Given the relatively small number of constraints compared to the number of endogenous variables in the regional programming model, the parameterization of the cost function determines to a large extent the allocative response in simulation. Therefore, the elements of the non-linear cost function for major crop activities are estimated econometrically on the basis of ex post data (Jansson and Heckelei 2011), whereas for the livestock activities, they are calibrated to exogenous expert elasticities. The approach can hence be termed hybrid, as it combines a programming and an econometric approach (cf. Heckelei 2002; Heckelei and Britz 2005).

The market module for main agricultural products calculates, based on sequential calibration (cf. Britz 2008), the prices which are delivered to the supply module and allows for a comprehensive market analysis as well as welfare analysis on the global, European or national levels. The market module is a spatial deterministic global multi-commodity model for around 50 primary and processed agricultural products, covering about 60 countries or country blocks in 28 trade blocks. The latter are linked via bilateral trade flows based on the Armington assumption (Armington 1969), which also allows to introduce bilaterally differentiated trade instruments such as specific and ad-valorem tariffs and tariff rate quotas as well as bilateral transport costs.

Prices of young animals are calculated in a separate market sub-module for young animals for the EU which ensures closed balances for young animals at the EU27 level. In between the iterations, a so-called premium module adjusts premium rates if ceilings in values or physical limits such as maximum eligible hectares for the different premiums schemes are overshot.

The CAPRI database comprises production data (areas, herd sizes, yields and output quantities) at the level of Member States or NUTS 2 regions, as well as input coefficients, income indicators for individual activities along with data referring to policy instruments such as production quotas and premium schemes. At the level of Member States, the database covers market balances for inputs and outputs, EAA and unit value prices, which link market balances and the EAA. Official European statistics from Eurostat are the main source of these data, along with engineering data and the Official Journal of the European Union to define policy instruments.

The global database includes the data of reference institutions and models (e.g. OECD, FAO, FAPRI, ESIM) on market balances, bilateral trade flows, foreign trade policy (e.g. tariffs, tariff quotas, preferential trade agreements, export subsidies), on domestic market measures for the EU, long-term forecasts of market balances and international price projections.

Scenarios

The model parameters in CAPRI are calibrated against a probable future state of the European and global agriculture for the year 2020[5]. The latter reflects mainly a medium term outlook for agriculture markets provided by the EU Commission, complemented by trend projections and further expert outlooks which together serves as priori information for a Bayesian estimator which chooses the most likely combination of values for the ex-ante baseline subject to a larger set of consistency restrictions. The given aggregate outlook results for the EU serve basically as a benchmark in that process. For non-EU regions and exogenous drivers forecasts from Faostat (2007) and World Bank are used. The projections by the European Commission (2006; 2007; 2008) underlying the baseline used in our analysis still assume a continuation of the 2003 Mid Term Review policy. As we aim at contributing to and reflecting on the current debate about the CAP 2014–2020 programming period, it was deemed relevant to integrate the already decided upon policy changes foreseen in the Heath Check. Accordingly, first a reference scenario based on the Mid Term Review baseline was developed.

Reference scenario

The reference scenario, which provides the comparison point for counterfactual (reform) scenarios, presents a probable future state given a fully implemented Health Check policy. It is assumed that agricultural producers fully adjust their production program to these future conditions. Major assumptions of the reference scenario, specifically regarding the macroeconomic and global agricultural market developments, related to CAP Pillar I direct payments and

[5]Base year is 2004 (the average of three years, 2003–2005).

border protection are in line with those from Witzke et al. (2009)[6].

The reference scenario takes the Member State specific implementation of the 2008 Health Check reforms into account, i.e. if the historic model, some regional model or a so-called hybrid implementation is applied, as well if some coupled payments to suckler cows and sheep and goat are kept (for United Kingdom the system for England is adopted). The EU12 countries, except Malta and Slovenia, apply the so-called Simplified Area Payment Scheme (SAPS) system. For the single farm payment (SFP), it is assumed that each hectare cropped is matched by a premium entitlement, so that all hectares draw premiums. As entitlements not used in two consecutive years are drawn from the market that is deemed a plausible assumption for a comparative static reference point.

