European farming and post-2013 CAP measures.
A quantitative impact assessment

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Abstract

Following the paradigm for reforming the current CAP, the first objective of this study is to give insights into the economic impact of post-2013 CAP measures at different levels of aggregation (e.g. EU, Member State and region). The post-2013 CAP measures included are directed towards income for the farmers, competitiveness, valuable areas and ecosystem services. The second objective is to analyse the impact of a scenario that combines the above mentioned post-2013 CAP measures. This study can be seen as a first attempt to quantify the transition to a CAP with more targeted measures at the European level and reveals considerable methodological and data challenges. A key finding is that the impact of the various measures is very different with regard to various economic indicators.

1. Introduction

The CAP as a policy instrument was designed to increase agricultural productivity and, thereby, output. It appeared at a moment when food security *within* Europe (the EU-6 and beyond as well) *was* a real issue. The principal additional motive has been to serve as a mechanism to enhance average farmer incomes to be more in line with the non-agricultural earnings for labour. The stimulus provided to the supply-side was so effective that the resulting production surpluses had to be deflated, and the first attempts to reduce output were the milk quotas in 1984 and the MacSharry reforms in 1992. The basis of direct / coupled payments beginning after 1992 was to compensate for income loss due to cuts in price support. The system of Community assistance for the agricultural sector remained coupled to particular products. Only with Pillar 2– introduced by Agenda 2000 in 1999 – has a non-coupled revenue stream began to be of any importance for the agricultural sector in financial terms, and only since 2005 (following the Mid-term Review of 2003) has a system based on the principle of decoupled payments been firmly established (in relation to specific products). The Health Check review in 2008 confirms the process of the disappearance of coupled payments by 2012 in their quasi-totality.

The transition from coupled to decoupled payments has been spurred by the WTO insistence that further negotiations on tariff-related barriers in international markets, in general, should depend upon resolving unequal competitive positions of agricultural producers, in particular. Farmers in the EU have been benefiting from public support in the EU internal markets through tariff protection and, as well, through measures to encourage exports in order to clear domestic markets. The WTO impetus for the EU in 1992 was the desire to complete the Uruguay Round, and the continuing negotiations in the Doha Round provide a similar impetus at the current time.

Decoupling has demonstrated that farmers can survive in a financial environment in which market support is shifted to income support. The difficulty is that the parallel shift in the financial burden has been from the consumer to the taxpayer, and this has rendered payments to the agricultural sector more transparent in political analysis and public debate. Therefore the justification for continuing financial support for the agricultural sector has been increasingly presented in terms of the ecosystems services rendered on

behalf of society, in a situation in which there is market failure regarding the additional costs of 'environmentally sensitive' production, which cannot be transferred to the consumer via the price mechanism. The services rendered are considered in terms of both minimum standards of good practice (currently the cross-compliance in exchange for base-level revenue support by Pillar 1 payments) and in terms of supplementary objectives entailing additional costs for specific efforts and /or revenue foregone because of such efforts (the contractual Pillar 2 payments).

The future of the Pillar 1 payments is undoubtedly in a transition from Single Farm Payments based on historical entitlements, as is the case today, to a system that is uniquely related to agricultural practices combining market orientation and the provision of public goods. The next financial programming period for the CAP (2014-2020) has to be designed on the assumption of agricultural and horticultural sectors operating competitively within international markets, without EU financed producer support. This corresponds to the logic of the Lisbon Agenda in which competitiveness is based on the encouragement of knowledge development, which leads to innovation as a principal outcome; in the current programming period, measures for the development of human and social capital are found in Axis 1 of Pillar 2. Furthermore, the financial structure of the renewed CAP has to be 'greened' through maintaining the dimension of 'environmentally sensitive' production methods and the provision of ecosystems services as a joint-product; animal welfare is to be included as part of minimal performance standards for the agricultural industry, along with the provision of biodiversity and the promotion of climate change mitigation and adaptation measures.

