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New challenges for EU agricultural sector and rural areas.

Which role for public policy?

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Distributional effects and structural change induced by various CAP Pillar 1 proposals; the case of the Czech Republic

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Abstract

This paper deals with the potential effects of the CAP pillar 1 on farm incomes and structural changes. It uses a dynamic Computable General Equilibrium model and a specific analysis on distributional effects. The effect of payments ceiling in the current CAP 2020 proposal with subtracting labour costs will bring only insignificant payment reduction for most farmers except large extensive beef breeders whose direct payments will drop by 13% on average. However, if the condition on labour costs is removed, capping will become effective, payments in some specialisations will drop to half and the production and employment will decline by 6% and 10%, respectively, compared to the current situation. It is showed that small farm measures could easily miss its goal if there is no possibility to adjust the threshold measure more respecting national conditions. Analogously, due to prevalence of large corporate farms on land it is very unlikely that the measure targeted on young farmers will significantly reduce an ageing problem. Regarding greening, the current proposal will induce additional operating costs on farms between 4 and 10 hectares without adequate environmental improvements. We conclude that more flexibility at the national level for respecting national farm structure will be needed if the good intentions of CAP reform are to be effective and efficient.

Keywords: CAP 2020, income distribution, structural change, Czech Republic

JEL Classification: Q10, Q18

1. INTRODUCTION

The issue of channelling income support in pockets of rich farmers (landowners) has been discussed in Europe already for some time (e.g. Baldwin, 2005). Decoupling has increased awareness of the CAP distribution problem among the public further (Schmidt, 2006). Thus from its beginning, the debate on CAP 2020 reform has exhibited concerns of uneven distribution of direct payments as well as resistance for its correction. The paper assesses the Commissions earlier (EC 2010) and latest (EC 2011) proposals of the Pillar 1 of the CAP 2020 with the following two objectives i) to show their impact on the distribution of supports and incomes, and ii) to investigate if the policy proposal might result in structural changes and of what nature. In particular, we examine three new measures: capping, additional support to small farms and greening.

Empirical evidence points to substantial differences in the regional farm size structure; in some regions farms are rather equally sized in terms of land endowment, while in other regions land is unequally distributed among the farms. In the Czech Republic, about 60% of small farms (i.e. with less than 10 ha) cultivate only about 2% of agricultural land (UAA). In contrast, a tiny number of large farms (0.5%) cultivate more than 30% of UAA. Under the current area based payments, the majority of income supports flow into large farms. A similar situation shares also Germany, Slovakia or UK.

There is vast literature on reasons for structural differences among countries and regions: Balmann (1997) stressed the relevance of path dependency explaining it with the presence of sunk costs; the immobility and shortage of production factors is perceived as the key factors by Chavas, (2001); Allen and Lueck (2003) account it to differences in nature´s parameters (seasonality and

random shocks). In addition, many authors emphasize the effects of policies on farm structure. For instance Leathers (1992), Vranken and Swinnen (2006) or Boulanger (2010). Happe (2004) summarised arguments on adverse effects of two policy instruments, namely the market price support and the direct area and headage payments, on desired structural change: i) direct payments even weakly coupled to production activities create production incentives and impede structural adjustment because marginal farmers use part of the payment to cover losses; ii) guaranteed prices reduce uncertainties and therefore reduce the incentive for farms to diversify and spread production risk; iii) if support payments are capitalised into farmland prices and rental prices (e.g. Medonos, et.al., (2011)) structural adjustment becomes prohibitively costly. On the other hand, there is evidence that CAP reforms with gradual decoupling have been associated with increasing farm size (Boulanger, 2010).

OECD (1999) published a study on distributional effect of agricultural policies. The study demonstrated huge differences in distribution of assets and income by farm size, specialisation and location. However, it provides only limited insight how these inequalities link to policies. Schmidt et al. (2006) have done a review of studies dealing with the evidence on the distribution of CAP transfer on incomes. In the empirical evidence they concluded that direct payments do not decrease the inequality of agricultural market incomes and farms with higher market incomes benefit more from direct payments (and it even concerns agri-environmental payments). Boulanger (2010) showed that income and support inequalities vary regionally depending on differences in the regional farm structures. The Commission study (EC 2010a) confirmed close relation between income and size on EU27 farms (referring to 2004-06) - on average, the farm net value added per labour unit of the largest farms (size class with more than € 120 000 potential gross margin) was about € 35 000, which is more than 10 times the figure for the smallest farms. Thus, the key issue of income support revolves around the existence of neoclassical assumption on increasing returns to size (and scale). Several studies on the effect of size in CEEC agriculture can, for example, be found in Balmann et al. (2003). Economy of scale is often the main argument for restricting the public transfer with increasing farm size.

There are several specific arguments why to support small farms; D´Souza, Ikerd (1996) who have done an overwhelming discussion on sustainability contributions of small farms conclude that although these are less efficient and slower to adopt new technologies in comparison to larger farms, the perceived costs may actually be benefits when viewed from a societal perspective. They argue that economies of size are often overstated in large farms due to exclusion of environmental efficiency. Furthermore, small farms tend to depend more on off-farm income, the buffering effect associated with such income can be viewed as an advantage. The Commission's conference on semi-subsistence farming (EC, 2010b) emphasised the importance of small farms for the diversity of landscape and the preservation of rural culture. The JRC study on Economic prospect for semi-subsistence farm households in EU New Member States (Fritsch et al., 2010) showed that small farms are not a homogenous group that several sub-groups can be recognised depending on their factor endowments and interactions with the rural business environment; these groups have consequently differentiated need for support and for the same measures they will respond differently.