The compulsory modulation rate is set at 5%, set-aside is abolished and intervention prices for rye, rice, milk and dairy products are either reduced or removed.

According to the equation structure of the supply model version used in the our analysis where land is treated as a fixed resource, an absolute change in decoupled payments leads to an equivalent change in the shadow price of the land as long there exist an activity with a non-zero margin, while having no impact on production. That behaviour roots in the assumptions of a fixed agricultural land endowment[7] matched by premium entitlements at the one hand and a risk-neutral, profit maximizing decision taker at the other. Further, as investment decisions are not explicitly models, effects of changed premiums on equity and access to credit are not taken into account.

Regarding the cow milk and dairy products market, the changes agreed under the Health Check of 2008 are taken into account, specifically the provisions of milk quota abolition scenario from the study of Witzke et al. (2009). Further, the sugar market reforms from 2006 and 2007 are integrated. Pillar II measures are not taken into account in version of CAPRI applied in our analysis.

For the milk and dairy products market development, EDIM model projections were integrated (Réquillart et al. 2008, quoted from Witzke et al. 2009). There are no changes to the baseline or the model structure respectively parameterization in the light of the extreme fluctuation of the world prices of agricultural products in 2007–2009 as well as the effects of the ongoing global economic recession, reflecting the comparative static nature of the system and not yet clear medium to long term impact of these developments.

Reform flat rate payment scenario with a 50% reduction in direct payments

The reform scenario is based on dismantling all coupled support while reducing the total SFP payments at EU level by 50% and replacing the Member State specific implementation of the SFP by European wide flat rate per ha payment, modulated by Purchasing Power Standards at Member State level to reflect differences in consumer prices. The scenario, implemented in the year 2020 hence attempts to model a possible reform contributing to aims expressed during the public debate on the CAP post 2013, such as a significant reduction of Pillar I spending, reduced coupled support, return to a more homogenous implementation of Pillar I, as well as increased transparency of the CAP (The Common Agricultural ... 2010). Modulation is abolished, while any other policy instruments are kept unchanged at a reference level.

In the first step, a flat rate hectarage payment is calculated from half of the sum of the available envelopes for the CAP Pillar I direct payments by Member States (modulation funds excluded), distributed to all eligible agricultural land in the form of the European single payment, with the exception of fallow land[8], which is eligible to a half payment. Next, the resulting per ha payment rate is multiplied by the Purchasing Power Standard (PPS) Index for each Member State (GDP per ... 2010). A correction factor ensures that the new Member States' envelopes and payment rate at given agricultural land cover exactly account for 50% of the original EU wide spending for SFP and SAPS.

The evolving flat rate is uniform across NUTS 2 regions in each Member State, but varies between them according to PPS indices (Table 1). The highest per ha payment is found in Ireland (169 EUR/ha), the lowest in Bulgaria (less than 52 EUR/ha), at the EU27 average of around 125 EUR/ha. As mentioned above, the change in the flat rate payment

[6]Witzke et al. (2009, p.23, Table 5 and 2009, p. 25, Table 7).

[7]A newer version comprises a land supply function to agriculture which depends on marginal economic returns to agriculture and allows for substitution between arable and permanent grass land (Jansson et al. 2010). That version was however not available at the time when our analysis was conducted.

[8]Under the flat rate payment scenario the fallow land is entitled to half of the reduced European flat rate payment. Thus, a dynamic land market is partially mimicked in the sense, that a part of the production effects can be attributed to the allocation of fallow land to production of other crops.

Table 1. Reduced European flat rate payment, adjusted by Purchasing Power Standards Index, by EU Member States in case of implementing reform scenario (payment received)

Member States	Purchasing Power Standards Index (PPS)*	Reduced European flat rate payment, adjusted by PPS Index (payment received)**
	(EU27 2008 = 100)	(EUR/ha)
Belgium and Luxembourg	115.1	143.7
Denmark	120.1	149.9
Germany	115.6	144.2
Austria	123.5	154.0
Netherlands	134.0	167.0
France	107.9	134.7
Portugal	76.0	94.8
Spain	102.6	128.1
Greece	94.3	117.5
Italy	102.0	127.0
Ireland	135.4	169.0
Finland	116.8	145.5
Sweden	120.0	149.6
United Kingdom	116.2	145.0
Czech Republic	80.3	99.8
Estonia	67.4	83.8
Hungary	64.4	79.9
Lithuania	61.9	77.2
Latvia	57.3	71.0
Poland	56.4	70.1
Slovenia	90.9	113.5
Slovakia	72.2	90.0
Cyprus	95.8	118.9
Malta	76.3	95.2
Bulgaria	41.3	51.5
Romania	41.6	51.8