According to the above paradigm for reforming the current CAP, the first objective of this study is to give insights into the economic impact of the post-2013 CAP measures at different levels of aggregation (e.g. EU, Member State and region). The second objective is to analyse the impact of a scenario that combines different post-2013 CAP measures as briefly articulated in the foregoing discussion. Therefore the remaining part of this paper is organised as follows. First we discuss the different scenarios and post-2013 CAP measures that will be investigated. Section 3 then discusses shortly the methodology, data and assumptions. A more thorough discussion can be found in Helming et al. (2010) and Nowicki et al. (2009). We will present some selected results in section 4. Section 5 finishes with discussion and conclusion.

2. Scenarios

In this study it is assumed that targeted measures will be introduced gradually in the period 2014 to 2020. The time horizon of this study is 2020 as the measures are fully introduced. We distinguish between exogenous drivers that are constant in the different scenarios and drivers that are more policy driven. Exogenous drivers include changes in population, income expenditure, technological change, etc. Data used here are borrowed from other studies such as Scenar 2020 and Scenar 2020-II or from projections of international institutes like OECD and FAO.

The reference scenario

With respect to policy variables, the reference scenario incorporates the 2003 CAP reform, including the sugar and dairy policy reform and the abolition of the milk quota system in 2015. We include the implementation of the Health Check, which among other things already foresees a 10% reduction in direct income support under the Single Payment Scheme (SPS) (in this paper also referred to as pillar I direct payments) and an increase in regional development payments until 2013. With respect to the budget of the CAP, we assume that this remains constant in nominal terms. No further WTO agreement or other trade liberalisation measures are included. With respect to the Renewable Energy Directive (RED), a 10% share of biofuels in the transport sector in 2020 in the EU is assumed.

The Stylised CAP Reform scenario with targeted measures

The Stylised CAP Reform scenario analysed in this study includes five elements, all related to the Pillar I direct income support, in which it differs from the reference scenario. No extra national co-financing is assumed and the available budget to support the sector is similar to the reference scenario (budget neutral). The following measures are included in the Stylised CAP Reform scenario:

- measures to improve competitiveness and sustainability;
- Extra direct payment to farmers in valuable areas;
- Extra payments to ecosystem services; through extra agri-environmental payments.
- A base premium paid as a flat rate per hectare per Member State.
- To pay for all these payments, the Stylised CAP Reform scenario assumes a 100% abolition of the direct income support under the SPS/SAPS.

As the focus of this study is on the effectiveness of measures, we have assumed that each member state allocates 25% of their SPS direct income support (pillar I direct payment) to each of the four measures.

3. Methodology and data and assumptions

Model descriptions

To perform the analysis, a modelling framework is constructed, consisting of two economic models namely LEITAP and CAPRI. LEITAP is a global computable general equilibrium model that covers the whole economy including factor markets. More specifically, LEITAP is a modified version of the global general equilibrium Global Trade Analysis Project (GTAP) model. Agricultural policies are treated explicitly (e.g. production quotas, intervention prices, tariff rate quotas, (de)coupled payments). Information is used from the OECD's Policy Evaluation Model (PEM) to improve the production structure and a new land allocation method that takes into account the variation of substitutability between different types of land as well as a new land supply curve have been introduced.

CAPRI is an EU-27 partial equilibrium model for the agricultural sector at NUTS-2 level (aggregated regional farm approach). It consists of a supply module and a global market

model. The supply module of CAPRI comprises about 50 crop and animal activities for each of the around 280 regions (at the so-called NUTS-2 level covering EU27, Norway, Western Balkans and Turkey), and includes about 50 inputs and outputs. Each independent model optimizes regional agricultural income at given prices and subsidies, subject to constraints on land, policy variables and feed und plant nutrient requirements in each region. An important feature of the supply module of CAPRI is that agricultural activities are divided into an extensive (low input, low yield) and an intensive type (high input, high yield). The CAPRI global market model is a comparative static Multi-Commodity model. It covers 47 primary and secondary agricultural products. The Supply and global market model of CAPRI are iteratively linked. Equilibrium ensures cleared markets for products and young animals, match of feeding requirements of national herd (source: www.capri-model.org).

