Direct Payments and Land Rents:

Evidence from New Member States

Kristine Van Herck[1] and Liesbet Vranken[1,2]

[1] LICOS - Centre for Institutions and Economic Performance, Department of Economics, K. U. Leuven, Belgium

[2]Department of Earth and Environmental Sciences, K. U. Leuven, Belgium

kristine.vanherck@econ.kuleuven.be
liesbet.vranken@ees.kuleuven.be

Abstract

This paper analyses the impact of increasing direct payments on land rents in six new EU member states in which agricultural subsidies largely increased as a result of their EU accession. We find that up to 25 eurocents per additional euro of direct payments is capitalized in land rents. In addition, the results show that capitalization of direct payments is higher in more credit constrained markets, while capitalization of direct payments is lower in countries where more land is used by corporate farms.

Keywords: Land rental prices, Farm subsidies, New Member States

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Abstract

This paper analyses the impact of increasing direct payments on land rents in six new EU member states in which agricultural subsidies largely increased as a result of their EU accession. We find that up to 25 eurocents per additional euro of direct payments is capitalized in land rents. In addition, the results show that capitalization of direct payments is higher in more credit constrained markets, while capitalization of direct payments is lower where more land is used by corporate farms.

1. INTRODUCTION

A general purpose of agricultural subsidies is to increase farmers' incomes. However, these first-order income objectives are influenced by second-order adjustments, in particular the impact of subsidies on factor markets. Various studies have analysed the second-order effects of agricultural policy measures (see e.g. Hertel, 1989; Salhofer, 1996; Dewbre *et al.*, 2001; Alston and James, 2002; Guyomard *et al.*, 2004; Ciaian and Swinnen, 2006, 2009). In general, these studies find that agricultural subsidies alter farmers' production incentives and thus factor demand. An important second order effect of agricultural policy is its impact on the land market, in particular on agricultural land prices (among others, Floyd, 1965; Guyomard *et al.*, 2004; Ciaian and Swinnen, 2006, 2009).

There are two important implications. First, land price increases due to subsidies reduce the impact of subsidies on agricultural income. This is particularly important in the EU New Member States (NMS). In 2004, eight Central and Eastern European countries joined the European Union (EU). This accession round was followed by the accession of Bulgaria and Romania in 2007. Since EU accession, farm support in the

NMS is implemented through the Common Agricultural Policy (CAP) and in most countries financial support to farmers largely increased compared to the pre-accession level. In many NMS land reforms restituted land rights to the former owners who are no longer active in the agricultural sector (Mathijs and Swinnen, 1998). As a result, a large share of agricultural land is rented out by these absentee landowners.

Second, an increase of land rents has a direct negative effect on land mobility and hence an indirect negative effect on farm restructuring. New farmers face a higher initial investment cost and existing farmers face a higher cost of expansion. Consequently, the transfer of land from less to more efficient users is reduced which has a negative impact on structural adjustments in the agricultural sector.

The majority of empirical studies have dealt with the land market in North America (the US and Canada). A few studies have empirically analysed the impact of direct payments on land rents in the EU (Patton *et al.*, 2008; Kilian *et al.*, 2008; Ciaian *et al.*, 2010a; Breustedt and Habbermann, 2011). This paper focuses on a selected number of EU NMS

To our knowledge there is only one study that analyzes the impact of direct payments in the NMS. In particular, Ciaian and Kancs (2009) investigate the impact of the Single Area Payment Scheme (SAPS) in the NMS based on farm level panel data for the period 2004-2005. However, this study only considers the post-accession period; while the pre-accession period, when most NMS already started to provide agricultural support to their farmers, has not been taken into account.

Our paper extends the Ciaian and Kancs (2009) analysis in two ways: (1) we use country-level data and (2) we study the pre- as well as the post-accession period.[1] While the use of farm level data has obvious advantages, the use of longer series of country level panel data also has advantages. There are two reasons for using country level data. First, when using farm-level data there is only limited variation in the main explanatory variable, the level of direct payments after EU accession, since a substantial share of the direct payments are Single Area Payments (SAPS), which are in principle uniformly distributed over all agricultural land in a country. Second, with two-year panel data, there is only limited variation in the dependent variable, because of the presence of longer term contracts. The capitalization of the direct payments will only occur when a new contract is signed by the land owner and the tenant. Hence, one needs longer time periods to capture these effects.

