AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

FACTOR MARKETS

Comparative Analysis of Factor Markets for Agriculture across the Member States

245123-FP7-KBBE-2009-3

WORKING PAPER

No. 58, August 2013

Pavel Ciaian, d'Artis Kancs and Ján Pokrivčák

Empirical Evidence of the Distributional Effects of the CAP in the New EU Member States

ABSTRACT

This study investigates the impact of the SAPS (Single Area Payment Scheme) on farmland rental rates in the new EU member states. Using a unique set of farm level panel data with 20,930 observations for 2004 and 2005 we are able to control for important sources of endogeneity. According to our results, the SAPS has a positive and statistically significant impact on land rents in the EU. However, the estimated incidence is smaller than predicted theoretically. Land rents capture only 19 cents of the marginal SAPS euro, and around 10% of the SAPS benefit non-farming landowners through higher farmland rental prices. As the share of rented land is higher in corporate farms than individual ones, family farms benefit more from the SAPS than corporate farms do.

Key Words: Agricultural policy, decoupled subsidies, capitalisation, land value

JEL classifications: L11, Q11, Q12, Q15, Q18, P32, R12

FACTOR MARKETS Working Papers present work being conducted within the FACTOR MARKETS research project, which analyses and compares the functioning of factor markets for agriculture in the member states, candidate countries and the EU as a whole, with a view to stimulating reactions from other experts in the field. See the back cover for more information on the project. Unless otherwise indicated, the views expressed are attributable only to the authors in a personal capacity and not to any institution with which they are associated.

Available for free downloading from the Factor Markets (www.factormarkets.eu) and CEPS (www.ceps.eu) websites

ISBN 978-94-6138-339-6

© Copyright 2013 Pavel Ciaian, d'Artis Kancs and Ján Pokrivčák

FACTOR MARKETS Coordination: Centre for European Policy Studies (CEPS), 1 Place du Congrès, 1000 Brussels, Belgium Tel: +32 (0)2 229 3911 • Fax: +32 (0)2 229 4151 • E-mail: info@factormarkets.eu • **web:** www.factormarkets.eu

Contents

List of Tables and Figure

Empirical Evidence of the Distributional Effects of the CAP in the New EU Member States

Pavel Ciaian, d'Artis Kancs and Ján Pokrivčák*

Factor Markets Working Paper No. 58/August 2013

1. Introduction

Since their accession to the EU in 2004, the new EU member states (NMS)[1] have received considerable amounts of farm income support through the Single Area Payment Scheme (SAPS). The SAPS brought two major changes to farmers in the NMS. Firstly, the switch to the SAPS' decoupled policy support from farm production. Secondly, it increased the average payments per farm (Ciaian et al., 2010). In addition to these direct effects, the SAPS also induces indirect changes in agricultural input and output markets.

The distributional effects of agricultural policy, which Alston and James (2002) refer to as the "incidence of agricultural policy", have been studied extensively in the literature. Theoretical models have shown that, due to inelastic land supply, area payments may be capitalised into land values and benefit landowners instead of farms (Floyd, 1965; Alston and James, 2002; Guyomard et al., 2004; Ciaian et al., 2008). While the theory is able to rank clearly the various types of agricultural subsidies by their incidence level, the empirical evidence is less conclusive on the exact capitalisation rate. Studies on area-based subsidies find a capitalisation rate of between 0.2 and 1.0 (e.g. Kuchler and Tegene, 1993; Barnard et al., 1997; Patton et al., 2008; Breustedt and Habermann, 2011). For example, Kuchler and Tegene (1993) estimate the impact of land tax on land rents using data from seven states in the US,[2] and find that all tax costs are incurred by landowners, which implies their full (negative) capitalisation into land rents. Patton et al. (2008) investigate the impact of various types of CAP direct payments on land rental values in Northern Ireland for the period 1994 – 2002, and find that less favoured area payments are fully capitalised into land rents.[3] Patton et al. also find that area-based subsidies lead to a higher capitalisation rate into land values than other types of subsidies. On the other hand, Breustedt and Habermann (2011) estimate the marginal capitalisation rate for EU coupled area payments at 0.38 in the German federal state of Lower Saxony. Studies on non-area-based subsidies also find a capitalisation rate of between 0.2 and 1.0 which, according to theoretical predictions, should be less capitalised

---

* Pavel Ciaian, European Commission (DG JRC) and Slovak Agricultural University in Nitra (pavel.ciaian@ec.europa.eu); d'Artis Kancs, European Commission (DG JRC), Catholic University of Leuven (LICOS) and Economics and Econometrics Research Institute (EERI) (d'artis.kancs@ec.europa.eu); Ján Pokrivčák, Slovak Agricultural University in Nitra (jan.pokrivcak@uniag.sk).The authors thank participants at conference in Berlin (EAAE) for very useful comments on the article. The authors acknowledge financial support from the European Commission FP7 project "Comparative Analysis of Factor Markets for Agriculture across the Member States". The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

[1] In the present study the Czech Republic, Estonia Latvia, Lithuania, Hungary, Poland and Slovakia are referred to as NMS. In contrast, all those countries that were already EU members before the 2004 enlargement are referred to as the 'old' EU member states (OMS).

[2] A land tax is similar to an area payment except that it represents a cost.

[3] The less favoured area payment is an area-based payment and it is paid to farmers located in less productive regions.

than area-based subsidies (Goodwin et al., 2003, 2005; Lence and Mishra, 2003; Roberts et al., 2003; Taylor and Brester, 2005).

Most of the existing studies focus on North America (the US and Canada), and only a few authors consider subsidy capitalisation in the EU (Breustedt and Habermann 2011; Goodwin and Ortalo-Magné, 1992; Duvivier et al., 2005; Patton et al., 2008). The present study attempts to fill this gap and analyses the distributional effects of the SAPS in the NMS. More precisely, we estimate the capitalisation rate of the SAPS into farmland rental prices in the NMS. There are three reasons for focusing on the NMS. First, there is no empirical evidence in the literature on subsidy capitalisation in the NMS. Secondly, the SAPS (which are area-based payments) introduced in the NMS are fundamentally different from the subsidy system in the old EU member states (OMS) (which are farm-based payments).[4] In addition, the structural differences between farms in the post-planning NMS economies and the Western European OMS require that they are analysed separately. We focus on land rental prices, because these are the only data available for the NMS at farm level. Analysing rental prices (compared to land sales prices) has two advantages. First, they capture to a much lower extent non-agricultural land use pressures, such as urban housing (Ciaian et al., 2010). Second, given that rental prices are available at farm level (which is not the case with land sales prices), they allow us to address important sources of endogeneity. A potential downside of analysing rental prices is that due to long-term rental contracts they may adjust to changes in market conditions/policies more slowly.

Our main contribution to the literature is to provide the first estimates on the SAPS' capitalisation rate into farmland rental prices in the NMS. Additionally, the findings of our paper may provide additional insights into the capitalisation rate of area-based subsidies, as there are not many examples of pure area-based payments implemented in other regions of the world.[5] Using a large panel of farm-level data for the NMS, we are able to address important econometric issues, such as unobservable heterogeneity, which cannot be dealt with in regional or cross-section studies.

The distributional effects of the SAPS have important policy implications for the NMS, where farmland renting is considerably more important than in developed countries. On average, 52% of agricultural land is rented (the share of rented farmland varied between 28% in Poland and 96% in Slovakia in 2010). At the same time, the dual farm structure – a characteristic feature of NMS' agriculture – and the fact that large corporate farms (CFs) tend to rent most of the agricultural land while small individual farms (IFs) mostly own agricultural land (Ciaian et al., 2011), may lead to a differentiated effect of the SAPS between IFs and CFs. This implies that the income effect of the SAPS will likely differ between CFs and IFs and hence across countries in the NMS.

2. Agriculture in the NMS

2.1 Rental market for agricultural land

Land is one of the main inputs in agricultural production. Compared to the OMS, farmland renting is considerably more important in the NMS. A particularly large share of farmland is rented in Slovakia and the Czech Republic, where rented farmland represents more than 90% of the total utilised agricultural area (UAA). In Hungary, Estonia and Lithuania land renting

---

[4] OMS implement the Single Farm Payments (SFP) and for this reason it was not considered in the paper.

[5] Kuchler and Tegene estimate the impact of land tax which may have different mechanisms for impacting land values than area-based payments, whereas Patton et al. (2008) investigate the impact of less favoured area payments applied only in selected EU regions, whereas Breustedt and Habermann (2011) consider area payments coupled to land cultivated with cereals, oilseeds, protein crops and set aside land.

also dominates (more than 60% in 2005). In Poland and Latvia farms rent less than 50% of the total land they use (Ciaian et al., 2011).