The paper is structured by the three examined measures. Findings are summarised in the concluding chapter. The necessary details on the assessment techniques are given in Appendix.

2. IMPACT OF CAPPING ON STRUCTURAL CHANGE AND DISTRIBUTIONAL EFFECTS

2.1 Choice of methodology and description of scenarios

In this section, the impact of the capping instrument proposed in the new CAP is investigated. In concrete, following research questions are formulated: i) what is the proportion of farms that would be strongly affected by proposed capping measures? ii) what is the effectiveness of capping in reducing inequality of income support distribution among farms? iii) can we expect a substantial structural change induced by the considered capping measures?

In order to determine the impact of capping on direct payments distribution, simple Excel based calculations on the fixed farm structure[1] are applied. Four size categories and 8 specialisations (TF8 as defined by FADN) are recognised (see later). Distributional effects are illustrated on the Lorenz Curve and by Gini coefficient (OECD, 1999). The impact of capping on structural change is further studied with the use of the general equilibrium approach.

The presented CGE model is an open small economy model that follows a standard IFPRI structure (Lofgren, 2002) with a recursive form of dynamisation providing simulations until 2020. The types of functional forms and main assumptions applied in the CGE model are described in Appendix.

The national economy is modelled in a disaggregation into 9 production sectors; of which 4 refer to agriculture and are differentiated by the size: sector 1 represents farms under 400 ha, sector 2 – farms in the category of 400 – 800 ha, sector 3 – farms in the interval of 800 – 1200 ha and sector 4 represents farms with area above 1200 ha. These size categories are chosen to capture well a range of proposed capping bounds (see Table 1 for the Commission proposal EC 2010). The same size categories are adopted in the Excel based analysis on the fixed structure.

The CGE model contains several agricultural policy extensions. Since land is included as a specific production factor employed in the four agricultural sub-sectors, it allows to model direct payments partially as land subsidies. Another extension concerns a representative household, where farmer households are distinguished from other households.

The instruments of the Common Agricultural Policy included in the CGE model concern the direct payments (1st pillar) and the investment subsidies (2nd pillar). With respect to the fact that in the Czech Republic the direct payment rate per hectare highly exceeds the land rent, modelling direct payments solely as land subsidies would cause computational problems, which is also alerted by other CGE modellers (see Gohin, 2006). In order to eliminate this problem, part of the direct payment subsidy is allocated to land and the rest is modelled as a production subsidy. Furthermore, the sources of financing the direct payments are recorded in the balance of payment equation of the EU (for the SAPS payments from the EU) and in the governmental expenditures equation (for the current "Top-up" payments). The investment subsidies in the 2nd pillar are incorporated into the investment allocation function for the recipient sectors.

The essential assumption of direct payments coupling is made for the structural change assessment. This is well illustrated in case of the capping scenario – by imposing a ceiling on the value of direct payments, large farms face a decrease of subsidy revenues and they become less competitive relatively to the unaffected ones. As a consequence, smaller farms will increase their participation in

[1] The analysed farm structure given by size and specialisation and the respective farm business and economic indicators are derived from FSS 2007 and FADN 2009.

the market. These changes are translated into the markets of production factors, particularly in case the affected farms had a strong position in labour and land markets. It is important to interpret results carefully: although we do not model explicitly the number of farms, the changes in the structure are derived from changes in the production volume of the sectors 1-4. It is justifiable if the underlying production functions of farming sectors 1 to 3 do not exhibit increasing returns to scale, which applies in our case.

The capping measure is considered in three modes (simple ceiling, progressive capping and progressive capping with a subtraction of labour costs as defined in the Article 11 of the regulation proposal COM(2011) 625/3 (EC 2011), each applied to both the whole amount of direct payments and the basic payment only.

Table 1 shows the area limits corresponding to the direct payment bounds for gradual reduction.

Table 1: Area thresholds of progressive capping

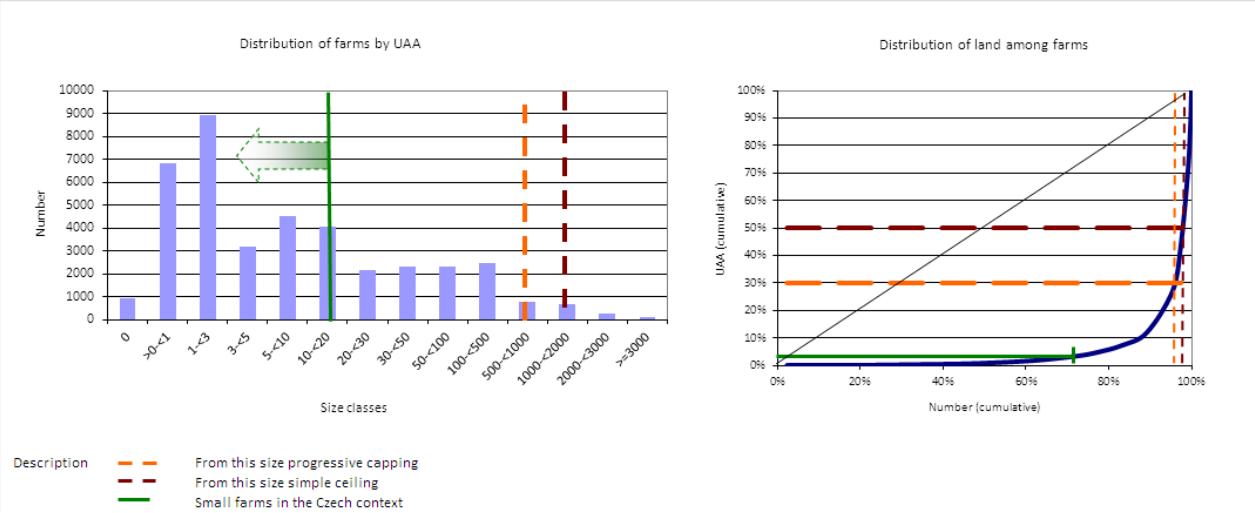
	Limiting area of the farm (ha)	
Direct payment limit	Under full direct payment	Under basic direct payment
(EUR)	*259 EUR*	*181.3 EUR*
150,000	579	827
200,000	772	1,103
250,000	965	1,379
300,000	1158	1,655