We estimate the impact of direct payments on land rents. In the NMS, investigating the effect of agricultural subsidies on land rents is more relevant than investigating the impact on land values for at least three reasons. First, rental rates are less affected by urban and other non-agricultural pressures as contracts have only a limited duration (Whithaker, 2006). Second, in the NMS the number of land rental transactions is considerably higher than the number of land sales transactions. In the NMS, the rental market is particularly important to ensure the occurrence of efficiency enhancing land transfers because there are also substantial costs associated with enforcing property rights and obtaining the necessary documents from local officials required for land sales next to the usual costs associated with land transactions, such as notary fees, taxes and administrative charges (Swinnen and Vranken, 2009; 2010).

[1] The disadvantage of including both pre- and post-accession data is that we are not able to disentangle the impact of different types of direct payments (coupled vs. decoupled), since these disaggregate subsidy data are – to our knowledge - not available for the pre-accession period.

Finally, rental rates are observed in the market while land value is often stated by the owner - because the limited number of sales transactions- and therefore subjective (Whithaker, 2006).

The remainder of the paper is as follows. In the next section, we briefly discuss the development of rental land markets in the NMS. We give a short overview on the agricultural policy and in particular on the use of direct payments in the NMS. The third section gives an overview of the existing literature on the impact of agricultural policy measures on land rents. In section 4, we empirically test the impact of direct payments on land rents in selected NMS. Finally, we conclude in section 5.

2. RENTAL LAND MARKETS AND DIRECT PAYMENTS IN NMS

In this section we briefly review rural land markets and agricultural policy in the NMS before and after EU accession.

2.1. Rental land markets

Similar to the US and several EU15 countries, a large amount of the land transactions in the NMS takes place through the rental market, although there are large variations among countries (Table 1). In Slovakia and the Czech Republic, more than 80% of the cultivated area is rented. Also in Bulgaria, land renting is very prominent (79% of total land). In Hungary, Estonia and Lithuania, between 48% and 56% of the cultivated area is rented. In Latvia, Poland and Romania, the figures are lower, respectively 27%, 20% and 17%.

There is a striking correlation between the prevalence of land rental at the country level and the proportion of corporate farms in total land use (Swinnen *et al.*, 2006). While corporate farms own little land, they use a lot of land in some countries, almost

all of which is rented. In the Czech Republic and Slovakia, more than 70% of the total agricultural land area is used by corporate farms (Table 1). Also in Hungary, Estonia and Bulgaria, corporate farms still use around half of all agricultural land. A large share of agricultural land is still rented to the large scale successor organisations of the former cooperatives and state farms (Vranken *et al.*, 2011). This can be attributed to the land reform process that was implemented at the start of transition. Land was restituted to former owners out of which the majority are not (or no longer) active in agriculture. They may be retired or living in urban areas and are more likely to rent it out, in particularly to large scale corporate farms and this for several reasons. First, because of limited information about the sales price and the expected increase in land prices upon accession to the European Union, most of these new landowners were unwilling to sell their newly acquired assets and preferred to rent it out instead. Second, since identifying potential tenants involves search and negotiation costs, the easiest way for the new landowners was to rent out their land to the corporate farms, which were the historical users of the land (Mathijs and Swinnen, 1998). Third, the corporate management was closely involved in the land reform process and their search and negotiate costs to identify and contract with those new owners were significantly lower than the costs faced by newly emerging structures (particularly family farms and de novo companies). In combination, these factors resulted in a higher demand for rented land by corporate farms than by family farms and an increased supply of rented land to corporate farms than to family farms. As a result, restitution has contributed to a consolidation of the large scale farming structures (collective and state farms in the past, now corporate farms) through the land rental market.

In the period 2000-2008, a strong and persistent increase in land rental prices is observed in all NMS and the increase was especially strong around the period of EU

accession. For example, if one compares rental prices from just before (2003) to just after accession (2006), real land rental prices grew with more than 20% in the Czech Republic, Lithuania, Hungary, Poland and Slovakia (Figure 1). This large increase in land rents correlates with an increase in direct payments in the same period indicating that at least a part of the direct payments are capitalized in the land rent (Figure 2).

2.2. Agricultural policy

At the beginning of the 1990s, after the transition to a more market orientated economy, agricultural support dramatically reduced in all Central and Eastern European countries. However, when the economic and institutional climate started to improve at the end of the 1990s, agricultural support started to increase again. Later, when the countries accessed the EU agricultural support increased even further.

There are several distinct types of support measures. First, governments can make payments directly to producers, so-called "direct payments". Figure 2 illustrates the strong increase in direct payments in a selected number of NMS in the period 2000-2010.

Before EU accession, agricultural policy in the selected NMS, included a wide variety of direct payments. For example, in Poland there were output payments for crop production such as bread cereals (payment/tonne) and in the Czech Republic and Slovakia there were payments for livestock production such as for sheep, beef or milk production (payment per head or per litre). In addition, there existed in all countries area payments, which are payments based on the cultivated area (payment/ha). For example for flax in the Czech Republic or for arable land in Slovakia.