The methodology to analyse the questions at hand and to obtain consistent results between the different models is based on a link between LEITAP and CAPRI. General model descriptions of LEITAP, CAPRI and the model linking, including further literature references can be found in Nowicki et al. (2009) and Helming et al. (2010). Due to space limitations this not repeated here. In this paper the description of the methodology is a function of the selected results presented in section 4.

Grouping of rural development (Pillar 2) measures

The reference scenario in CAPRI and LEITAP models the existing budget and rural development (RD) measures (Nowicki et al., 2009; Helming et al., 2010). However, the reference scenario can't model separately the 46 rural development measures distinguished in the planning period 2007-2013. Hence, the individual rural development measures are grouped according to fundamental similarities in the economic mechanisms. In doing so three broad categories of post-2013 CAP measures are included in CAPRI and LEITAP, namely competitiveness measures, valuable areas payments and agri-environmental payments to improve ecosystem services. Table 1 shows how the existing RD measures are linked to these three categories.

Table 1. Grouping of RD measures to post-2013 CAP measures in CAPRI

Post-2013 CAP measures	RD measures
Competitiveness	01 – Human Capital Investment [111-115, 131-133]
	02 – Physical Capital Investment [121-126]
Valuable areas	03 – LFA Land Use Support [211, 212]
	04 – Natura 2000 [213]
Eco-system services	05 – Agri-Environment measures[214-216]

* The RD measure numbers are indicated between square brackets [#].

Implementation Pillar 1 direct payments and post 2013 CAP measures

Implementation of Pillar 1 direct payments

In LEITAP Pillar 1 direct payments are implemented as land payments in the various agricultural sectors. Coupled payments are directly coupled to sectors. Decoupled payments are implemented as an equal payment rate to the production factor land in all eligible sectors and therefore do not provide an incentive to switch between eligible sectors. Of course, changes in decoupled payments will result in changes in the allocation of production factors between eligible sectors (e.g. agriculture) and non-eligible sectors (e.g. non-agricultural sectors).