*Source: GDP per ... (2010). For Romania the (last available) value for 2007 was taken

**Fallow land is entitled to a half of this payment

would have no direct allocative impacts on crop or livestock production activities in the applied model version, whereas the abolishment of coupled support of suckler cows and sheep and goat clearly impacts the allocation.

RESULTS

The key model results comprise first, the results regarding gross margins of individual activities (Table 2), defined as GVA plus premiums per ha or head of some major production activities, results regarding agricultural GVA plus premiums and results regarding the production of major products (Table 3). Depending on the crop shares in the different regions in the reference run and the difference between the premiums at NUTS 2 level under the reference and the reform scenario, average GVA plus premiums per ha for the different crops do change. The highest drop is observed for barley (–60%), reflecting the fact that it is mostly cropped in regions in the old Member States where the SFP per ha was rather high. The relative income drops are less pronounced for grain maize, soft wheat and for the aggregate group of cereals. Due to dismantled coupled supports, GVA plus premiums per head drops by about 60% in the cattle sector. The drop in suckler cows is somewhat smaller (around –42%). The income from pork and poultry meat remains relatively stable compared to the reference scenario.

Figure 1 shows the quartile distribution by absolute differences in GVA plus premiums per production unit from beef meat production by NUTS 2 regions under the reform scenario compared to the reference income. The figure reveals in which NUTS 2 regions the income from beef meat activities will be most significantly affected by the proposed reform scenario in the absolute terms.

The most negatively affected NUTS 2 regions in absolute change in GVA/head include the predominant part of France (among them also significant producers of beef meat at the European level Pays de Loire, Auvergne, Bourgogne, Limousin), all of Sweden, Finland, Denmark, majority of Portugal, Slovenia, Austria (except Burgenland), northern and north-eastern Spanish regions, part of Belgium and certain other NUTS 2 regions, less important beef meet producers. For majority NUTS 2 regions in Spain and France, which together breed around 41% of the beef meat herd in the reference run conditions, significant relative income decreases are foreseen. This is indirectly indicated in the Figure 1 as all Spanish and French regions[9] are classified into the lower two quartile classes. The upper limit of the second quartile class is positive, however, the absolute differences in all Spanish and French regions in this class are markedly negative. For Germany, Italy, Ireland and United Kingdom (and majority of their NUTS 2 regions), that

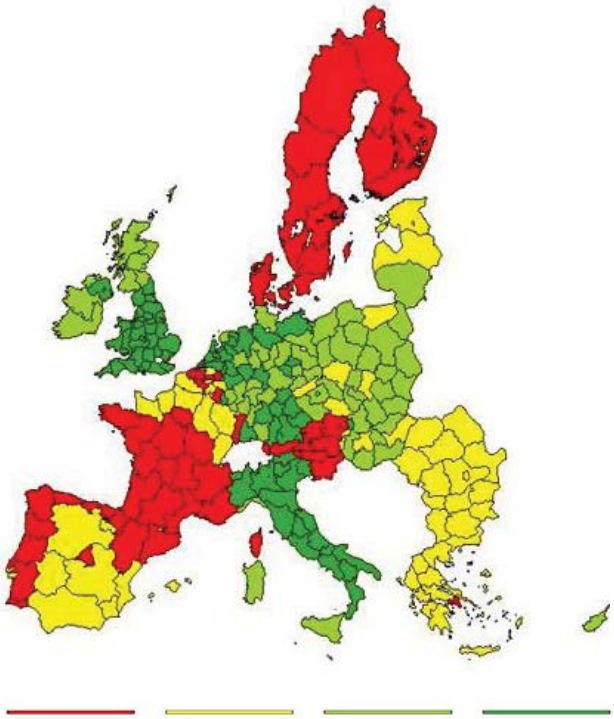
[9]Autonomous cities in Spain and overseas regions in France excluded.