There are also sizeable differences in renting behaviour between different types of farms. On average, CFs tend to rent most of the land they use, while IFs tend to use both owned and rented land (CFs rent 92% whereas IFs rent 36% of the UAA in the NMS). The dual farm structure in the NMS and the sizeable differences in the renting behaviour between IFs and CFs suggest that the gains from the SAPS may vary substantially in the NMS, if landowners absorb part of the subsidies, e.g. through higher rental rates.

Usually, in the NMS land rents are paid at the end of the season (after harvest) in cash. Often land rents are calculated based on market conditions at the end of the season particularly for in kind rents, where they depend on the observable land productivity.[6] When production is low, e.g. due to unfavourable weather or market conditions, the rental arrangements stipulate that rent is reduced or not paid at all (Ciaian et al., 2010).

2.2 Single Area Payment Scheme (SAPS)

Since the 1992 MacSharry Reform and the Agenda 2000, the vast majority of the CAP subsidies in the EU are the so-called 'direct payments'. In 2010, €39.3 billion were spent on direct payments in the EU (EUR-Lex, 2010). They made up to two-thirds of the CAP budget and hence were a central issue in the NMS' accession negotiations. During the negotiations, the NMS and OMS agreed that the direct payments would start at 25% of the OMS' level in the first year after the accession and continuously increase over 10 years, reaching the full level in 2013.[7]

Given the administrative complexity of the CAP, which made full implementation of the Agenda 2000 unfeasible in a short time period, it was agreed that a simplified version of the CAP would be implemented in the NMS under which farmers receive a per hectare payment (i.e. SAPS). With the exception of Slovenia, all other NMS from Eastern Europe adopted the SAPS from the first year of the EU accession.[8]

According to EU regulations, the total SAPS payments will increase from around €1.6 billion in 2004 to around €6.2 billion in 2013 in the NMS, while per hectare payments will increase from €53 to €212/ha in the same period. There is a significant variation in the SAPS payments between countries. On average, in the period 2004-13 the lowest rate is in Latvia (around 45% of the NMS average) followed by Estonia (55%) and Lithuania (68%). The highest SAPS rate is in Hungary and the Czech Republic (about 125% of the NMS' average) (Agra Europe, 2007; European Commission, 2010; EUR-Lex, 2010).

These differences in the value of the SAPS per hectare between the NMS are because the total value of the SAPS payments allocated to each country were calculated based on historical agricultural production levels. More precisely, the total value of direct payments per country was calculated as a sum of the crop and animal direct payments which farmers would receive under the Agenda 2000. Different years between 1995 and 2001 were used as a reference

---

[6] In several NMS land rents are also paid in kind or through sharecropping. For example, in Poland more than 20% of land rents in 2005 were paid in kind. In Slovakia, only half of the farms paid rents exclusively in cash, while the other half of the farms paid part of the rent in cash and part of the rent in kind in 2006. Usually, the in-kind payments depend on the yields, which implies that the rent is directly linked to the contemporaneous land productivity (Ciaian et al., 2011).

[7] In addition to the SAPS, the national budgetary resources (the so-called top-ups) are used to increase the direct payments by some additional 30%. In general, these payments are coupled to crop and animal production.

[8] Slovenia introduced the Single Farm Payments (SFP) and for this reason it was not considered in the paper. The SFP differs from the SAPS with respect to its implementation (see further) and with respect to its impact on land markets (see for example Courleux et al., 2008; Kilian and Salhofer, 2008; Ciaian et al., 2008).

period for different products in different NMS.[9] The total value of direct payments represented the country's total ceiling for the SAPS, which was divided by the utilised agricultural area to obtain the per hectare SAPS payment. This implies that the current levels of the SAPS payments are determined by past production – the higher the agricultural production in the reference period the more support a country could obtain from the CAP.

After a transition period of ten years, all NMS which adopted the SAPS will have to switch to the SFP introduced by the 2003 CAP reform in the OMS.[10] Under the SFP, the subsidies will be given as a fixed set of payments per farm. In other words, the SFP is an entitlement, the size of which depends on the eligible area. For an individual farm the size of the SFP depends on the cultivated area in the reference period. Under the current regulation if the NMS were to decide to implement the SFP their reference period would be 2005-07.

3. Theoretical framework

3.1 The model

The conceptual framework of the present study builds on extensive theoretical work on the distributional effects of agricultural subsidies (Floyd, 1965; Alston and James, 2002; de Gorter and Meilke, 1989; Gardner, 1983; Guyomard et al., 2004; Salhofer, 1996; Ciaian and Swinnen, 2006; Ciaian et al., 2008). Most studies adopt partial equilibrium models either by assuming representative farm models, or by considering supply-demand market representation of the analysed sectors.

Following Ciaian and Swinnen (2006), who analyse the income distributional effects of the SAPS in a partial equilibrium model, the representative farm's output, $f(A;T)$, depends on the amount of land, A, and the non-increasing to scale production technology, T, with $f_A > 0$, $f_{AA} < 0$ and $f_T > 0$.[11] The entire land is assumed to be owned by landowners, who rent it to the farm.[12] The maximisation of profit function, $\prod = pf(A;T) - (r-s)A$, together with market clearing conditions yields:

$$pf_A = r - s \tag{1}$$

$$A = S(r) \tag{2}$$

$$f = D(p) \tag{3}$$

where p is the price of farm output, r is the rental rate of land, s is the SAPS, $S(r)$ is the land supply, and $D(p)$ is the output demand. Equation (1) is the farm's marginal equilibrium condition for land derived from profit maximisation. Equations (2) and (3) are market clearing conditions for land and output, respectively. The market clearing conditions imply

[9] Initially, the NMS wanted to use the reference period from the end of 1980s, when production was high because of the high subsidisation of the agricultural sector during the Communist period. This period was not accepted by the European Commission because it would significantly increase the CAP expenditures and create huge market distortions in the NMS.

[10] According to EU regulations, the NMS can keep the SAPS until 2013, after which time they will have to switch to the SFP (EUR-Lex, 2003a 2003b; European Commission, 2008; EUR-Lex, 2009).

[11] f_i and f_{ii} are first and second derivatives of the production function with regards to its arguments, respectively.

[12] This distinction between landowners and farmers is convenient for our explanation but is not essential for the analysis and the derived results (Ciaian et al., 2008).

that in equilibrium land demand, A, and production supply, $f(A;T)$, of the representative farm is equalised to land supply and output demand, respectively.[13]

Totally differentiating equilibrium conditions (1) – (3) yields the following capitalisation effect of the SAPS (see Appendix for derivations):

$$\frac{dr}{ds} = \frac{1}{1 - \left[pf_{AA} + p\frac{f_A^2}{f\varsigma} \right] \varepsilon \frac{A}{r}} \tag{4}$$

where ε is land supply elasticity, and ς is output demand elasticity. With $f_{AA} < 0$, $\varepsilon > 0$ and $\varsigma < 0$, the second and third terms in the denominator on the right hand side of equation (4) are negative, implying that the value of the whole denominator is positive. Overall the capitalisation rate is between zero and one, $0 \le dr/ds \le 1$.

Equation (4) suggests that the capitalisation of the SAPS into land rent, r, is increasing in the SAPS.[14] In addition, the capitalisation of the SAPS also depends on output price, output demand, and land supply. The output demand elasticity, ς, measures the rate of output price adjustment to farm production change. The SAPS stimulates land use and hence output supply, which exerts downward pressure on output price resulting in income losses to the agricultural sector. The output price decline decreases in the demand elasticity, implying an inverse relationship between the SAPS and land rate: the capitalisation rate of the SAPS is increasing in demand elasticity. The land supply elasticity, ε, reduces landowners' gains, whereas with fixed land supply, $\varepsilon = 0$, landowners benefit the full value of the SAPS ($dr/ds = 1$). This is illustrated in Figure 1. The horizontal axis shows the quantity of land and the vertical axis measures the rental price and subsidies. The initial land demand of representative farm, L, is given by a downward sloping curve derived from the marginal condition (1), where $A = L(r)$. Land supply is shown by an upward sloping curve: S_0 for zero elastic supply ($\varepsilon = 0$) and S_1 for supply with positive elasticity ($\varepsilon > 0$). Without the SAPS, the equilibrium set of land allocation and land rent is A^*, r^*. The SAPS shifts land demand upward to L_s. The equilibrium depends on land supply elasticity. With inelastic land supply the equilibrium set of land allocation and land rent is A^*, r_{s0}^*, implying that land use is not affected ($A_{s0}^* = A^*$), and the SAPS is fully capitalised into land rent, $r_{s0}^* - r^* = s$. With higher land supply elasticity the SAP capitalisation declines. As shown for land supply S_1, the equilibrium shifts to A_{s1}^*, r_{s1}^*. The rent adjustment is lower than the value of the SAPS, $r_{s1}^* - r^* < s$, because an upward adjustment in land use, $A_{s1}^* > A^*$, reduces the pressure on land rents.