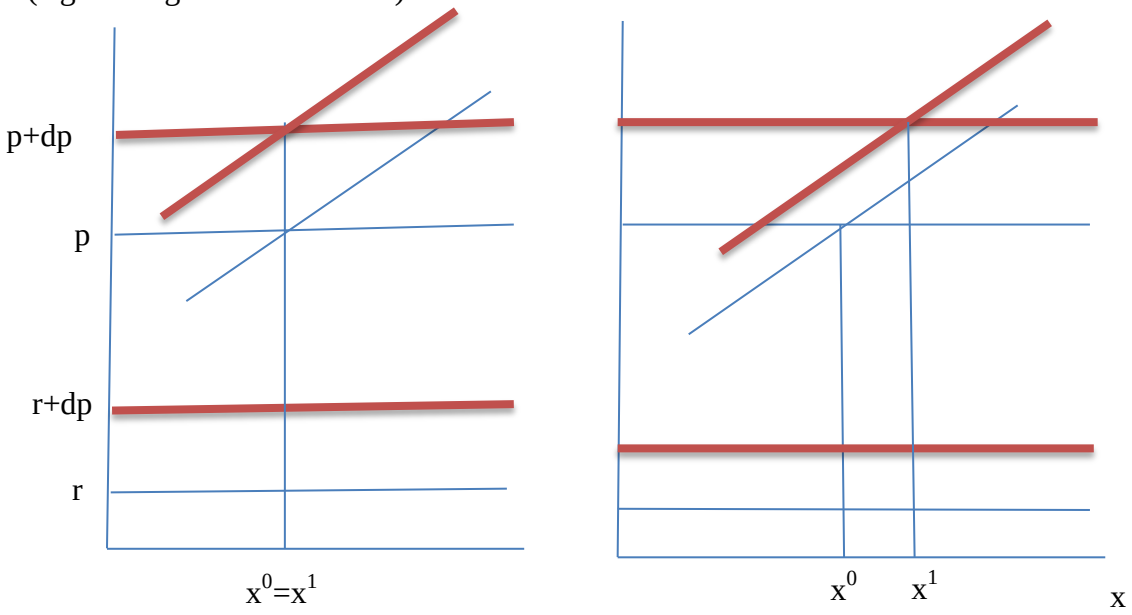


Figure 0: Effect of direct payment (dp) on hectare of crop x (horizontal axes) in case all crops are eligible for the direct payment (left figure) and in case not all the crops are eligible for the direct payment (right figure). p is output value (€ per hectare), dp is direct payment (€ per hectare), r is land rent (€ per hectare), x is crop (hectare)

In CAPRI the SPS direct income support (or pillar I direct payment) at the level of the regional farm is modelled as a decoupled direct payment linked to land. The SPS direct income support is interpreted as 'crop specific subsidies to land' (Britz et al., 2006). The income support or direct payment is the same for all eligible crops. Thus, the payment has the effect of increasing land rents (compared to no policy) and increasing agricultural income, but has no effect on the choice between eligible crops. In the reference scenario, we assume that all land use classes distinguished in CAPRI are eligible, except fallow land. In this study, fallow land is treated as a land buffer. This however only partially captures the possible changes in allocation of land between agricultural and non-agricultural sectors in case of changes in Pillar 1 direct payments. [1]

[1] The current available version of CAPRI includes a land supply curve, comparable to the LEITAP model. This version is not used here.

In figure 0 the economic mechanisms behind the models in case of a pillar I direct payment per hectare is pictured. In the left figure all crops(sectors) are eligible and the positive effect of the direct payment on supply is offset by the increase of the land rent. In the right figure not all crops (sectors) are eligible and the direct payment is not fully included in the land rent. This in turn gives the eligible crops room to expand until marginal costs equals marginal revenue again. The expansion effect depends on the share of land rent in total revenue, the share of direct payment in total revenue and the supply elasticity.

Implementation of post-2013 CAP measures

Competitiveness measures

Investments in human and physical capital are likely to lead to an overall increase in productivity and efficiency. In CAPRI competitiveness measures are included by shifting the IO coefficients of the different activities in the different regions. Data is supplied via a link with the general equilibrium model LEITAP. Both in LEITAP and in CAPRI the magnitude of the shift is basically a function of the ratio between the extra budget for investment in human and physical capital and the output value and value of the physical capital stock respectively; if the value of output is relatively low (high) and the pillar I budget for direct payments is relatively large (small), the ratio between human capital investments and output will be high (low) and the effect on productivity and efficiency will also be high (low). The magnitude of the shift is equal per activity and region, but is different per member state. Member States with high ratios between human capital investments and output value and between physical capital investments and the value of the physical capital stock are especially located in the EU-10. These ratios are relatively low in countries of the EU-15 (Helming et al., 2010; Table 3.5). The economic effect of these differences is that member states in LEITAP and CAPRI that achieve the highest percentage changes in productivity and efficiency may expand their production. The extra supply of agricultural products from these member states will decrease market prices. This in turn will dampen the extra supply and might even decrease supply in member states with relatively low productivity and efficiency changes.

Valuable area payments

LFA and Natura 2000 areas are included as valuable areas. LFA and Natura 2000 payments are included as a payment to land in LEITAP. We use information on the distribution of the payment across sectors from FADN (2005 data) to distribute payments across sectors (e.g. pork and poultry and horticulture receive no LFA payments and relatively more payments are distributed to grassland than crop land).

Ecosystem services

In LEITAP a payment to land has been used as a proxy for agri-environment payments to eco-system services. In contrast with the LFA payments, the agri-environment measure can also reduce labour and output productivity. Information of the current distribution across sectors from FADN is used to distribute payments across sectors (e.g. pork, poultry and horticulture receive no agri-environment payments and relatively more payments are distributed to grassland than crop land). In addition, to capture the extra labour effect, labour productivity decreases (10% of increase in land payment rate).