Table 2. Percentage changes in Gross Value Added plus premiums per ha from production of selected crops and per unit of production of selected livestock products in case of implementing reform flat rate payment scenario by groups of Member States

Group of Member States	Crops			
	cereals	soft wheat	barley	grain maize
Percentage changes in hectarage income under flat rate payment scenario (reference scenario = 0%)				
EU27	–33.4%	–27.5%	–59.6%	–21.9%
EU15	–31.5%	–25.5%	–55.5%	–20.8%
EU10	–44.2%	–32.7%	–69.1%	–34.3%
EU2	–29.0%	–35.7%	–98.5%	–20.5%
Group of Member States	Livestock products			
	beef meat	suckler cows	pork meat	poultry fattening
Percentage changes in income per unit of production under flat rate payment scenario (reference scenario = 0%)				
EU27	–61.2%	–41.5%	0.4%	0.3%
EU15	–58.1%	–42.2%	0.3%	0.3%
EU10	–11.7%	–37.3%	0.2%	0.2%
EU2	3.8%	4.4%	0.0%	–0.4%

breed around 39% of the whole European beef meat herd in the reference run conditions, at the MS level relative as well as absolute income increases compared to the reference scenario are foreseen.

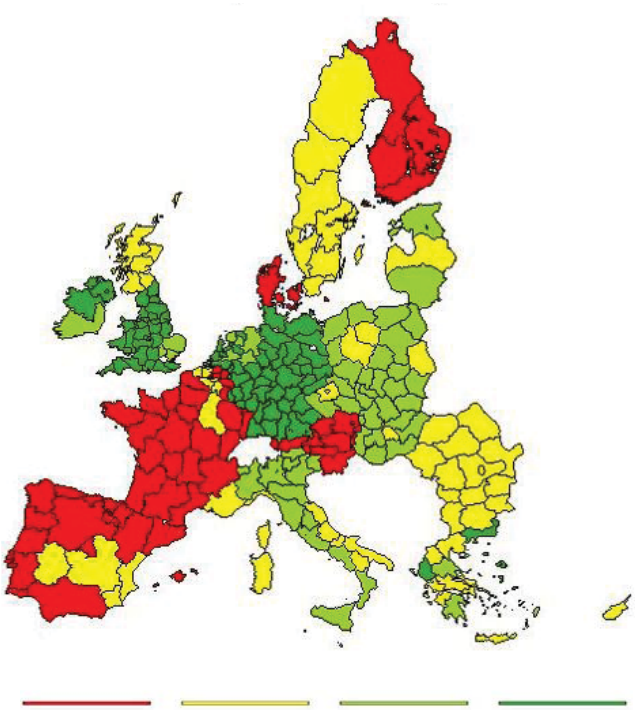
The model results show that under the reform scenario the production of pig and poultry meat remains almost unchanged at the aggregate levels compared to the reference scenario (Table 3). The situation



< –49.7 EUR/head < 3.0 EUR/head < 11.1 EUR/ head ≥ 11.1 EUR/head

Flat Rate Payment Scenario (Ø EU 27 = –24.8 EUR/head)

Figure 1. Absolute changes in income per production unit from beef meat production by NUTS 2 regions in case of implementing reform flat rate payment scenario (reference scenario = 0 EUR per head)



< –5.4% < 0.5% < 1.7% ≥ 1.7%

Flat Rate Payment Scenario (Ø EU 27 = –3.4%)

Figure 2. Percentage changes in production of beef meat by NUTS 2 regions in case of implementing reform flat rate payment scenario (reference scenario = 0%)

Table 3. Percentage changes in production quantities of selected crops and livestock products in case of implementing reform flat rate payment scenario

Group of Member States	Crops			
	cereals	soft wheat	barley	grain maize
Percentage changes in production under flat rate payment scenario (reference scenario = 0%)				
EU27	–0.1%	0.3%	0.4%	–0.8%
EU15	–0.2%	0.2%	0.3%	–1.2%
EU10	0.4%	0.6%	0.8%	0.5%
EU2	0.2%	1.1%	2.0%	–0.7%