3.2 Other determinants of the SAPS capitalisation

In addition to the relative elasticities of land supply and demand, the capitalisation rate of the SAPS also depends on other factors (Ciaian et al., 2011). According to Alston (2007), Kirwan (2009), Plantinga et al. (2002) and Ciaian et al. (2011), the share of subsidies which gets capitalised into land values depends, among others, on policy implementation details, expectations about changes in future policies, market imperfections, and formal and informal land institutions.

---

[13] Note that for notational simplicity we assume one representative farm operating in the agricultural sector and behaving competitively. This implies that the entire land cultivated by the representative farm also represents the aggregate market demand for land. This representation of farming sector is equivalent to assuming N number of homogenous farms.

[14] Ciaian and Swinnen (2006) have shown that these results also hold in imperfectly competitive land markets. In several NMS the farm sector is dominated by large corporate farms. For example, in countries such as the Czech Republic and Slovakia large corporate farms cultivate more than 70% of the agricultural land. The dominance of corporate farms may allow them to exercise market power on the land market by being able to alter the market rental price.

The capitalisation of the SAPS may be affected by the *conditionality* on fulfilling certain farm management criteria. Generally, the SAPS provides for a flat-rate, per-hectare payment to farmers paid once a year, irrespective of the crops produced, or whether any crops are produced. However, in order to be eligible for the SAPS, farmers are required to maintain land in good agricultural condition.[15] If maintaining land in good agricultural condition results in additional costs for farms, then the effect of the SAPS on land rents will be smaller than theoretically predicted. According to Ciaian et al. (2011), the cross-compliance costs are higher in less productive areas, where land would be abandoned in the absence of the SAPS. In productive agricultural regions it is profitable to keep land in good agricultural condition even without the SAPS.

The effect of the SAPS on land rents may also be affected by *land rental contracts and rural institutions*. Both formal and informal land rental contracts imply that the transmission of changes in policy into land rental prices is not instantaneous. Rental arrangements are typically multi-year in their nature and cover either written contractual arrangements between farmers and landowner or reflect long-term personal relationships in rural communities, sometimes among members of the same family (Robison et al., 2002; Rainey et al., 2005). Competitive pressures might not take full and immediate effect in such a setting (Gardner, 2002). Sluggish adjustment of rental rates implies that the short- and intermediate-run incidence of policies will be different from the long-run outcome with complete adjustment. Moreover, even without contracting, land markets involve lags and dynamics, uncertainty and expectations.

The presence of long-term formal and informal rental arrangements might yield lower capitalisation rates than predicted by the theoretical literature. Moreover, the size of the bias may be country-specific, because the types of rental contracts vary considerably between different types of farms. Big commercial type farms tend to apply written multi-year types of rental contracts. Family-type farms tend to use both written and informally arranged contracts (e.g. oral) but with the latter being more common. The evidence from Slovakia and Poland shows that, with the EU accession, the duration of land rental contracts has increased (Ciaian et al., 2011). In Slovakia before the EU accession contracts tended to be shorter (up to five years). After the accession, contracts became longer to allow farms to use European funds such as the CAP rural development payments. A rise in the number of long-term rental contracts was also observed in Poland. Long-term contracts (of a duration of more than 10 years) increased from 46% to 66% in 2005 relative to 2000 (Ciaian et al., 2011).

The current farm behaviour may be subject to uncertainties about policy changes (OECD, 2001; Shaik et al., 2005). When farmers, landowners and other market participants make their decisions, they take into consideration the policy risk related to uncertainty about future subsidies. The SAPS is implemented in the NMS for ten years - from 2004 to 2013. By the end of 2013 the SAPS will be replaced by the SFP, which is currently implemented in the OMS. At the time of the SAPS' introduction, the exact implementation date and reference period for future payment calculations were not known by farmers, because of frequent changes in future policy design. For example, initially the NMS had to switch to the SFP by 2008 at the latest. Later this date was shifted to 2011. Finally, it was agreed to postpone the SFP implementation to 2013 (EUR-Lex, 2003a and 2003b; European Commission, 2008; EUR-Lex, 2009; Bureau and Witzke, 2010).

4. Econometric specification

According to the theoretical model (4), changes in land rental rates are determined by the SAPS, output price, output demand, and land supply. In addition, farm-specific

[15] The main objective of this requirement is to ensure that if land is kept fallow but used to claim the SAPS area payment then this land is maintained such that it can be brought into agricultural production at minimum cost.

characteristics, such as market return, yield, sectoral specialisation, farm size, revenue and expenditures and farm access to credit also affect the rental price for land:

$$\Delta r_i = \beta_1 \Delta s_i + \beta_2 \Delta X_i + \Delta \eta_i \tag{5}$$

where, Δr_i is change in land rent for farm i, Δs_i is change in the SAPS payment per hectare, ΔX_i is a vector of observable covariates, which contains change in market return, other subsidies, economic size of farms, ratio of family labour to total labour, and assets to liabilities ratio. The selection of covariates is based on the findings of Ciaian et al. (2010) and Ciaian et al. (2011), who study the determinants of agricultural land values in the EU. Similar covariates were also used in other studies on the capitalisation of subsidies into farm land rents (e.g. Lence and Mishra, 2003; Patton et al., 2008; Kirwan, 2009). As usual, η_i is the residual, which is assumed to have finite moments.

The estimation of the SAPS capitalisation is subject to several econometric issues. Firstly, omitted variables, which determine both the land rental rate and the level of subsidies, may bias the subsidy-rental rate relationship. Secondly, a significant share of farms do not rent any land. Excluding them from the estimations may result in sample selection bias.

Omitted variable bias. Many farm characteristics that influence both subsidies and farmland rental rates cannot be observed. Even using farm-level data not all farm characteristics, such as farm-level soil properties, farmer human capital and managerial skills, can be observed by the econometrician. Given that unobserved productivity factors may confound the rental rate and subsidies, this positive correlation between subsidies and the unobserved factors that influence productivity might result in an upward bias of capitalisation estimates and confound β_1 as a measure of the effect of subsidies on rental rates.[16] Without addressing the unobserved farm heterogeneity, s_i would be correlated with η_{it}, and the resulting OLS estimate of β_1 would be biased. We control for permanent farm-level characteristics that cause β_1 to be inconsistent, by employing panel properties of the FADN data, and, like Kirwan (2009), include time-unvarying farm fixed effects as an explanatory variable. In our model the farm effect is absorbed by first-differencing the data.[17]

A further potential source of omitted variable bias is farmers' expectations about changes in future policies. As detailed in the previous section, in 2013 the current SAPS payments in the NMS will switch to the SFP, which is implemented in the OMS. These policy changes in future payments have two characteristics, which are important for the empirical analysis: i) according to the legislation in force the eligible area per farm will be calculated based on the current land use; and ii) information about the most likely changes to future policies is already available to farmers now. In order to increase their subsidies in the post-2013 period, profit maximising farmers (and landowners) might adjust their current renting behaviour. This implies that change in the rented area and change in the rental rate may be affected by future subsidies.

This source of bias can be addressed by including future subsidies as an explanatory variable on the right-hand side. At country level, the post-2013 SFP subsidies are approximately known - they will be at the SAPS level in 2013. Therefore, in order to account for the expected

[16] Previous studies (e.g. Livanis et al., 2006) have attempted to overcome the omitted variable bias by including observable soil characteristics as controls. However, because of a highly non-linear relationship between soil characteristics and productivity, using soil characteristics as controls cannot fully overcome the omitted variable bias.

[17] Note that in a panel with $t = 2$, the coefficients estimated from first difference data will be identical to those obtained by including individual fixed effects.

policy changes in future subsidies, we include variable future policy changes, g_i, as a control variable in equation (5) defined as SAPS change in 2013 relative to 2005.[18]

Due to farm heterogeneity and market imperfections, such as credit constraints, not all farms are equally able to adjust their rented area subject to long-run (post-2013) profit maximisation. Assuming that land markets are in equilibrium, only those farms making positive profits would be able to increase the rented area as, marginally, any increase in farm size would yield negative profits, which can be compensated only by the most productive farms. This implies that g_i is farm-specific. In addition to farm productivity, the regional productivity also matters, as usually farms compete for land within the same region. The higher the average productivity in a region the more farms will compete for additional land, the greater the upward pressure on rents and, in relative terms, the less competitive a particular farm will be on the land market within that region. This implies that farm-level productivity is positively correlated with the post-2013 subsidies whereas regional productivity is negatively correlated with them, g_i. In order to account for farm-level and regional productivity, which determine farms' ability to adjust their current renting behaviour with respect to future subsidies, we condition the country-level future subsidies on the relative farm productivity.

Selection bias. A significant number of farms in the FADN data set do not rent any land. Because of missing left hand side variables, these farms are excluded from our sample. If the farm rental decision is non-random, then the standard estimation approach would result in biased estimates. Indeed, one may expect that more dynamic farms and/or those with limited own land resources may be more inclined to participate on the land rental market compared to less dynamic, part-time and/or subsistence farms. Similarly, more productive and dynamic farms received a higher per hectare subsidy as, on average, they cultivate more productive, non-marginal land and have a higher share of 'subsidy hectares' in the total cultivated area. Given that farms with zero rentals drop out of equation (5) (as their land rental prices do not exist), the farm rental selection might potentially bias the subsidy coefficient.