Source: own calculation

2.2 Distributional effects of capping

The structure of land utilization from the structural survey in 2007 is displayed in Figure 1. Strong inequality in land distribution is apparent from the Lorenz curve and high Gini coefficient (0.894).

Figure 1: Structure of land utilization from the FSS-2007 (capping under the full direct payment rate)



Source: Czech Statistical Office, own calculation

In other words, 90% of farms operate only on 10% of the agricultural area. Due to the uniform SAPS[2] rate, the same proportion applies to the distribution of direct payments. The thresholds of progressive capping applied to the full direct payment indicated in the figure shows that only 5% of farms but operating on 70% of land would be affected and about 3% of farms operating on 50% of land in the case of simple ceiling.

The impact of considered capping scenarios on the loss of the subsidy revenues in each farm size category is displayed in Table 2. It is found out that by progressive capping direct payments (DP) of large (800-1200 ha) and very large (>1200 ha) farms will be reduced on average by 13% and 49% respectively if it is applied to the whole sum, and by 2% and 23% if it concerns only the basic payment.

Table 2: Reduction in direct payment revenues per farm category

Scenario	Subsidy rate option	Farms < 400 ha	400 - 800 ha	800 - 1200 ha	Farms >1200 ha	Average cut
Progressive Capping	Full Rate (259 EUR/ha)	0%	0%	-13%	**-49%**	-26%
	Basic Rate (181 EUR/ha)	0%	0%	-2%	-23%	-12%
Simple Ceiling	Full Rate (259 EUR/ha)	0%	0%	0%	**-46%**	-22%
	Basic Rate (181 EUR/ha)	0%	0%	0%	-16%	-8%
Progressive Capping with Labour Cost Subtr.	Full Rate (259 EUR/ha)	0%	0%	0%	0% / -13% for beef cattle	0%
	Basic Rate (181 EUR/ha)	0%	0%	0%	0%	0%

Source: Czech Statistical Office, own calculation

The scenario of simple ceiling affects only the largest farms that would lose on average 46% of direct payment revenues if applied to a full rate. Whereas the effective capping might have a significant negative impact on the direct payment revenues of Czech farms, the effect of capping is almost completely offset if labour costs are subtracted from the direct payment account. In this case, only farms specialized in extensive cattle breeding will be affected and their revenue will decline by 13%.

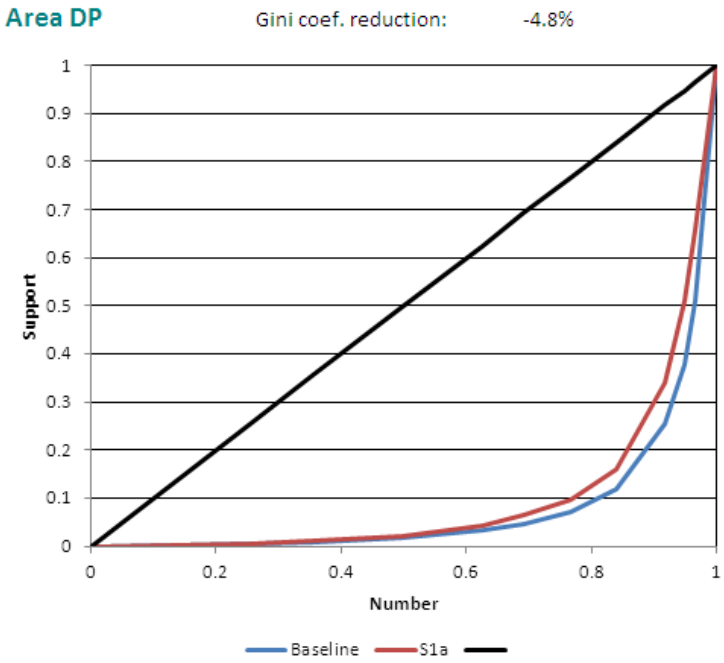
The issue *to what extent the reduction of subsidies under the effective capping reduces the inequality of income support distribution* is illustrated in Figure 2. Here, a Lorenz curve is constructed in simplified way for the five farm categories. The horizontal axis displays a cumulative number of farms ordered according their size (expressed in %) and the vertical axis displays their corresponding share in total direct payments. The results are demonstrated for the scenario of progressive capping with a full payment rate (S1a in Figure 2) as it induces the strongest affects. The figure clearly shows that by imposing an effective progressive capping on direct payments, large scale farms will lose about 50% of direct payment revenues yet the effect on reducing income support inequality will only be very moderate – the respective Gini coefficient drops by 4.8%[3].