After EU accession, there were two main types of direct payments depending on the source of the subsidy. First, there is the Single Area Payment Scheme (SAPS),

which is financed by the EU budget. SAPS payments are fixed payments per ha, which are decoupled from production and, in principle, uniform for all eligible land within each NMS.[2] SAPS payments are gradually implemented and they will reach the EU-15 level in 2013. Second, the NMS were allowed to supplement the SAPS payments by national "top-up" payments (or Complementary National Direct Payments (CNDPs)). These "top-up" payments can be implemented in a similar way as SAPS, namely as a fixed payment per ha, such as for example in Slovakia for arable crops. However, the NMS can also decide to couple the support to a specific production and provide payments per ha or per animal head for a specific production such as for example the per-hectare payment for hops in Slovakia or the suckler cow premium in Hungary.

In addition to direct payments, governments can also use specific instruments, such as quota, tariffs and intervention buying to support farmers' income. These instruments create a gap between the domestic producer price and the world market price of a specific agricultural commodity and are referred to as market price support (MPS). Before EU accession, the NMS implemented quota, tariffs and intervention buying, to protect their agricultural markets. After EU accession, the NMS were integrated in the common EU market and MPS was implemented in the same way as in the EU15, such that for the same commodity all EU farmers receive in principle the same level of support (single market principle). This implies that after EU accession the amount of MPS in a country fully depends on its production structure. The dairy sector is for example traditionally more protected than fruit and vegetables producers.

[2] However, there are substantial differences between the NMS. These variations stem from the fact that the level of per hectare payments is computed by dividing the available EU financial "envelope" for each country by the eligible agricultural area. The EU rules for the determination of the CAP Pillar I financial allocations imply that higher land productivity results in higher hectare payments, as historical yield levels (2000-2002) were factored into the determination of the financial envelope for Pillar I. There was a large variety in the reference yield of the different NMS which results in a disparity in the direct payments.

3. CONCEPTUAL MODEL

3.1. Support measures and capitalization

Various studies analysed how land markets were affected by agricultural policy measures that have been implemented to support farmers' income in developed countries (e.g. Floyd 1965; Goodwin and Ortalo-Magné, 1992; Lence and Mishra, 2003; Kirwan, 2005; Ciaian and Swinnen ,2006, 2009).

Capitalization of agricultural subsidies in land rents depends on the type of support. Ciaian *et al.* (2010b) analyse the impact of different forms of coupled direct payments on land markets. They develop a partial equilibrium model, which combines two inputs (land and a non-land input) in a production function of one agricultural output.[3]

According to Ciaian *et al*. (2010b), output payments increase the price of a factor if the supply elasticity of that factor is not perfectly elastic. A given percentage increase in product price will result in the same percentage rise in all factor prices if the factors are perfect substitutes in production or if the supply elasticities of the two factors are the same. If the factor supply elasticities are not equal, the price of the input with the least elastic supply will increase more. Hence, the impact of output payments on land rents depends largely upon the factor supply and substitution elasticities. In fact, in case the factor supply is entirely inelastic and the elasticity of substitution between factors is zero or the factor proportions are fixed, the output payment will be fully capitalized in the price of the factor with inelastic supply. If this factor is land, which is often the case, then the output payment will be fully capitalized in land rents.

Area payments, which are targeted on land, stimulate farm land demand and in combination with inelastic land supply, these payments are capitalized into higher land

[3] They based their model on the model of Floyd (1965), who analyzes the effects farm price supports on the returns to land in agriculture.

rents, creating leakages of policy rents to landowners. In a corner solution, when the land supply is fixed, the land subsidy is fully capitalized into land rents (Ciaian *et al.*, 2010b).

In summary, in case land is the most inelastic production factor, both output and area payments are expected to be capitalized in land rents and the price of land will increase relative to the price of the other factors. In case the land supply elasticity is equal to zero (or land supply is fixed) area payments will be fully capitalized in land rents. Output payments are only fully capitalized in land rents if, additionally to zero land supply elasticity, either the supply elasticity of non-land inputs is perfectly elastic or if factor proportions are fixed.

In addition to the type of subsidy, the capitalization of subsidies also depends upon the exact policy implementation. If subsidies are only implemented for a limited period of time, they may not be capitalized in the land value. Also the criteria determining the eligibility to receive the future stream of policy transfers, may limit the capitalization of subsidies (Sumner and Wolf, 1996; Ciaian and Swinnen, 2006, 2009; Kilian and Salhofer, 2008). For example, area payments may be subjected to cross-compliance, set-aside, or other requirements. If area payments are subjected to cross-compliance, then their effect on land rents is (partially) mitigated due to the fact that farmers have to incur certain costs in order to meet the eligibility criteria.