To control for the selection bias related to farms' rental market participation decisions, we employ the Heckman's sample selection model (Heckman, 1979), and adopt a two stage estimation approach. In order to calculate the Inverse Mills Ratio (IMR), we examine the determinants of farms' decisions to rent agricultural land using a Probit model by assuming that the error term follows a standard normal distribution.[19] The first stage includes both the land characteristics and the characteristics of the farm, which are likely to influence the propensity to rent land. The farm covariates are as follows: whether the farm is a family farm, whether farming is the principal occupation, whether the farm size has increased compared to the previous year, whether the number of hours worked by own labour is larger than the number of hours worked by hired labour. The coefficients from the first step Probit regression have no direct interpretation (being simply the values that maximise the likelihood function), but they allow us to calculate the IMR. The IMR is calculated as the ratio of the probability density function to the cumulative distribution function. In the second stage, we estimate the rental equation, where the selection bias is controlled by including the IMR computed in the first stage.[20] If the IMR is significant and negatively signed in the

---

[18] As a robustness test, we also experiment with the year 2004 and the average of 2004 and 2005. The obtained results are similar both in terms of sign and magnitude and therefore not reported. Note that in the presence of rigid rental markets, the variable future policy changes may capture not only the impact of the expected future shift to SFP on land rents but also the affect of higher future SAPS payments which gradually increase from 25% of the OMS' level in 2004 to 100% in 2013.

[19] The dependent variable h_i is a dichotomous $(1,0)$ variable indicating whether the i-th farm rented land or not.

[20] One potential limitation of the Heckman method is that if the Heckman's selection model is not well-specified, the IMR may be weaker than expected and the Heckman method may have limited power to detect bias. As a result, a second factor to examine following the addition of the IMR variable

second stage, it suggests that the error terms in the selection and primary equations are negatively correlated, implying that the (unobserved) factors that increase the probability of land renting tend to be associated with lower land rents (higher land rents for significant and positively signed IMR). In both cases, the sample selection bias needs to be controlled for in the land rental model by including the IMR as an additional covariate.

Although the FADN sampling strategy is representative and theoretically consistent, the estimation of equation (5) could suffer also from attrition bias. The FADN is an unbalanced panel, where every year 5 to 20% of farms are dropped from the sample. Farms are excluded either because of the FADN sampling strategy of regular annual replacement of observations and/or because of other reasons (voluntary drop-out, exit from farming). If some groups of farms drop out from the sample more frequently than others, then the standard estimators would yield biased results. Therefore, we also test for the attrition bias using the Heckman's sample selection model. We find no significant impact on the estimated coefficients.[21]

In order to control for unobserved productivity differences between regions, we include time-varying region fixed effects, R_j in the vector of observable covariates X_i, where *j* stands for FADN regions (see further). The time-varying region-specific effect, R_j, captures localised effects that might affect farmland rents, and allows for transient shocks, such as weather or pests that affect all farms within a localised region. As a result, the time-varying fixed-effects model (6) is resistant to bias caused by weather and pest differences between regions, which vary over time, and, at least theoretically, might have affected the calculated per-hectare subsidy in the reference period.

Furthermore, in order to capture rental price differences due to farm specialisation and farm type, in the estimation of equation (6) we also include sector and farm-type dummies.[22][23] As a result, we obtain the following estimable time-varying fixed-effects model:

$$\Delta r_i = R_j + \beta_1 \Delta s_i + \beta_2 \Delta X_i + \beta_3 \Delta g_i + \beta_4 \Delta IMR_i + \Delta \eta_i \qquad (6)$$

where $\Delta g_i = g(\phi_i / \phi_r)$ captures the impact of future subsidies, where ϕ_i and ϕ_r are farm-level and regional total factor productivity (TFP) measures, respectively, and IMR_i is the Inverse Mills Ratio.

Equation (6) is the final empirical specification which we estimate. The coefficient of interest is β_1, which measures the share of each marginal SAPS euro that is capitalised into land rents.

5. Data and variable construction

The main source of data is the Farm Accountancy Data Network (FADN), which is compiled and maintained by the European Commission. The FADN is a European system of sample

---

into the initial specification models is whether or not there have been significant changes in any of the parameter estimates.

[21] Similarly to in the case of selection bias related to farms' rental market participation, in the first stage we examine the determinants of farms' decisions to exit the sample using the Probit model. In the second stage, we estimate the rental equation with correcting for the selection bias by the inclusion of the Inverse Mills Ratio computed in the first stage. Because the estimated results are not affected significantly, we do not follow this approach.

[22] The sectoral dummies capture 14 different farm specialisation types, which change over time, among other reasons, due to crop rotation and other agronomic requirements. Farm-type dummies capture the restructuring of farms in the transition economies. Both farm sectoral specialisation and farm type may affect productivity and hence rental price.

[23] We also experiment with country level variables, but their magnitude turns out to be insignificant.

surveys that take place each year and collect structural and accountancy data on EU farms.[24] In total there is information about 150 variables on farm structure and yield, output, inputs, costs, subsidies and taxes, income, balance sheet, and financial indicators. The yearly FADN sample covers approximately 18,000 agricultural farms in the seven NMS which implemented the SAPS. In 2004, they represented a population of almost 1,000,000 farms, covering approximately 90% of the total utilised agricultural area and accounting for more than 90% of the total agricultural production in the NMS. Farm-level data are confidential and, for the purposes of this study, accessed under a special agreement.

The FADN is unique in the sense that it is the only source of harmonised data (the bookkeeping principles are the same across all EU member states) and is representative micro-economic data in the EU. Farms are selected to take part in the survey on the basis of sampling plans established at the level of each region in the EU. The FADN survey does not, however, cover all farms in the EU, but only those which are of a size allowing them to rank as commercial holdings (FADN, 2010).

In the present study, we use a sub-sample of the FADN data, which covers seven NMS implementing the SAPS. From the FADN data for two years (2004 and 2005) we create a balanced panel of farming operations. Although the total number of farms is roughly equal over the two years, this masks a great deal of turnover. The populations of interest are those farms surveyed in both years. This leaves us with 10,465 farms observed over two years, which yields 20,930 observations in total. A summary of statistics is provided in Table 1.

The dependent variable – farmland rental rate – is constructed from the FADN data. The FADN does not report the rental rate. However, it reports the total amount of rent paid for farm land and rental charges (SE375),[25] and the utilised agricultural areas rented by the holder under a tenancy agreement for a period of at least one year (SE030). From these two variables we construct the per-hectare rental rate by dividing the total rent paid by the hectares rented.

The explanatory variable – the SAPS payments – is also constructed from the FADN data. Every agricultural producer in the FADN sample is asked to report both the total subsidies received as well as to specify the amount by subsidy type received. Among the different types of received subsidies, farmers also report the Single Area Payments (SE632). We obtain the per-hectare SAPS payments by dividing the total SAPS payments by total hectares (SE025). According to the FADN data, in 2004 the SAPS accounted for 23% of all the subsidies in the NMS.[26]

The identification of the rental price change due to the SAPS is given by three sources of SAPS variation. The first source is the interregional variation of SAPS. Different regions have

---

[24] The surveys are conducted by national authorities.

[25] The rental costs in the FADN data include not only farm land rents, but also rents for buildings and other rental charges. We made an attempt to correct this data issue (e.g. by excluding high value rents which may represent rental for buildings), but one must take this into consideration when interpreting the results because the data may still contain a measurement error bias.

[26] The remaining 77% of subsidies are coupled payments and include subsidies such as crop and livestock coupled payments, investment payments, environmental payments, etc. These payments are allocated to farmers independently of the SAPS. In general, they depend on the current activity level of the farm at which they are targeted on (e.g. cultivated area of supported crop, stock of supported livestock, supported farm environmental practices). Their exact value is set by the EU CAP regulation. However, there is a tendency to support the livestock sector through these payments in some NMS. The main objective is to offset the disadvantage of a lower farmland area available on livestock farms which may result in lower SAPS payments allocated to this type of farm. This implies that the total value of coupled payments might be correlated with the total value of the SAPS but their hectare values are independent of each other because the SAPS per hectare value does not depend on the farm activity level. To control for their potential impact on land rents, we introduce the variable other subsidies in the estimated equation.

different values of subsidies, hence leading to year-to-year regional variation in the hectare value of SAPS. Secondly, farms which use non-eligible land will have lower SAPS per hectare than farms with all land qualifying for the SAPS. Thirdly, although farms are eligible for the payments, in some cases the payment is claimed by landowners. These farms experience lower levels of SAPS and hence are less likely to bid rental price up. However, this effect may lead to underestimation of the impact of the SAPS on land rent, because actually landowners benefit from the SAPS as they are direct payment recipients. There are no data available to account for this effect. According to the data, the coefficient of variation (standard deviation divided by mean) of the first differenced hectare values of SAPS (2005 relative to 2004) varies between 0.4 and 1.05. All three sources of variation pose a limited endogeneity problem as both are independent of farm behaviour and tend not to be linked to farm characteristics. The first source of variation is determined by past regional productivities[27] and the second and third sources are determined by policy and market conditions, respectively. The land eligibility is imposed by the policy whereas whether farms or landowners apply for the SAPS is determined by the institutional setting of land rental contracts.