There will be some differences among specialisations. Productions like wine, fruits, horticulture and pigs will not be affected by capping. Since there are not many very large farms (in terms of area) among specialised dairy producers, this category will be affected less (-38% on farms>1200 ha) than crop or mixed farms (around -50% on farms>1200 ha). Including the subtraction of labour costs in the

[2] The future SPS will also be an area payment.
[3] From 0.84 to 0.80

capping formula will make capping ineffective for most farms. The exception will be the extensive beef production on grasslands – farms in the biggest category will on average lose 13% of DP.

Figure 2: Impact of progressive capping on the inequality of support distribution

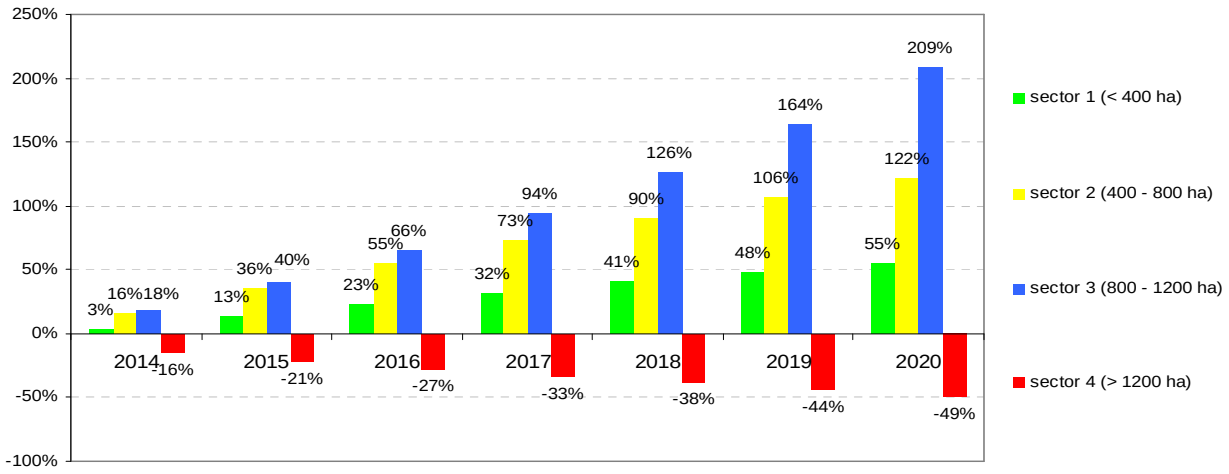


Source: Czech Statistical Office, State Agricultural Intervention Fund, own calculation

In the context of all operational (non-investment) supports, progressive capping of DP will reduce inequality in the distribution of these supports by 3% and in the overall economic context, the inequality in the distribution of income (NVA at factors costs) will decline only slightly by 1.3% (measured by Gini coefficient).

2.3 Structural change induced by capping

Figure 3: Impact of effective progressive camping on Gross Ag. Production - Deviation from Baseline



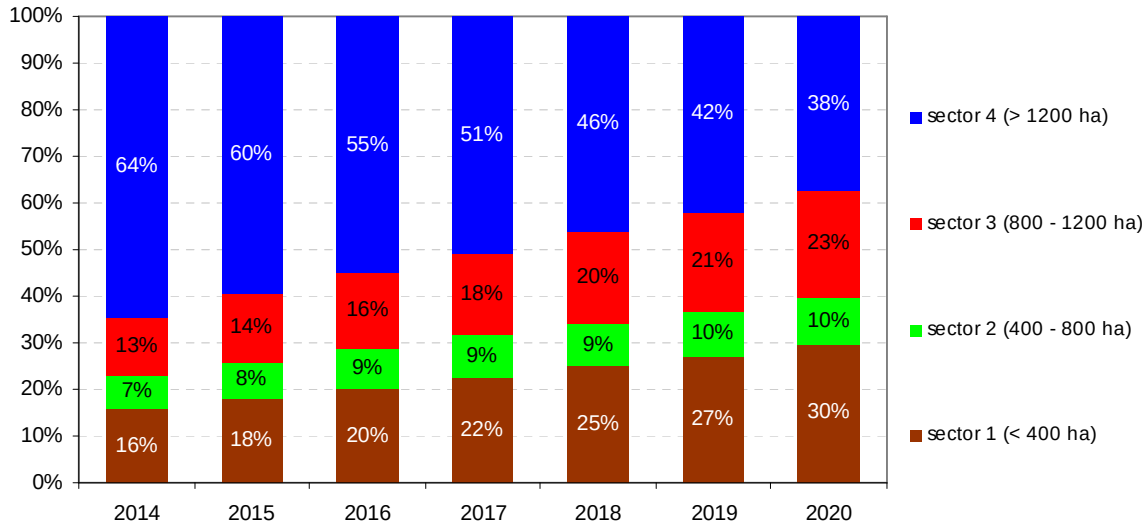
Source: own calculation based on the CGE model

It is possible to expect that the substantial reduction of direct payments revenues for large farms in case of effective capping would dramatically influence their position on the market. This assumption was investigated with the use of the CGE model by applying a scenario of progressive capping without labour costs subtraction imposed on the full subsidy rate.

The results of the simulation show that under the progressive capping, the gross agricultural production of the largest farms expressed in relative terms would decline by 50% compared to baseline and by 33% in absolute terms. On the other hand, the smallest farms (< 400 ha) and farms in category of (800-1200 ha) would significantly increase their agricultural production (Figure 3).