4. Results

Total impact in the EU-27

Agricultural production and trade

The Stylised CAP Reform scenario (total impact with all measures combined) leads to an increase in EU primary production of about 1.5% (Figure 1). This is especially due to increased productivity because of investments in measures to improve competitiveness. Figure 1 also shows the effectiveness of the different measures individually on agricultural production. The measures to improve competitiveness will increase agricultural production by about 2%. The effects of other targeted measures on production are limited. As explained before (agri-environmental) payments to ecosystem services lead to more extensive production methods, which lower yields per unit of input. As a result the agricultural production will decrease slightly (Figure 1). Area payments and the base premium keep extra land in production that would otherwise be abandoned. The effect of this is a slight increase in agricultural production. Compared to the area payment and the base premium, the 100% abolition of decoupled SPS direct income support shows an opposite effect on agricultural production. The negative production effect of the latter is limited. This indicates that, at least in our system of models, SPS direct income support is fairly decoupled from production.

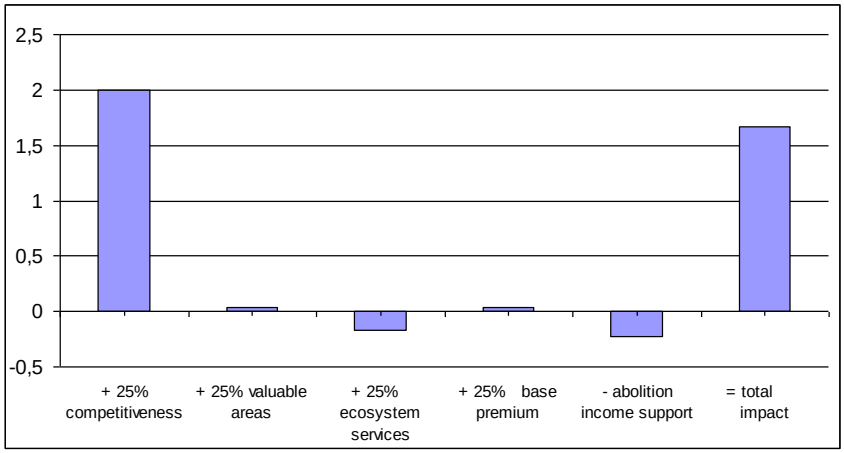


Figure 1: Effectiveness of individual measures and the total impact of the Stylized CAP Reform scenario on agricultural production in the EU-27 (% change compared to the reference scenario)
Source: LEITAP

Trade effects

Trade is mainly influenced by competitiveness measures that increase productivity and reduce product prices relative to the prices of competitors. Exports increase by more than 10% and imports decrease by 7%. The introduction of the base premium and valuable area payments increase exports slightly, as EU prices decline slightly. Abolition of income support has the opposite effect. Agri-environmental payments to ecosystem services lead to a small decline in exports as EU prices increase slightly. Overall the Stylized CAP Reform scenario improves the trade balance substantially for the EU.

Land prices and total agricultural area

The impact on the total area of agricultural land is related to the development of land prices. Valuable area payments, agri-environmental payments to ecosystem service and a base premium keep agricultural land in production under agriculture. Subsidies to competitiveness have a marginal impact on land use, as they stimulate production on the one hand, but on the other hand use less input per unit of output. Abolition of direct income support under the SPS (pillar I direct payment) has a negative impact on the agricultural area in production (-7%), as marginal areas are abandoned. Overall, the Stylised CAP Reform scenario just has a negative effect on total agricultural area.