Similarly, the covariates are constructed from the FADN data. Their selection is based on the findings of Ciaian et al. (2010) and Ciaian et al. (2011), which study the determinants of agricultural land values in the EU. Similar covariates were used by other studies on capitalisation of subsidies into farm land rents (e.g. Lence and Mishra, 2003; Patton et al., 2008; Kirwan, 2009). All covariates except ratios are measured on a per-hectare basis.[28] Given that agricultural productivity is one of the key determinants of farmland rental rates, we include a variable capturing market return. The FADN reports the total output (SE131), which is constructed by adding to total sales and own use of crop livestock and livestock products, the change in stocks of products, the change in valuation of livestock and subtracting the total purchases of livestock. We construct the market return variable by dividing the total output (SE131) by the total utilised agricultural area (SE025). A variable capturing all other subsidies is directly available in the FADN data set by subtracting SAPS (SE632) from the total subsidies (SE605) and dividing by the total area. In order to capture the higher market power of large farms on land rental markets, we include a variable capturing the economic size of farms, which is also available in the FADN data set (SE005). Economic size of holding is expressed in European size units on the basis of the EU typology.[29] Given that land rent may increase with the share of family labour due to productivity differences between family and hired labour, we include the relative share of family in total labour. The ratio of family labour/total labour is constructed by dividing unpaid labour input (SE015) by total labour (SE010) (unpaid plus paid labour input). Both are directly available in the FADN data. Finally, in order to account for farm access to credit, in the regressions we also include the assets to liabilities ratio by dividing total fixed assets (SE441) with long and medium-term loans (SE490) plus total fixed assets (i.e. SE441/(SE441 + SE490)). The total fixed assets capture agricultural land and farm buildings and forest capital, buildings, machinery and equipment, and breeding livestock. The variable long and medium term loans (SE490) captures all loans contracted for a period of more than one year. In addition, in order to account for farmer adjustments with respect to the future SFP payments, we construct a variable called 'Future policy changes', g_i. From Eurostat and Agra Europe (2007) we extract approximate future SFP payments by country. Then we subtract the SFP payments in 2013 from the SAPS in 2005 to obtain future subsidy change. As

[27] As a robustness test, we also perform estimations by MS, but we do not find significant differences compared to the full sample results.

[28] The per-hectare form is chosen as it allows for a more natural interpretation of the coefficients. As a robustness test, we also perform the analysis using log-levels. The obtained results are similar to those presented in the paper.

[29] The economic size of holding is expressed in European size units on the basis of the Community typology – the total standard gross margin in euro/1200.

explained above, at farm level the adjustment of current behaviour with respect to the future SFP payments depends on the relative farm productivity. Both farm level and regional productivity measures are obtained by estimating TFP using the FADN data (see Kancs and Ciaian, 2010). Multiplying the relative farm productivity by the future subsidy change yields variable Future policy changes. A summary of key variables is provided in Table 1.

In addition, we construct six regional variables: wheat yield, total factor productivity, share of CFs in total land use, total utilised agricultural area, population density and GDP growth. The last three variables are extracted from the Eurostat database. The rest of the regional variables are constructed from the FADN data. These variables are not included in the main regressions, where region-specific effects are captured through regional dummies. Instead, we use these variables for robustness tests by estimating alternative specifications with time-varying regional variables.

To control for region-specific effects we introduce regional dummies. According to the FADN classification of the European Union, the seven NMS (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia) are divided into 66 FADN regions. Regional dummies capture regional unobserved heterogeneity which represent common characteristics for all farms in the region but may differ between regions such as informal and formal land institutions, differences in climatic conditions, and market imperfections. We use two variables to measure productivity: wheat yield and total factor productivity. The variable wheat yield is directly available in the FADN data (SE110) and is calculated as a weighted average wheat yield for each region. We use this variable to capture productivity differences arising from differences in weather, climatic and other conditions between regions over time. The total factor productivity is estimated using the Olley and Pakes estimator and is averaged by region (Kancs and Ciaian, 2010). In order to account for non-agricultural pressures on land rental markets, in robustness tests we include population density at regional level, regional GDP growth and country level percentage change (2005 relative to 2004) in the total utilised area. These variables are extracted from the Eurostat database.

As discussed in section 2, CFs' market power has important implications for land rents. In order to proxy for the CFs' market power, we calculate weighted average shares of CFs in the total land use for each region.

6. Results

We estimate equation (6) using a first difference estimator with farm fixed effects. The results are reported in Table 2. Model (1) is the basic model. Models (2) and (4) control for (*future policy changes*), whereas models (3) and (4) control for a potential sample selection bias. All estimations also contain region, sector and farm type dummies (suppressed in Table 2).

All estimated models suggest that the contemporaneous subsidies (*SAPS payments* and *other subsidies*) drive up land rents in the New EU Member States. The estimates are relatively stable across the four models. When accounting for expectations about future changes in subsidy payments (*future policy changes*), the estimated incidence of subsidies slightly changes, whereas the change is stronger for other subsidies than for the SAPS. These estimates imply that, when accounting for the expected future changes in subsidy payments, the rental price of farmland increases between €0.18 and €0.20 for each euro of SAPS payment. The capitalisation of the SAPS is higher than the capitalisation of other subsidies. This result is in line with our expectations, as land-based subsidies directly increase the profitability of land, which increases the competition for land resources, leading to higher land rents. These results are in line with the underlying theoretical model, according to which the SAPS may get capitalised into farmland rents if land supply is inelastic. Given that empirical studies find rather low (between 0.1 and 0.6) land supply elasticity (Salhofer, 2001), landowners may benefit from a substantial share of the total value of the SAPS area payments through higher rental prices.

The estimated incidence of the SAPS payments is comparable to that of Kirwan (2009), who finds that farmers who rent the land they cultivate capture around 75 percent of the subsidy, leaving around 25% for landowners. Our results are slightly higher but of the same order of magnitude as the estimates for the OMS. Ciaian et al. (2011) estimate the incidence of the SFP (which is not an area payment but a fixed payment per farm) at 6%. The results for the OMS are likely lower, because the SFP is only partially coupled to farm land (Ciaian and Swinnen, 2006; Courleux et al., 2008; Kilian and Salhofer, 2008).

Thus, the empirical findings of the present study, of Kirwan (2009) and of Ciaian et al. (2011) contradict the predictions of neoclassical models. According to the theoretical literature (Floyd, 1965; Alston and James, 2002; de Gorter and Meilke, 1989; Gardner, 1983; Guyomard et al., 2004; Salhofer, 1996; Ciaian and Swinnen, 2006), land-based subsidies get capitalised to a large extent into land rents. The standard prediction may not hold due to other factors constraining the adjustment of land rents, such as, imperfections in the farmland rental market, the presence of long-term rental contracts and informal institutions in the land rental markets in the NMS. Due to the fact that our estimates are based only on two years' observations, we may not fully capture the long-term adjustments in land rents, which may result from full renewal of rental contracts and thus further adjustment to SAPS. Secondly, the investigated years (2004 and 2005) were the first two years of the SAPS' implementation in the NMS and land market agents were not familiar with this type of subsidy. Moreover, there were delays in the distribution of the SAPS payments to farmers, which might have increased farm uncertainty and/or delayed subsidy capitalisation into land values. These issues should be addressed in future research, when more recent data become available.

Similarly to contemporaneous subsidies, the expected change in future subsidies (*future policy changes*) induces a positive and significant impact on land rents. This implies that future subsidies affect contemporaneous farmland allocation decisions in the NMS. These results are in line with studies arguing that future subsidies may affect current farm decisions, therefore farmers may react differently to policies than expected (OECD, 2001; Shaik et al., 2005).

As expected, market return has a positive and significant impact on land rents (Table 2). These results confirm previous findings that agricultural profitability is an important determinant of farmland rental rates (Goodwin et al., 2003, 2005; Lence and Mishra, 2003; Roberts et al., 2003). The estimated coefficient is statistically significant at 1% in all estimated models.

Similarly, the relative importance of family labour in total labour (*family/total labour*) has a positive and significant impact on land rents, though its significance is lower. These results are in line with the literature on farm structure (Pollak, 1985; Allen and Lueck, 1998), according to which land rent may increase with the share of family labour due to productivity differences between family and hired labour. Family labour enhances farm productivity and leads to higher land rents. However, the importance of family labour is less significant than the market return and subsidy variables.