The structural change that will result from progressive capping is displayed in Figure 4. It is observed that there will be a gradual decline of large farms´ share in the total agricultural production in favour of the other farm categories. Particularly the smallest farms (< 400 ha) and farms in category 800 – 1200 ha will experience the strongest expansion.

Figure 4: Structure of the gross agricultural production in the scenario of effective progressive capping



Source: own calculation based on the CGE model

The structural shift is now considered when assessing the impact of capping on the reduction of inequality. Gini coefficient reduces by 5.4%[4] which can be regarded as a very moderate improvement toward a more balanced distribution of direct payments.

As the direct payments are linked to agricultural land, the effect of capping has also visible repercussions on the land market. The contraction of large farms that operate on more than 50% of agricultural land induces a significant decline of land rents (about 30%[5]). In the longer run, land rents converge to baseline due to the expansion of number of the smaller farms.

The CGE analysis also reveals an important finding that the resulting replacement of very large farms by smaller farms would produce an overall economic loss. Although some farm categories will clearly benefit from the capping measures, the overall agricultural production will decline with respect

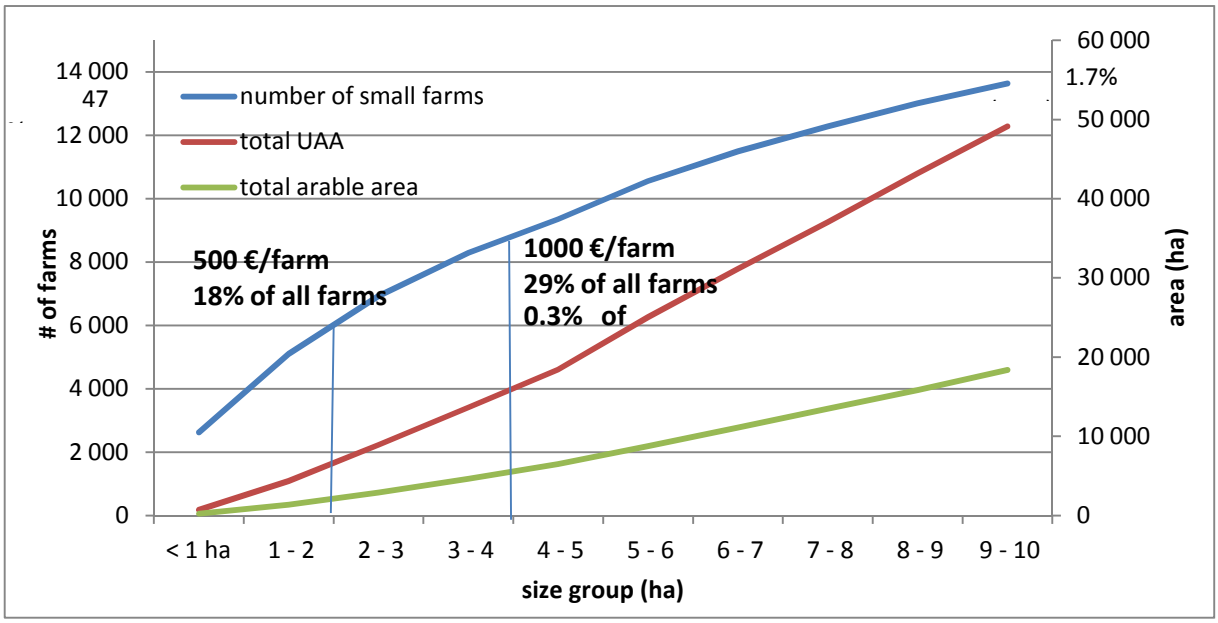
[4] Of 0.6 percentage points more against the case of the fixed structure.
[5] This is rather over-estimated by the model, nevertheless it indicates a significant impact.

to baseline by 6%. This is attributed to the fact that the capping instrument negatively affects those farms that are relatively more efficient and which also play an important role in the labour market. As a consequence of capping, a decline of employment in agriculture by 10% will be expected. The macroeconomic effects of capping measures are negligibly negative – there will be a 0.15% decline of GDP compared to baseline and the price level will increase by 0.15% compared to baseline.

3. SMALL FARMS

It is stated in the preamble (38) of the regulation proposal COM(2011) 625/3 (EC 2011) that a simple and specific scheme for small farms should be put in place in order to reduce the administrative costs linked to the management and control of direct support. The maximum payment limit € 1000 per farm resulting from Art. 49 will definitely encourage holders up to 3.9 hectares to take part in this scheme. These farm holders represent 29% of all registered farms but with only a negligible share on UAA (0.3%). The volume of the production on these farms is even proportionally smaller. The respective financial needs account for less than 0.5 % of the Pillar 1 budget (just 1/20 of the allowed maximum of 10%).

Figure 5: Cumulative number of farms and area (<10 ha) and indicative payment thresholds for small farms scheme



Source: own calculations based on LPIS 2011

One might reasonable expect that potential advantages resulting from the exemption from the greening compliance could stimulate slightly bigger farms to join the regime of small farms. If these are farm holders up to 5 hectares, then the number of farms will exceed 10 thousand (33% of all registered farms) with the share of 0.6% on UAA. Yet, the budget spending will stay deeply below the limit given in the regulation proposal COM(2011) 625/3 (EC 2011)[6].

[6] The budget will not be exceeded even if the area limit for active farmer gets down (below the current 1 ha).