Land prices are higher due to valuable area payments, ecosystem service payments and a base premium, as the economic rent (i.e. subsidy) is partly taken by the fixed production factor, land. The impact of competitiveness measures on land prices is negligible, as on the one hand production increases and therefore demand for land is higher while on the other hand less land input is needed to produce one unit of output and therefore less land is needed. In this case, both effects more or less cancel each other out. Abolition of direct income support under the SPS implies substantially lower land prices. This is also an important mechanism to explain why production is not going down very much due to the abolition of direct payments. The lower land prices stimulate further structural changes at farm level and keep EU agricultural production competitive.

Prices of agricultural products

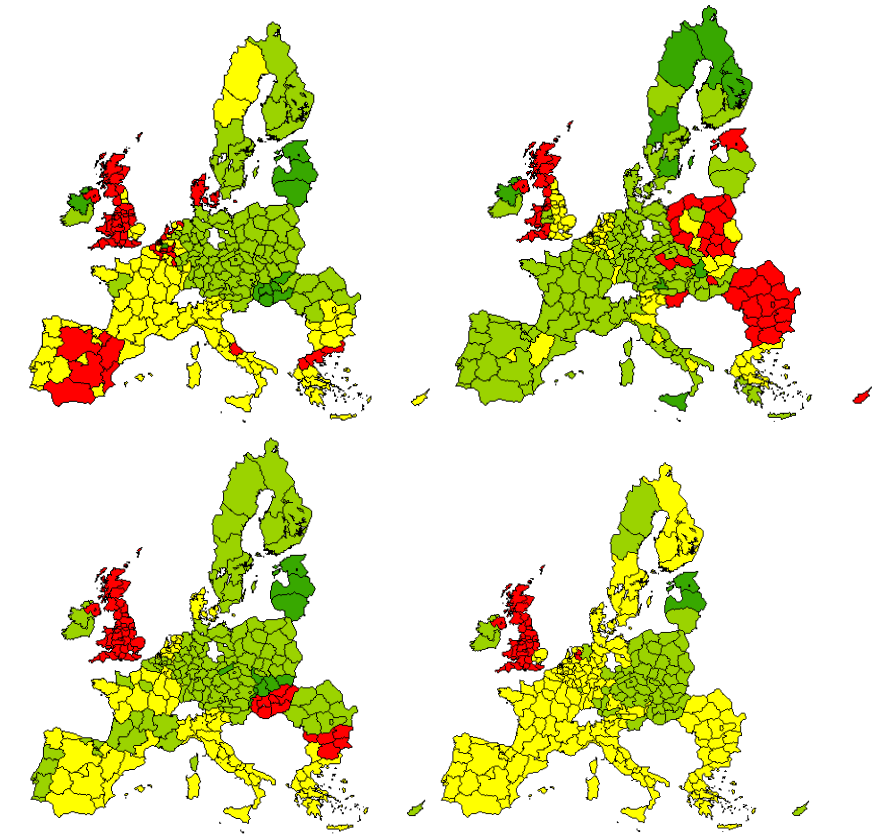
The Stylised CAP Reform scenario leads to a decline in the consumer price of EU primary production of about 2%. This is especially due to increased productivity because of investments in measures to improve competitiveness. The measures to improve competitiveness will reduce agricultural consumption prices by about 2.7%. The effects of other targeted measures on agricultural production and prices are limited. Agri-environmental payments to ecosystem services lead to more extensive production methods, which reduce yields per unit of input. This corresponds with a limited decline in supply and somewhat higher prices for agricultural commodities. Area payments and the base premium are a kind of subsidy that leads to a small increase in agricultural land and production and consequently to a small decline in consumer prices. Compared to the area payment and the base premium, the 100% abolition of SPS direct income support (the pillar I direct payments) shows an opposite effect on consumer prices, as subsidies are reduced in this case and agricultural production decreases slightly.

Regional and environmental impacts in the EU-27

Measures to improve competitiveness

As we have seen above, the largest effect on agricultural production stems from measures to improve competitiveness. Below we show the effect of measures to improve competitiveness on regional supply of some selected agricultural products within the EU-27. Figure 2 shows that supply of agricultural products increases particularly in the EU-10. As explained above, the value of the additional budget for competitiveness measures and physical and human capital investments in the EU-10is relatively high compared to

the current production level and capital stock. As a result, there is a relatively large increase in productivity and efficiency in the EU-10.