Group of Member States	Livestock products				
	beef meat	suckler cows	pork meat	poultry fattening	cow milk
Percentage changes in production under flat rate payment scenario (reference scenario = 0%)					
EU27	–3.4%	–5.9%	0.1%	0.1%	0.4%
EU15	–3.6%	–6.0%	0.1%	0.1%	0.4%
EU10	–0.7%	–4.2%	0.1%	0.1%	0.2%
EU2	0.1%	0.1%	0.0%	–0.2%	0.3%

is different for the production of suckler cows and consequently beef meat, where the introduction of the CAP reform has extremely negative impacts[10]. At the level of EU27 and the EU15 the production of suckler cows decreases by 6% under the reform scenario, at the EU10 level by 4%, whereas at the EU2 level no marked changes are expected compared to the reference scenario. Under the reform scenario the production of beef meat in EU27 and EU15 decreases by more than 3% compared to the reference scenario. The production of beef meat in EU10 decreases by almost 1%, whereas it hardly changes at all in the EU2 compared to the reference scenario.

A major part of the decline in beef meat production stems from reduced suckler cow herds in Spain (–9% compared to reference scenario) and France (–12% compared to reference scenario), two main producers paying coupled support to suckler cows in the reference scenario. The decline in the suckler cow herds in these two countries has a strong impact on the aggregate EU27 average (decline by 6% compared to reference scenario), although this is not the only impact. It triggers a whole chain of second order effects: an increase in production of these herds in some other Member States (United Kingdom, Germany, Ireland), a decrease in demand for beef meat and meat for human consumption due to higher prices at the EU27 level and the related substitution effects with other types of meat, as well as increased imports of beef meat. The implementation of the reform scenario also has significant impacts on the crop production. Namely, the negative impacts on maize production are a consequence of decreased demand for feed, stemming from decreased herds for beef meat and suckler cows.

Figure 2 shows the quartile distribution by percentage differences in beef meat production by NUTS 2 regions under the reform scenario compared to the production in the reference scenario. The most markedly affected regions in negative terms are all Finnish, Danish, Austrian, and Portuguese regions, almost all French regions, all of Slovenia, a part of Spain and Belgium. All these regions are classified into the first quartile. On the other hand the production impacts of implementing the reform scenario are the most favourable for the majority of regions in Germany and on British Isles, and Netherlands, which compensate an important part of the lost beef meat production in France and Spain, countries which had decoupled support to beef production under the reference scenario. Due to the high share of suckler cows in the total beef herd (45% in EU27, 48% in EU15, and 18% in EU10), an important part of the impacts of implementing a reform scenario on beef meat production can be attributed to the impacts on suckler cow production. This share is for France 66% and for Spain 51%, respectively.

The aggregate income from agriculture (sum of gross value added and direct payments) on average declines by almost 9% at the EU27 level under the flat rate payment scenario compared to the reference scenario. A drop in the aggregate income from agriculture is under the reform scenario slightly less

[10]Introduction of the reform scenario implies abolition of direct payments for cattle sector.

pronounced for the EU15 Member States (drop by 7% compared to reference scenario) and more pronounced at the level of EU10 Member States (drop by 17% compared to reference scenario) and EU2 Member States (drop by 13% compared to reference scenario). That might be an astonishing outcome, as we simulate the European flat rate. The lower reduction in EU15 reflect the rather pronounced differences in the PPS, which overcompensate the equalization effect, whereas all income changes discussed are in Euro and hence not PPS corrected.

Beside the strong impact of PPS difference, a higher share of production coupled direct payments in the reference run is a further reason for more pronounced impacts of the reform scenario. The production and economic impacts of implementing the CAP reform scenario are more intensive for countries with a historical or a hybrid direct payment model in the reference run, the most obvious cases being Spain and France. Both countries have PPS above EU average, but not as high as to mute the effect of the 50% cut in direct payments before adjusting for PPS differences.