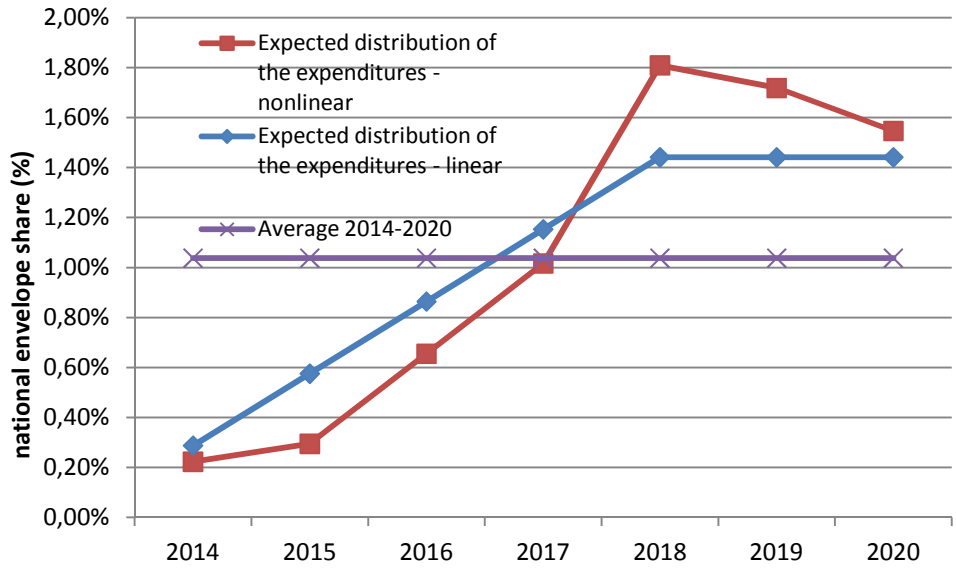
Due to prevalence of large farms and the way of farming in the Czech Republic, the measure addresses just hobby farms[7] leaving out small commercial farms (around 10-20 hectares) which are also part-time based and simplification of administration and management is very relevant for them. We will come to it later when talking about greening.

4. YOUNG FARMERS

A characteristic feature of agriculture is its suboptimal age structure. The problem of aging farming population is addressed by the measure "Payment for young farmers" (Articles 36-37 of COM(2011) 625/3, EC 2011) which aims at encouraging young generation to start their own business. There are two ways of staring farming: i) by taking over a farm of an older entrepreneur and ii) by gathering land released from neighbour farmers (either buying it or renting it). Concerning the latter option, the emergence of entirely new farms was rather low during the last 10 years; actually the number of farms declined by 1.4% annually. The generation exchange is supported in the current RDP and it is still claimed by the Association of Private Farming as insufficient thus a measure stimulating it will be welcome in the new programming period. The problem with the Art. 36-37 measure is that it does not deal with the replaced old farmer.

The first step of the analysis is to estimate potential absorption capacity. Having known the age structure of farmers and holding managers (particularly the figures of farmers older than 40 years who might potentially give up farming) the number of the potential applicants could reach up to 33 % of all current farms. Under this circumstance, annual budget spending will amount to some 0.25 % of the national envelope for Pillar 1 at the first period and will culminate to 1.54 % at the end of the programming period (1.8% in 2018 if non-linear uptake is considered, Figure 6). It indicates that the allowed budget share (2% of the envelope) will not be exploited.

Figure 6. Expected distribution of total applicants in the measure for young farms over the whole programming period



Source: LPIS-CZ (2011), own calculations

[7] Horticulture farms can be an exemption.

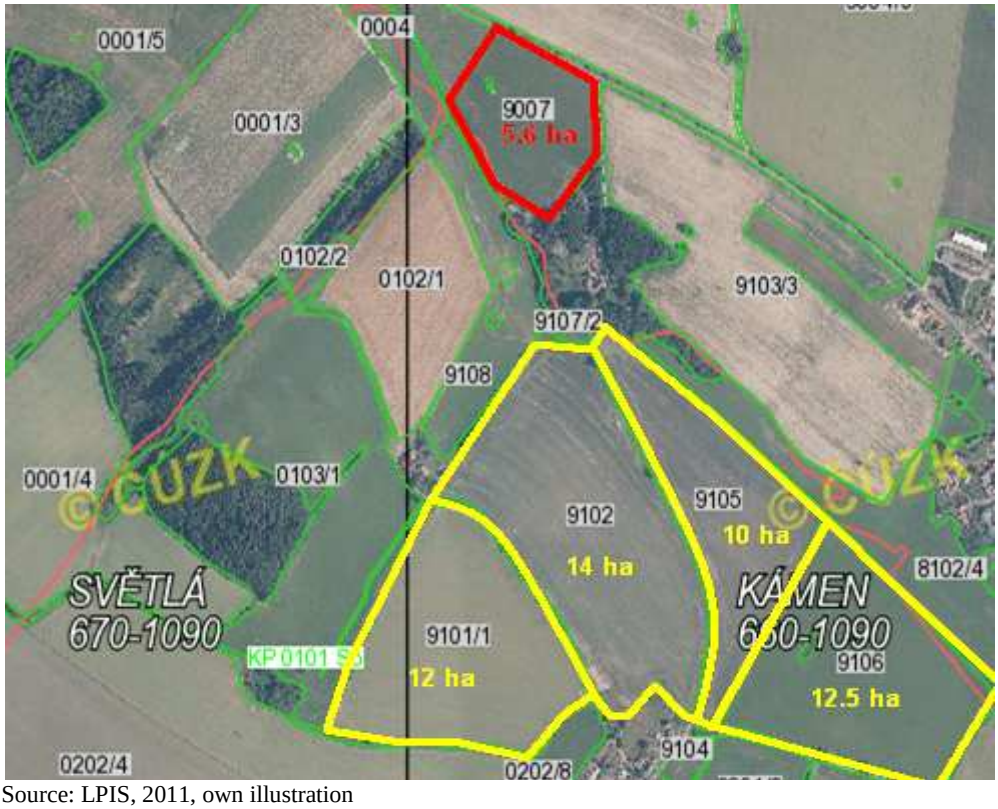
The above graph (Figure 6) shows the dynamics of potential measure spending as a share on the national envelope. The annual average share of the budget spending is projected on slightly above 1% of the envelope. There are two scenarios of the uptake of the measure: the linear one and the one of an S shaped curve. The S shape reflects the experience of the uptake of measures in the previous programmes. Since generation exchange is a complex process affected by a number of factors, the above scenario is rather optimistic in the participation propensity. Firstly, there will not always be a suitable candidate for taking over the farm and secondly, the suggested maximum limit for additional support proportional to the farm size but no more than € 5,650 per farm (referring to 25 hectares) will hardly encourage stakeholders to speed up generation switch on large farms.