Less than 0%	Between 0% and 1.5%	Between 1.5% and 5%	More than 5%

Figure 2: Effectiveness of competitiveness measures on regional supply of cereals (upper left corner), other arable field crops (upper right corner), meat products (lower left corner) and other animal products [milk and eggs] (lower right corner) in comparison with the EU-27 average (% change compared to the reference scenario)
Source: CAPRI

In case the case productivity and efficiency effect of the competitiveness measures are relatively small, negative market and price effects could offset the productivity and efficiency effects. This occurs with regard to cereal production in Denmark and in regions within the UK, the Netherlands, Belgium, Spain, Greece and Italy. In the United Kingdom cereals are substituted for fodder crop activities. In Poland arable field crops are substituted for cereals. As a result, the production of arable field crops decreases in some regions within Poland.

Figure 2 also shows the effect of competitive measures on meat products. Production of meat increases especially in Eastern Europe, Germany, Sweden, Finland, Ireland and in regions in France and Portugal. The production of meat decreases in the United Kingdom and in Hungary. The decline in meat production in Hungary is especially due to the slight decline of pork production in Hungary. This is explained by changes in prices of inputs

and outputs, which affects competitiveness for fixed resources in Hungary, in favour of other animal products.

The effects of measures to improve competitiveness stimulate the production of other animal products in Eastern Europe, Ireland and parts of Sweden (Figure 2). The effect on other animal products is also slightly positive in the rest of Europe, with the United Kingdom and some regions within the Netherlands as exceptions.

Regional income

Compared to other post 2013- CAP measures full abolition of the decoupled direct income support as provided by the SPS (the pillar I direct payments) has the largest impact on agricultural income per NUTS-2 region (see left figure of Figure 3). Here income or gross value added (GVA) is measured as revenue plus EU payments minus variable costs. The decline of the GVA per NUTS-2 region as a result of the abolition of the pillar I direct payment varies from more than minus 20% in regions within France, Germany, United Kingdom, Austria, Sweden and in the EU-12 countries to a range between -7 and 0% in the Netherlands. These differences are explained by the differences in the regional share of the direct payment provided by the SPS in total income in agriculture, including horticulture, in 2020 in the reference scenario.