Farm size has a negative impact on land rents; the coefficient is significant in all models reported in Table 2. It may reflect the effect of the market power of large farms on land rental markets. At the same time, this variable may account for productivity differences between different farm sizes. The previous literature is not conclusive on the relationship between farm size and productivity. The early literature finds an inverse relationship between farm size and output per hectare suggesting that small farms are more productive than large ones (Feder, 1985). This result is explained by credit market imperfections, asymmetric access to land and differences in family labour endowment. Family labour has a greater incentive to work than hired labour, because it is a residual claimant hence leading to more efficient use of farm recourses. The more recent literature finds evidence against this hypothesis. Several recent studies have shown that when taking into account, among other things, the adoption of new technology, soil quality, regional characteristics, and development level, the inverse

relationship between farm size and productivity is reduced or disappears (e.g. Bhalla and Roy, 1988; Deolalikar, 1981). Studies focusing on Eastern Europe mainly analyse the productivity difference between IFs and CFs. These studies typically find that the relative efficiency depends on various factors, including the types of activities (e.g. crop, livestock, vegetables), institutions, infrastructure and economic conditions, which in turn depend on the type of farm (e.g. Gorton and Davidova, 2004).

The coefficient of the CFs in land use at regional level (not reported) is negative and significant. Two effects may have been captured here: land transaction costs related to land withdrawal from CFs and CFs' market power. Ciaian and Swinnen (2006) show that both effects reduce land rents.[30] Hence, the higher the share of CFs in land use in a particular region, the higher the land transaction costs and the CFs' market power are expected to be.

The assets to liabilities ratio tends to reduce land rents, which implies that farm access to credit may affect land rents negatively. More credit per farm (the smaller the ratio fixed assets/total liabilities) implies higher land rents and vice versa. The selection bias was examined using the Heckman's model. The coefficient of the Inverse Mills Ratio, which tests the impact of rental market participation bias, fails to be significant and parameter estimates of subsidies are to a large extent consistent with the fixed effects estimates reported in Table 3. The fixed effect estimates of SAPS capitalisation into land rents are found to be of similar order of magnitude as the first difference results reported in Table 2: farmland rents increase between €0.18 and €0.20 for each SAPS euro. The sign and the magnitude of the remaining variables are comparable to the results reported in table 2.

7. Conclusions

In this paper we analyse the incidence of CAP subsidies in the new EU member states. According to the underlying theoretical framework, in well-functioning land markets, area payments would be incorporated into land values and would thereby benefit mainly landowners. On the other hand, they would increase the input costs for farms. Certain factors, however, such as farm heterogeneity, unequal access to the SAPS' payments, formal and informal land market institutions, accompanying policy measures and positive land supply elasticity may reduce the SAPS' capitalisation into land values.

This is the first paper to empirically estimate the extent of capitalisation or the SAPS into land values in the NMS and the first to consider a standard area payment. Using a unique farm-level panel data set with 20,930 observations for 2004 and 2005, we are able to control for important sources of endogeneity. The estimation results suggest a positive and statistically significant impact of the SAPS on land rents in the NMS. However, the effect is smaller than theoretically predicted. Our estimates imply that €1 of the SAPS per hectare increases land rents by €0.19 per hectare. This implies that there are important constraints which prevent full adjustment of land rents in the NMS. These could be, for example, due to information asymmetries, long-term rental contracts, informal rural institutions, and the short time period since the SAPS' implementation. However, because in some NMS the payment may be claimed directly by landowners and not by farmers, our estimate might slightly understate the total landowners' benefit from the SAPS.

Based on the estimated SAPS incidence and on the FADN data on land renting, we can calculate the aggregate non-farming landowner gains from the SAPS. The results are reported

[30] According to Ciaian and Swinnen (2006), land withdrawal transaction costs increase the costs of rental transactions hence they reduce activity on the rental market and push rental prices down. Corporate farms may not be price takers in the land rental market. For example, in countries such as Slovakia, where they occupy around 90% of the land, CFs may have important market power and may affect rental prices. Ciaian and Swinnen (2006) use a dominant buyer model to show that renting land in large quantities allows CFs to affect market rents. Through their rental behaviour they may set the rental price below the competitive market rent yielding market power gain to CFs.

in Table 4.[31] On average, 10% of the total SAPS payments are channelled to non-farming landowners through higher rental prices in the NMS. The highest leakages of the SAPS payments are in the Czech Republic and Slovakia, where non-farming landowners gain approximately 18% of the total SAPS value. They are followed by Estonia, Hungary and Lithuania, where around 12% of the SAPS flow to non-farming landowners. In Poland and Latvia the leakages are the smallest, 5% and 8% of the SAPS payments, respectively. These results suggest that the SAPS leakages are stronger for CFs than for IFs, because on average the share of rented land is larger for CFs than IFs. On average, CFs transfer to non-farming landowners 17% of the total SAPS payments they receive, whereas IFs transfer on average only 7% of the total SAPS payments. This suggests that in relative terms the difference in land ownership implies a higher IF gain from the SAPS than is the case of CFs. However, the size of CFs' and IFs' gains from the SAPS depends on the impact of the SAPS on output and input prices. We did not investigate these effects in this paper, although they are a promising avenue for future research.

Our results indicate that the SAPS to a large extent is in line with the policy objective of improving the standards of living of the agricultural community, because the SAPS capitalisation rate into land rents and its leakage rate to non-farming landowners are relatively low. In 2010 the total value of the SAPS represented around €4.4 billion (EUR-Lex, 2010). If we consider the 10% leakage rate of the SAPS to non-farming landowners (Table 4), only around €0.44 billion is channelled outside the farming sector. Secondly, the leakage rate is bigger for large CFs than for small IFs due to differences in land renting patterns, which also tends to be in line with the policy objective to promote smaller holdings rather than large farm enterprises.

The results in this paper are subject, however, to some limitations. The presence of long-term rental contracts and basing our estimate on two years' data mean that we may not have been able to fully capture long-term adjustments in land rents. Additionally, the short time period covered by the data and the delays in the distribution of the SAPS payments to farmers might have affected the actual capitalisation rate of the SAPS. These issues should be addressed when more recent data become available and are a promising avenue for future research.

[31] We assume a 19% incidence. To obtain the non-farming landowner gains from the SAPS, we adjust the incidence rate for the rental share. Implicitly, we assume that the rental income from own land represents the return to farmers (i.e. to farming landowners).

References

Agra Europe (2007), "Threat of SFP Cuts Rises as NMS Accede", *Agra Europe Weekly*, 12 January.

Allen, A. and D. Lueck (1998), "The Nature of the Farm", *Journal of Law and Economics,* 41: 343-386.

Alston, J.M. (2007), "Benefits and Beneficiaries from U.S. Farm Subsidies", AEI Agricultural Policy Series: The 2007 Farm Bill and Beyond, American Enterprise Institute Washington, D.C. (http://www.aei.org/farmbillà.

Alston, J.M. and J.S. James (2002), "The Incidence of Agricultural Policy", in B.L. Gardner and G.C. Rausser (ed.), *Handbook of Agricultural Economics, Volume 2,* pp. 1689-1749; Amsterdam: Elsevier.

Bhalla, S.S. and P. Roy (1988), "Mis-Specification in Farm Productivity Analysis: The Role of Land Quality", *Oxford Economic Papers,* 40: 55-73.

Barnard, C.H., G. Whittaker, D. Westenbarger and M. Ahearn (1997), "Evidence of Capitalisation of Direct Government Payments into U.S. Cropland Values", *American Journal of Agricultural Economics* 79: 642-1650.

Bureau, J. and H.P. Witzke. 2010. The Single Payment Scheme After 2013: New Approach-New Targets. European Parliament, March 2010.

Breustedt G. and H. Habermann (2011), "The Incidence of EU Per-Hectare Payments on Farmland Rental Rates: A Spatial Econometric Analysis of German Farm-Level Data" *Journal of Agricultural Economics* 62(1): 225–243.

Ciaian, P. and J.F.M. Swinnen. 2006. Land Market Imperfections and Agricultural Policy Impacts in the New EU Member States: A Partial Equilibrium Analysis. *American Journal of Agricultural Economics* 88(4): 799-815.

Ciaian, P., D. Kancs and J.F.M. Swinnen (2008), "Static and Dynamic Distributional Effects of Decoupled Payments: Single Farm Payments in the European Union" LICOS Discussion Paper No. 20, LICOS Centre for Institutions and Economic Performance, Leuven.

Ciaian, P., D. Kancs and J.F.M. Swinnen (2010), *EU Land Markets and the Common Agricultural Policy*. CEPS, Brussels.

Ciaian, P., D. Kancs, J.F.M. Swinnen and L. Vranken (2011), *EU Land Markets and the Common Agricultural Policy*. OECD: Paris.