The impacts of implementing the reform scenario are more pronounced also in the case of a higher share of direct payments in the income per unit of production of the analysed products. Farm income changes and possible allocative ones to changes in (decoupled) payments depend on a whole range of factors, such as competitiveness, natural conditions, the size structure of agricultural holdings or alternative uses of production factors. The impacts of the reform scenario are less pronounced and more favourable in the countries and regions with a more competitive and productive agriculture, i.e. a higher share of income coming from the market. Farms in these regions tend to be larger on average.

DISCUSSION

Model results

Apart from the detailed and comprehensive presentation of relations between production activities at regional level and their interaction with EU and global commodity markets, the modeling approach offers further the possibility of disaggregating and comparing the model results at various regional levels, in particular at the level of NUTS 2 regions, which is of crucial importance to the CAP impact analysis.

CAPRI comprises further modules which allow the assessment of impacts, e.g. at the level of farm groups in regions or at the level of 1 km^2 spatial units for the analysis of environmental impacts. Currently, regional Computable General Equilibrium models are being developed to be linked with CAPRI to analyze the interaction between agriculture and other economic sectors at the level of NUTS 2 regions (CAPRI-RD 2008).

The model results underline that more uniform and lower CAP Pillar I direct payments will have quite diverse impacts across Member States and regions, but also on different production activities. The differences evolve from various factors of which the most important appear to be: (i) the specific implementation of the CAP Pillar I direct payments in the reference run, (ii) the share of direct payments in the gross margin, and (iii) the importance of individual activities for the whole agricultural sector in a country or region.

The direction of simulated changes is plausible from an economic viewpoint, however, one might question the size of the responses given the fact that our scenario cuts a major part of agricultural subsidies by 50% while removing still sizeable coupled payments from suckler cows and sheep and goats. What are the possible limitations in our analysis which might dampen the allocative response? The most significant appear to be two: (i) a fixed land endowment and (ii) the deterministic character of the model in combination with assuming profit maximizing behaviour.

Limitations of the applied modelling approach

The limitation arising from treating land as fixed resource is already partially mitigated through the above-mentioned solution for fallow land, which is under the flat rate payment scenario only entitled to a half of the hectarage payment. Accordingly, some land abandonment modeled is simulated by letting some land unused which does not draw premiums. Recently, CAPRI has been extended with land supply- and transformation functions allowing for endogenous supply of arable land and grass land in response to changed marginal land rents. The behavioural functions (Jansson et al. 2010) were parameterized based on the results of van Meijl et al. (2006) and Golub et al. (2006), but adapted to the regional resolution of CAPRI based on GIS analysis and simulation experiments with the Dyna-CLUE model (Verburg et al. 2010). The effect of that change in the model structure is that the reduced SFP rate leads to a reduction in agricultural land use, which can be sizeable if the reduction is high and the SFP was large compared to the land rent in the calibration point. Jansson et al. (2010) report a reduction of about one tenth of agricultural land cover if Pillar I is completely abolished.

The second point relates to the question if profit maximizing, i.e. assuming risk neutral behavior, is the correct behavioural model, and if not, how easy the model structure could host alternative behavioural models. If farmers are risk-neutral and show profit maximizing behaviour, given the introduction of the entitlements, an increase in decoupled payments could only have allocative effects via reduced costs of financing assets. It is not very likely that this effect is large. The discussion therefore mostly concentrates on risk effects of premiums e.g., in Bhaskar and Beghin (2009) which review inter alia empirical studies on the effects of various (semi)-decoupled payments. All studies show rather limited effects even for programs which are still coupled such as the former payments to Grandes Cultures for the EU. The findings thus suggest that effects are rather limited and capitalization into land rents high. The so-called risk effects of the premiums relate to changes in risk attitudes, i.e. farmers could develop an appetite for more risky production programs if their income increases by higher decoupled payments.

To our knowledge, there is no yet empirical evidence which could allow us to quantify that effect. We tend to conclude that these effects are all likely to be small. However, if farmers have preferences for on farm work, the decoupled payment could be a decisive element to keep them in farming. That is especially true if land markets do not function well so that the capitalization of premiums into rental rates or selling prices of land are low. If that is the case, the farmers would lose a bigger part of the payments if they give up farming and rent or sell land and entitlements.