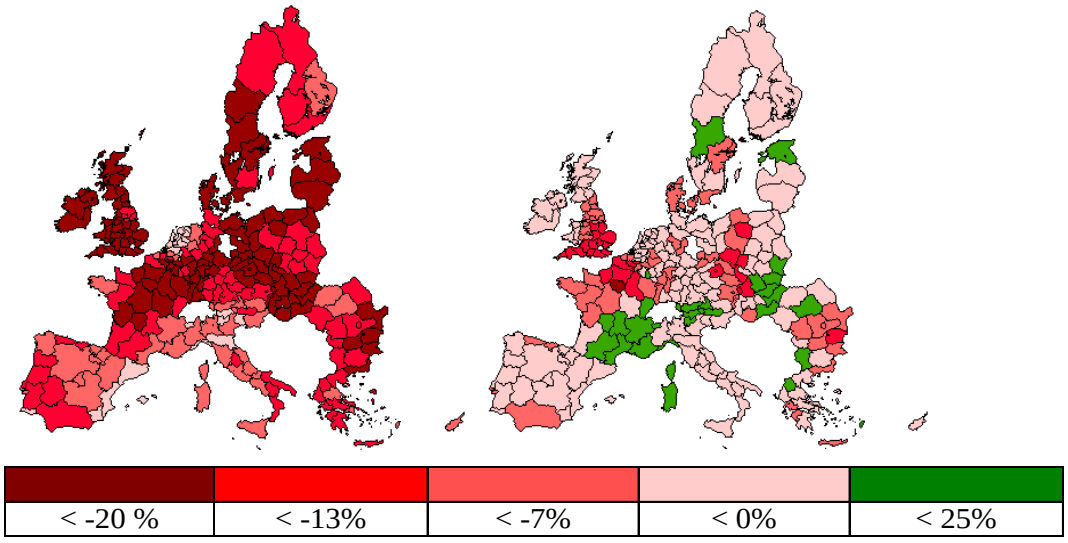


Figure 3: The impact of abolition of direct income support (left figure) and the GVA from agriculture (right figure) in the Stylized CAP Reform scenario, given as a percentage change compared to the reference scenario per NUTS-2 in the EU-27
Source: CAPRI

The total impact of the Stylised CAP Reform scenario on regional agricultural income can be positive in some regions. This is the case in regions in the south-east of France, in Austria and in some Eastern European regions (right hand figure in figure 3). These regions either receive a large amount of post-2013 targeted payments, including the base premium per hectare, or they gain more than average from productivity, efficiency and consequently production changes due to the extra investments in human and physical capital. Moreover, the share of direct payment under the SPS in regional agricultural

income might be relatively low in the reference. The largest decline in income can be found in regions that receive a relatively large amount of direct income support under the SPS in the reference scenario and a relatively limited amount of post-2013 targeted payments in the Stylised CAP Reform scenario. These are, in particular, regions in the north-east of France, the south of the United Kingdom and some regions in Poland, Czech Republic and Slovakia.

5. Discussion and conclusion

The economic tools, as they currently stand, are more useful tools for analyses on the first pillar of the CAP, but less so for the analyses of effects of Pillar 2 and post-2013 CAP measures. However, modelling the reductions in SPS direct income support within the first pillar (or pillar I direct payments) is not without its problems either, as the impact of decoupling is not yet empirically known. Pillar 2 and post-2013 CAP measures are even more difficult to analyse. This is especially caused by the range of different measures with different objectives which can be implemented in many different ways in individual Member States or regions. Moreover, also in this case there a lack of empirical data and hard evidence concerning the impact of targeted measures on farmers' behaviour.

The strengths of the methodology presented above can be summarised as follows:

- The whole budget for different kinds of EU income support is accounted for.
- Differences in the initial distribution of the budget for RD measures (Pillar 2) over farm types and regions are translated to activities and regions in the market models (CAPRI, LEITAP). This is achieved by the extensive use of data from FADN and Dyna-CLUE (Verburg and Overmars, 2009)
- Integrated and EU wide approach. The approach takes into account changes in prices and quantities at sectoral and regional level.

Some difficulties modelling the post-2013 CAP measures are discussed below.

- As already stated above, empirical or ex post information for estimating the impact of post-2013 CAP measures is very scarce. Therefore, the simulations of impact of post-2013 CAP measures require some assumptions on what these effects could be. This, combined with the strong dependence on the current second pillar measures for the modelling, highlights the current exploratory character of this study.
- Post-2013 CAP measures to improve competitiveness are translated in such a way that they affect production. However, in the financial programming period 2007 to 2013, part of this budget can also be used for on-farm capital investments that should reduce emissions from agricultural production to the environment. This is the case in the Netherlands, for example, where almost 67% of the budget of measure 121 (physical capital investments, see Table 1) should be used for this type of capital investments. In general, as investments in competitiveness are more directed to stimulating more environmentally sustainable production techniques as mentioned above or food quality rather than food quantity, the production and price effects as presented in this report might be overestimated.
- Due to a lack of data, the rate of return on investments is assumed equal per sector and Member State. This implies that agricultural production increases most in Member States with a relatively high ratio between the value of extra investments and the value

of production or physical capital (see Table 3.5). In reality, structural, institutional and other differences between Member States might result in differences in the rate of return on investments mentioned above. Moreover, the investments might vary per sector and region. These differences are not taken into account.

- Public goods and transaction costs are not included in the modelling, although they are an important part of the post-2013 CAP measures.

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