5. GREENING

In this section we concentrate on "structural" impact of greening (Articles 29-33, COM(2011) 625/3, EC 2011) – particularly on its differentiated impact of two greening measures on small and large farms: crop diversification, which requires at least three crops on arable land on farms with more than 3 hectares of arable land, and introduction of ecological focus area on 7% of arable land .

Taking into account that holdings which will participate in the small farm scheme are exempted from greening, our interest is in small farms between 4 and 10 hectares[8]. Currently, half of farms in this size bunch plant only one crop. Now, they will have to introduce additional two crops each on a minimum of 5% of arable land, but both together on more than 25%.

Figure 7. Illustration of the organisation of blocks in small (red) and large farms (yellow)



Source: LPIS, 2011, own illustration

[8] Farms above 10 hectares are already well diversified.

It follows from interviews we conducted among small farmers in 2011, crop diversification will rise costs from several reasons: i) per unit much higher harvest costs; it holds even if small farms hire harvesting services, in both cases (own or contractual harvesting) associates high fixed costs; ii) application of pesticides is more complicated and expensive; iii) it doubles or triples marketing costs. In contrast, crop production on large farms is already well diversified, thus Greening will not increase costs at al.

The envisaged contribution to environmental sustainability (biodiversity, soil conservation) is marginal or even doubtful, since most of the arable land on large farms is in blocks of the size much bigger than these small farms often covered by single crop. This is well illustrated in Figure 7 (above): small (red) farm has just one 5.6 hectare block, while the large farm in the region (yellow) has four blocks, each larger than 10 hectares. Obviously, crop diversification on 5.6 hectares will hardly compensate mono-culture on each block of the large farm. In the best case, the large farm will sow each block by different crop, but one crop can be on two blocks without breaking the rules of greening. One can imagine that on farms of 1000 hectares and more the issue will be even severe.

Table 3 below summarises the potential effect of crop diversification on small farms. We can see that farms below 10 hectares cultivate less than 1% of the total arable land.

Similarly, the benefit of crop diversification is doubtful on large farms with a tiny share of arable land. Considering holdings with permanent grassland above 90% there is disproportion between the impact result and potential costs of administration: this group consists of 1.5 thousand farms, but cultivates only insignificant amount of arable land (0,21%). Also, setting aside 7% of arable land for ecological purposes on the farms between 3 to 10 hectares and/or almost entirely grassland farms seems only to increase costs (for both producers and policy administration) without any essential contribution to environment. That is to say for the former group of farms the ecological focus areas will amount on average to 0.4 ha per farm; considering that half of them have one or two field blocks that compliance will bring difficulties to prove such area in the terrain. As a result, 15% of farms will have to be administrated because of insignificant part of arable land (0.07%) is being set aside.

Table 3. Farm size up to 4 ha and groups of farms which should be considered for the exclusion from arable land greening

Group of farms	Number	Share on the number	Share on the arable land	Share on total UAA	Average size
1 - 4 ha	3 760	13%	0,34%	1,22%	2,3
4 - 10 ha	3 164	11%	0,82%	1,77%	6,6
4 - 100 ha, grassland over 90%	211	1%	0,15%	2,24%	17,64
> 4 ha, grassland over 90%	1472	5%	0,21%	2,90%	23,92

Source: own calculations based on LPIS 2011.

6. CONCLUSION

In the above paragraphs, various measures of the CAP proposal for the period 2014-2020 are discussed from the perspective how they address or contribute to eliminate or increase income inequality among farms in the Czech Republic. Generally, we can conclude that the proposal of the Pillar 1 regulation (COM(2011) 625/3, EC 2011) will rather deepen inequality by imposing more

greening costs on smaller farms (particularly those between 4 and 10 hectares) than on larger farms while capping direct payments on big farms has been made ineffective.

The most severe progressive capping applied to the whole DP without considering labour cost in the formula will be a moderately effective instrument for reducing inequality in direct supports (-5.4%), and finally its effect on income (NVA at fc) distribution will be very negligible (-1.3% in terms of Gini coefficient). Other modes of capping considered in the CAP 2020 debate are even less effective.

Effective capping might positively affect land market and thus easy setting up own farm business for young farmers (as the CGE model calculations indicated). However, the current proposal for capping makes it ineffective. Thus the main way of staring own farm business for young people is generation exchange; however, we have showed its limited scope.