Further on, given larger shares of rented land in many European regions owned by non-farmers, these land owners will share with farmers the effect of decreased payments, so that the farm income effect is dampened. And in the case of suckler, sheep and goat payments, given stocking density and other restrictions, one might assume that a part of these coupled payments is indirectly already linked to land, so that the conversion to a payment to land has a limited impact. As farmers are obliged to remove crop cover at least once a year to draw premiums, having some grazing livestock (if fences are already present) might be economically inviting solution even if returns to land and the livestock are relatively low. That might explain why adjustments in suckler cow and sheep and goat herds might be less pronounced then feared by some.

It is not easy to draw immediate conclusion from the discussion on the model structure. Some programming models comprise risk, and it is interesting to analyze formally if that impacts on the behaviour to changes in decoupled payment. The most often applied solution to introduce risk in programming models consists in adding a covariance matrix of revenues V and a risk aversion coefficient λ as shown below:

$$\max_{x \geq 0} U = gm'x + 1/2\, xBx' + \frac{\lambda}{2} xVx' + p'x$$

$$s.t.\, Ax \leq b[\eta]$$

$$1'x = l[\varpi]$$

where gm are the gross margins, B are the parameters of the quadratic cost function and p is a vector of premiums, A is the constraint matrix, b a vector farm endowment besides land which is termed l. The first order condition for the optimal level of the decision variables x are:

$$gm + Bx + \lambda Vx + p - \eta A - \varpi \leq 0 \perp x \geq 0$$

It is obvious that changing each premium p by an identical additive term does not change the optimal x. It will only lead to equivalent change in the land rent. Taking risk preferences that way into account would hence not lead to changes in the farm program if decoupled payment rates change. That simply expresses the fact that applied modelling approach of decoupled payments does not include the insurance effects for the individual activities. We would hence need to change the risk aversion coefficient λ as a function of the payments received to model the wealth effect, which would require a much more non-linear form of the objective function, questions about how to consistently estimate B, λ and the health effect notwithstanding. The reader should note these findings do not change if we introduce a land market such that the marginal returns from agriculture impact on land supply to agriculture and premium entitlement are binding in the point of analysis and we increase the flat rate premiums. In that case, the entitlements would receive a higher (marginal) value. However, with such a land market introduced, a reduction in the flat rate premium leads to lower agricultural land use if the marginal value of the entitlement in the calibration is zero. And then, depending on the B, λ and V, we will see naturally an effect on the allocation.

The analysis above only discusses modelling decoupled payments. It is clear that other elements of possible CAP reforms such as changed safety net prices or the introduction of subsidized yield and revenue insurance change gm and V and thus would lead to a different simulation response depending on λ which is zero in the deterministic model used in our analysis.

CONCLUSIONS

Despite the described limitations of the applied modelling approach, a key message of the presented results is that even significant reductions in the SFP would not lead to drastic adjustment in EU agriculture at the aggregate level. That is specifically true if the reduction is specifically large in such regions where the share of SFP per hectare is high, but also sizeable market incomes are generated per hectare, i.e. in the more intensively farmed regions, mostly found in the old EU Member States. However, the impacts can be more pronounced in specific sectors and regions.

Any CAP budget changes which impact sharply the net position of Member States regarding their contributions to and backflows from the EU budget are bound to provoke strong political opposition. At the same time, the electorate might fear negative effects on the farming sector such as land abandonement, a viewpoint certainly vividly stressed by the farming lobby (Kilian et al. 2008). It is therefore likely that the next CAP reform will lead to smaller changes in the Member States envelops for the SFP as simulated with our reform scenario, probably by using besides PPS additional so-called objective criteria, such as costs of production to modulate premium rates (Commission blueprint on ... 2010; The CAP towards ... 2010). Indeed, the recently released budget proposal by the President of the EU Commission proposes a stable agricultural budget.

The flat rate payment, uniform at the level of Member States (or regions) and eventually corrected by some criterion(s) will most probably form a central part (basic income support) of a three-tiered system of CAP Pillar I direct payments, proposed in November 2010 by the European Commission (The CAP towards ... 2010). The proposed three-tiered system appears to be politically the most preferred reform option (Matthews 2010b).

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