Ciaian, P., D. Kancs and J. Michalek (2011), SPS Capitalization into Land Value: Generalized Propensity Score Evidence from the EU. LICOS Discussion Paper No. 293, Leuven: LICOS Centre for Institutions and Economic Performance.

Courleux, F., H. Guyomard, F Levert and L. Piet (2008), "How the EU Single Farm Payment should be Modelled: Lump-sum Transfers, Area Payments or… what else?"; Working Paper SMART – LERECO N°08-01. Rennes: INRA.

de Gorter, H. and K.D. Meilke (1989), "Efficiency of Alternative Policies for the EC's Common Agricultural Policy", *American Journal of Agricultural Economics* 71: 592-603.

Deolalikar, A.B. (1981), "The Inverse Relationship between Productivity and Farm Size: A Test Using Regional Data From India", *American Journal of Agricultural Economics* 63: 275-279

Duvivier, D., F. Gaspart and B.H. de Frahan (2005), "A Panel Data Analysis of the Determinants of Farmland Price: An Application to the Effects of the 1992 CAP Reform in Belgium", Paper presented at the XIth EAAE Congress, Copenhagen, 23-27 August.

EUR-Lex (2003a), Council Regulation (EC) No 1782/2003. *Official Journal of the European Union* L 270, 29 September 2003.

EUR-Lex (2003b), Treaty of Accession 2003. *Official Journal of the European Union* L 236, 23 September 2003.

EUR-Lex (2009), Council Regulation (EC) No 73/2009. *Official Journal of the European Union* L 30, 19 January 2009.

EUR-Lex (2010), 2010 General budget: Title 05. Agriculture and rural development. http://eur-lex.europa.eu/budget/www/index-en.htm (accessed December 15, 2010).

European Commission (2008), Health Check of the CAP. Brussels: European Commission, DG Agriculture and Rural Development.

European Commission (2010), Agriculture in the European Union - Statistical and economic information 2010. Brussels: European Commission, DG Agriculture and Rural Development.

FADN (2010), The Farm Accountancy Data Network (FADN). European Commission. http://ec.europa.eu/agriculture/rica/ (accessed November 17, 2010)

Feder, G. (1985), "The Farm Size and Farm Productivity: The Role of Family Labour, Supervision and Credit Constraints", *Journal of Development Economics* 18: 297-313.

Floyd, J.E. (1965),." The Effects of Farm Price Supports on Returns to Land and Labour in Agriculture", *Journal of Political Economy* 73: 148-158.

Gardner, B. (1983), "Efficient Redistribution through Commodity Markets", *American Journal of Agricultural Economics* 65(2): 225-234.

Gardner, B.L. (2002), "U.S. Commodity Policies and Land Prices", Department of Agricultural and Resource Economics WP02-02. College Park: University of Maryland.

Goodwin, B.K., A.K. Mishra and F.N. Ortalo-Magné. 2003. What's Wrong with Our Models of Agricultural Land Value? *American Journal of Agricultural Economics* 85:~744-752.

Goodwin, B.K., A.K. Mishra and F. Ortalo-Magné (2005), "Land owners' Riches: The Distribution of Agricultural Subsidies", University of Wisconsin-Madison School of Business, Department of Real Estate and Urban Land Economics.

Goodwin, B.K. and F.N. Ortalo-Magné. 1992. The Capitalisation of Wheat Subsidies into Agricultural Land value. *Canadian Journal of Agricultural Economics* 40: 37-54.

Gorton, M. and S. Davidova (2004), "Farm Productivity and Efficiency in the CEE Applicant Countries: A Synthesis of Results", *Agricultural Economics* 30:1-16.

Guyomard, H., C. Le Mouël and A. Gohin (2004), "Impacts of Alternative Agricultural Income Support Schemes on Multiple Policy Goals", *European Review of Agricultural Economics* 31(2): 125-148.

Heckman, J. (1979), "Sample selection bias as a specification error", *Econometrica* 47(1): 153-161.

Kancs, D. and P. Ciaian. 2010. Factor content of bilateral trade: the role of firm heterogeneity and transaction costs. *Agricultural Economics* 41: 305-317.

Kilian, S. and K. Salhofer (2008), "Single Payments of the CAP: Where Do the Rents Go?", *Agricultural Economics Review*, 9(2): 96-106.

Kirwan, B. (2009), "The Incidence of U.S. Agricultural Subsidies on Farmland Rental Rates", *Journal of Political Economy* 117(1): 138-164.

Kuchler, F. and A. Tegene (1993), "Asset Fixity and the Distribution of Rents from Agricultural Polices", *Land Economics* 69(4): 428-437.

Lence, S.H., and A.K. Mishra (2003), "The Impacts of Different Farm Programs on Cash Rents", *American Journal of Agricultural Economics* 85: 753-761.

Livanis, G., C.B. Moss, V.E. Breneman and R.F. Nehring (2006), "Urban Sprawl and Farmland Prices" *American Journal of Agricultural Economics* 88(4): 915-929.

OECD (2001), *Decoupling: A Conceptual Overview*. Paris: OECD.

Patton, M., P. Kostov, S. McErlean and J. Moss (2008), "Assessing the Influence of Direct Payments on the Rental Value of Agricultural Land" *Food Policy* 33: 397-405.

Plantinga, A.J., R.N. Lubowski and R.N. Stavins (2002), "The effects of potential land development on agricultural land prices" *Journal of Urban Economics* 52: 561-581.

Pollak, R.A. (1985), "A Transaction Costs Approach to Families and Households", *Journal of Economic Literature* 23: 581-608.

Rainey, R.L., B.L. Dixon, B.L. Ahrendsen, L.D. Parsch and R.W. Bierlen (2005), "Arkansas Landlord Selection of Land-Leasing Contract Type and Terms", *International Food and Agribusiness Management Review* 8(1): 1-19.

Roberts, M.J., B. Kirwan and J. Hopkins (2003), "The Incidence of Government Program Payments on Land Rents: The Challenges of Identification", *American Journal of Agricultural Economics* 85: 762-769.

Robison, L.J., R.J. Myers and M.E. Siles (2002), "Social Capital and the Terms of Trade for Farmland", *Review of Agricultural Economics*, 24 (1): 44–58.

Salhofer, K. (1996), "Efficient income Redistribution for a Small Country Using Optimal Combined Instruments", *Agricultural Economics* 13: 191-199.

Salhofer, K. (2001), "Elasticities of Substitution and Factor Supply Elasticities in European Agriculture: A Review of Past Studies", in *OECD Market Effects of Crop Support Measures*. Paris, pp. 89-119. Paris: OECD.

Shaik, S., G.A. Helmers and J. A. Atwood (2005), "The Evolution of Farm Programs and their Contribution to Agricultural Land Values", *American Journal of Agricultural Economics* 87(5): 1190-1197.

Taylor, M.R. and G.W. Brester (2005), "Noncash Income Transfers and Agricultural Land Values", *Review of Agricultural Economics* 27(4): 526-541.

Table 1. Definition and summary statistics of key variables

Variable	Definition	Source	Year	Mean	Stdev
Dependent variable					
r_i	Farmland rent (EUR/ha)	FADN	2004	24.91	17.85
			2005	28.56	18.30
Explanatory variable					
s_i	SAPS (EUR/ha)	FADN	2004	40.02	16.36
			2005	49.47	19.06
Covariates					
m_i	Market return (EUR/ha)	FADN	2004	814.39	353.43
			2005	818.36	318.30
o_i	Other subsidies (EUR/ha)	FADN	2004	127.37	29.53
			2005	162.76	37.34
g_i	Future policy changes*	EC, FADN	2004	34.98	23.16
			2005	33.72	24.71
z_i	Farm size (ESU)	FADN	2004	57.25	187.02
			2005	57.43	186.47
h_i	Family labour-to-total labour ratio	FADN	2004	0.565	0.437
			2005	0.556	0.441
c_i	Assets-to-liabilities ratio	FADN	2004	7.57	8.98
			2005	6.19	6.20

Notes: The data are from the 2004 and 2005 confidential FADN microfiles. *Own estimations based on the Eurostat and FADN data. All monetary values are adjusted to 2004 EUR.