We have showed and have argued that the small farm measure will miss its goal if there is no possibility to adjust thresholds and payments to the specific national farm structure as it is in the case of the Czech Republic.

The pressure put by greening on small farms and predominantly grassland farms with a very tiny share of arable land is in contrast to rather modest cost and doubtful ecological potential of 7% of arable land set-aside form production for ecological purposes on large farms in the best soil and climatic conditions (the decline of profit by no more than 5 per cent, Ratinger, T. et al, 2012). These farms are actually very deficient in environmental practices especially in respect to soil and water protection (MoA, 2011).

Taking our findings in the institutional economic framework we can conclude that the current proposals might redistribute property rights by limiting entitlements for income support formally but not effectively and thus that it brings confusing signals to farmers. As pointed out Burreau and Mahe (2008), capping payments would help to counter the most outspoken criticism of the present allocation of payments, by limiting the amount cashed in by the most visible recipients. However, individual ceilings will not address the core of the issue, which is the lack of objective foundations for direct payments once the “compensatory logic” is no longer seen as appropriate. One should admit that “greening” is a serious attempt to bring content to direct payment support, however, it is evident, that the parameters/criteria can hardly be set commonly for all Member States. If the measures of Pillar one are to be effective, their adjustment to national conditions, like farm structure, is essential. Therefore, successful reform must “re-nationalise” Pillar 1 in the similar way as Pillar 2. It is principally in the accord with the proposal of so called Stockholm group (Farmers Guardian, 2012), which claims more national flexibility for more greening. Renationalisation, will necessary lead to a requirement of well justified programming document with national objective, conditions and an evaluation approach.

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Disclaimer

The paper represents opinions of authors. By no means can these be regarded as an official position of the Ministry of Agriculture of the Czech Republic or UZEI.

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APPENDIX – THE CGE MODEL

The presented CGE model is built for the economy of the Czech Republic and contains further agricultural policy extensions. The level of disaggregation concerning various markets and agents is presented in Table 4:

Table 4: Representation of agents and markets in the CGE model

Sets	Elements of sets	Sets	Elements of sets
Production sectors	Farms under 400 ha	Commodity markets	Cereals
	Farms with 400-800 ha		Fruits and vegetables
	Farms with 800-1200 ha		Sugar beet
	Farms above 1200 ha		Oilseeds
	Food processing sector		Cattle
	Other processing industry		Pigs and poultry
	Research and development		Milk
	Other services		Food
Production factors	Labour		Industrial goods
	Land		Research and development
	Capital		Services
Institutions	Firms	Foreign sector	EU
	Farmer households		
	Other households		Rest of the World
	Government		

There is a nested production structure with a fixed factor Leontief combination of intermediate consumption and value added under perfect competition and constant returns to scale (for the schematic production structure as well as for more details on the model description see Křístková, 2010 b).

The production structure further incorporates the depreciation of capital, which is modelled as a fixed proportion from the current level of capital stock.

The behaviour of households in the Czech economy is simulated by introducing two representative households – farmer households and other households, which optimise their utility subject to a budget constraint. Whereas microeconomic theory provides numerous suggestions, a standard choice in the field of CGE models is the Stone-Geary Linear Expenditure System (LES).

The government maximizes utility modelled by the Cobb-Douglas utility function subject to the disposable budget which is derived from incomes received on basis of tax collections. The closure of the governmental account is arranged by fixing a ratio of governmental consumption to GDP. Governmental savings are thus adjusted to the difference between governmental incomes and expenditures.

The intention of producer to find the most profitable combination of supply between foreign and domestic markets is modelled with a Constant Elasticity of Transformation *(CET)* function, and the intension of the consumer to find an optimal combination of imported and domestically produced commodity, modelled with a *CES Armington* function. An extension to the foreign market equations

has been carried out in order to model trade and financial flows on a disaggregated level comprising the EU foreign sector and the Rest of the World (RoW).

Furthermore, the model is based on the following closure options and factor market assumptions:

- Supply of labour and land is fixed; capital stock grows at the rate of net investments.
- Capital is fully employed in all sectors, whereas land is employed only in sub-sectors of agriculture.
- Certain amounts of labour are not employed, modelled by a Phillips curve determining the level of unemployment.
- The model follows a standard macroeconomic balance of savings and investment.
- Based on the assumption of a small country, both world export and import prices are fixed.
- Two foreign sector closures (for the EU and the RoW) consist of endogenous exchange rate adjusting to the exogenously set foreign savings.

The CGE model follows a recursive form of dynamization with a Tobin's Q investment function, which allocates investments to the sectors according to their ratio of profitability to the user costs (for a detailed description, see Křístková, 2010 a).

In the dynamic part, the expected growth rates of the exogenous variables were taken from the following official sources: the growth rates of the domestic exogenous variables, such as the transfers or the GDP deflator, are taken from the Czech Ministry of Finance (MF, 2011) and the prediction of other exogenous variables is taken from the Economic Forecasts of the European Commission (EC, 2011).

The general form of the Social Accounting Matrix (SAM) that is uploaded to the CGE model is based on data provided by the Czech Statistical Office (CSO) in their published version of the SAM for the year 2006. For a detailed representation of agricultural sectors and commodities three major sources of information were used – the FADN network, the commodity balances and the cost surveys of agricultural enterprises, provided by UZEI. The disaggregation of household account into farmer and other households was carried out with the use of the Statistics of Household Accounts (CSO, 2006), where the groups of incomes and expenditures are recorded individually for each type of household.