Table 2. First-difference estimates with farm fixed effects

	Model (1)	Model (2)	Model (3)	Model (4)
SAPS	0.1932 ***	0.1870 ***	0.1827 ***	0.1964 ***
	(0.0259)	(0.0358)	(0.0243)	(0.0349)
Market return	0.1220 ***	0.1098 ***	0.1187 ***	0.1044 ***
	(0.0099)	(0.0319)	(0.0105)	(0.0343)
Other subsidies	0.0807 ***	0.0778 ***	0.0864 ***	0.0807 ***
	(0.0060)	(0.0120)	(0.0065)	(0.0124)
Future policy changes	-	0.0513 ***	-	0.0468 ***
	-	(0.0103	-	(0.0098)
Farm size	-0.0281 **	-0.0432 ***	-0.0256 **	-0.0389 ***
	(0.0192)	(0.0112)	(0.0184)	(0.0111)
Family-to-total labour ratio	0.0344 *	0.0558 **	0.0326 *	0.0556 *
	(0.1458)	(0.0959)	(0.1513)	(0.1053)
Assets-to-liabilities ratio	-0.0288 **	-0.0493 ***	-0.0303 **	-0.0529 ***
	(0.0345)	(0.0117)	(0.0364)	(0.0123)
Inverse Mills Ratio (IMR)	-	-	0.0103	0.0082
	-	-	(1.9021)	(1.8851)
N	10465	10465	10465	10465
R^2	0.57	0.65	0.61	0.66

Notes: OLS estimates, robust standard errors corrected for heteroscedasticity in parenthesis. All estimations contain also region, sector dummies and farm type dummies (suppressed). * significant at 10% level, ** significant at 5% level, and *** significant at 1% level.

Table 3. Robustness checks

	Model (1)	Model (2)	Model (3)
SAPS	0.1958***	0. 2021***	0.1779***
	(0.0402)	(0.0596)	(0.0944)
Market return	0.1305***	0.1314***	0.1160***
	(0.0131)	(0.0117)	(0.0239)
Other subsidies	0.0805***	0.0984***	0.0872***
	(0.0093)	(0.0073)	(0.0161)
Future policy changes	0.0475***	0.0463***	0.0374**
	(0.0133)	(0.0121)	(0.0304)
Farm size	-0.0340**	-0.0279*	-0.0253
	(0.0289)	(0.0718)	(0.4537)
Family-to-total labour ratio	0.0375*	0.0334*	0.0319
	(0.2186)	(0.1684)	(0.4355)
Assets-to-liabilities ratio	-0.0291**	-0.0297*	-0.0297
	(0.0312)	(0.0516)	(0.0928)
N	10465	9314	1151
R^2	0.60	0.59	0.57

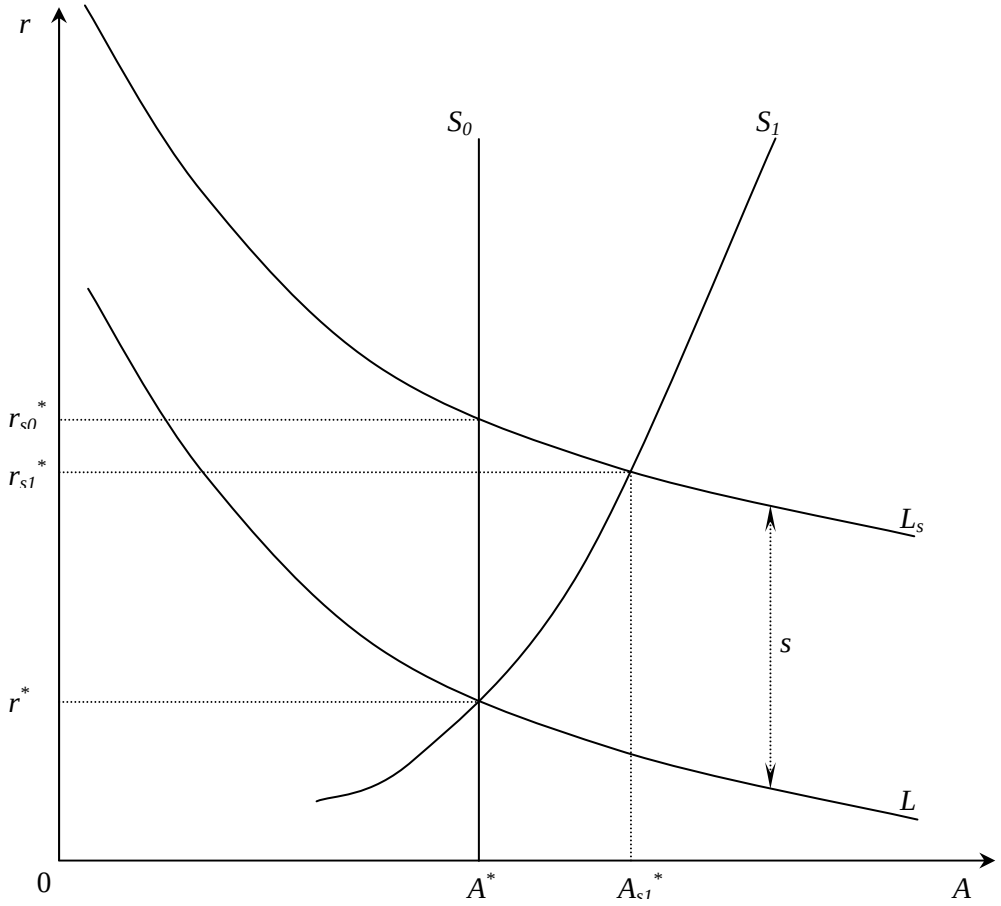
Notes: Model (1): country-level fixed effects instead of regional-level fixed effects; model (2): individual farms (IFs); model (3): corporate farms (CFs). OLS estimates, robust standard errors corrected for heteroscedasticity in parenthesis. All estimations contain also region (country) and sector dummies (suppressed). * significant at 10% level, ** significant at 5% level, and *** significant at 1% level.

Table 4. Farm size, land renting and non-farming land owner gains from the SAPS

	Share of rented farmland, %			Non-farming land owner gains, %		
	Total	IFs	CFs	Total	IFs	CFs
Czech Republic	91	76	96	17	14	18
Estonia	62	55	80	12	10	15
Hungary	67	48	99	13	9	19
Lithuania	62	55	91	12	10	17
Latvia	42	38	68	8	7	13
Poland	28	25	71	5	5	13
Slovakia	96	90	97	18	17	18
NMS	52	36	92	10	7	17

Notes: land owner gains, % - non-farming land owner gains in percent of the SAPS; IFs- individual farms, CFs - corporate farms. Source: own calculations based on Table 2 and the FADN data for 2005. In all calculations we assume a 19 percent incidence.

Figure 1. Effect of SAPS in the land market



Appendix

Derivation of the SAPS capitalisation effect

Totally differentiating equations (1) - (3) yields:

$$pf_{AA}dA + f_A dp = dr - ds \tag{7}$$

$$dA = S_r dr \tag{8}$$

$$f_A dA = D_p dp \tag{9}$$

where $S_r = \frac{\partial S(r)}{\partial r}$ and $D_p = \frac{\partial D(p)}{\partial p}$

Rearranging equations (8) and (9) yields:

$$dA = \varepsilon \frac{A}{r} dr \tag{10}$$

$$f_A dA = \varsigma \frac{f}{p} dp \tag{11}$$

where $\varepsilon = \frac{\partial S(r)}{\partial r} \frac{r}{A}$ and $\varsigma = D_p \frac{p}{f}$

Inserting equations (10) and (11) in equation (7) yields:

$$\left[pf_{AA} + p \frac{f_A^2}{f\varsigma} \right] \varepsilon \frac{A}{r} dr = dr - ds \tag{12}$$

Dividing equation (12) with ds and solving for $\frac{dr}{ds}$ yields:

$$\frac{dr}{ds} = \frac{1}{1 - \left[pf_{AA} + p \frac{f_A^2}{f\varsigma} \right] \varepsilon \frac{A}{r}} \tag{13}$$

Comparative Analysis of Factor Markets for Agriculture across the Member States

245123-FP7-KBBE-2009-3

The Factor Markets project in a nutshell

Title	Comparative Analysis of Factor Markets for Agriculture across the Member States
Funding scheme	Collaborative Project (CP) / Small or medium scale focused research project
Coordinator	CEPS, Prof. Johan F.M. Swinnen
Duration	01/09/2010 – 31/08/2013 (36 months)
Short description	Well functioning factor markets are a crucial condition for the competitiveness and growth of agriculture and for rural development. At the same time, the functioning of the factor markets themselves are influenced by changes in agriculture and the rural economy, and in EU policies. Member state regulations and institutions affecting land, labour, and capital markets may cause important heterogeneity in the factor markets, which may have important effects on the functioning of the factor markets and on the interactions between factor markets and EU policies. The general objective of the FACTOR MARKETS project is to analyse the functioning of factor markets for agriculture in the EU-27, including the Candidate Countries. The FACTOR MARKETS project will compare the different markets, their institutional framework and their impact on agricultural development and structural change, as well as their impact on rural economies, for the Member States, Candidate Countries and the EU as a whole. The FACTOR MARKETS project will focus on capital, labour and land markets. The results of this study will contribute to a better understanding of the fundamental economic factors affecting EU agriculture, thus allowing better targeting of policies to improve the competitiveness of the sector.
Contact e-mail	info@factormarkets.eu
Website	www.factormarkets.eu
Partners	17 (13 countries)
EU funding	1,979,023 €
EC Scientific officer	Dr. Hans-Jörg Lutzeyer