Almost all available studies on the capitalization of land rent use US data.[4] However, recently the number of studies analysing the impact of CAP payments on land rents increased.

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[4] Using US-county level data from the state Iowa, Lence and Mishra (2003) examine the impact of government payments on cash rents using county-level panel data for 1996-2000. Unlike most other studies on land values and rents, Lence and Mishra control for spatial autocorrelation and they find an increase in land rents of $0.13 per acre for each additional dollar of government payments. Roberts *et al.* (2003) use 1992 and 1997 farm-level panel data from the US Census of Agriculture. They find that an increase in cash land rents of between $0.34 and $0.41 per acre for

Patton *et al.* (2008) analyse the impact of both coupled (output) and decoupled (area and single farm) direct payments on land rents in Northern Ireland covering the period 1994 to 2002. They find that the impact of CAP direct payments on rental values depends on the type of payment and on the nature of the production characteristics of the associated agricultural commodity. Also in the EU, Kilian *et al.* (2008) analyses capitalization of direct payments in land rental prices in 2005 in Bavaria (region in Germany). They find that one additional euro of direct payments increases rental prices by 28 to 78 eurocents. Additionally, they evaluate the effect of decoupling support and they find an increase in the capitalization ratio due to decoupling and an additional 15 to 19 eurocents are capitalized into land rents.

Ciaian and Kancs (2009) investigate the impact of the Single Area Payment Scheme (SAPS) in the NMS based on farm level panel data of the period 2004-2005. They find that almost 20% of the SAPS payment is capitalized in land rents. In a related study, Ciaian *et al.* (2010a) analyse the income distributional effects of the CAP for farmers and landowners, using farm level panel data for the period 1995-2007 in selected member states. Their results do not confirm the theoretical hypothesis that landowners benefit from a large share of the CAP subsidies. According to their estimates, farmers gain between 60% to 95%, 80% to 178% and 86% to 90% of the total value of coupled crop/animal, coupled RDP and decoupled payments, respectively. They find that CAP subsidies are only marginally capitalized in land rents, although the effects depend on the type of payment.

Finally, Breustedt and Habermann (2011) analyse the impact of direct payments on land rents in Germany in 2001 by estimating a general spatial model to account for

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each additional dollar of government payments. Using the same data, Kirwan (2005) finds in a related study that landowners capture on average between $0.20 and $0.40 of the marginal per acre subsidy dollar depending on the region and farm size.

both spatial relationships among rental prices of neighboring farmers and spatially autocorrelated error terms. They find that the marginal incidence of EU direct payment on land rents amounts to 38 eurocents for each additional euro of direct payments.

3.2. Market Imperfections, Land Institutions and Regulations

In addition to the magnitude and type of the agricultural subsidy measure, the capitalization of agricultural subsidies will also be affected by market imperfections in in- and output markets as well as by the land institutions and rental regulation in place (see for example, Chau and de Gorter, 2005; Hennessy, 1998; Latruffe and Mouël, 2009).

First, at the end of 1990s, credit market imperfections (including credit and technology) were major limitations on the functioning of land markets in the NMS (Petrick, 2004). At the end of the 1990s and especially in the beginning of the 2000s, under the impulse of the prospect of EU accession and economic growth, market imperfections started to decrease. This resulted in increased investments in agriculture and in an increase in farm productivity which in turn led to a rise in the demand for land in the NMS. Furthermore, foreign and domestic investment in the food industry and agribusiness were stimulated with major positive vertical spillovers on farms. With EU accession direct payments started to increase which had a positive impact on farmers' investments by reducing their credit constraints (Latruffe *et al.*, 2010). Ciaian and Swinnen (2009) develop a theoretical model in which they analyse the impact of credit market constraints on capitalization of area payments in land rents. They find that, in the presence of credit market imperfections, area payments increased land rents by more than the payment.

Second, several studies document that land markets in the transition countries, even the most advanced such as in the NMS, are still characterized by the existence of significant transaction costs in the rural land markets. Transaction costs affect the development of land markets as they constrain access to land for rural households willing to start up or enlarge their farm and reinforce the persistence and dominance of large scale corporate farms (Ciaian and Swinnen, 2006). As a consequence rental prices for land rented by corporate farms is often much lower than that rented by individual farms due to the combination of imperfect competition and transaction costs. In the Czech Republic and Slovakia land rents paid by corporate farms are generally much lower: they vary between 50% and 20% of the rents paid by family farms (Swinnen *et al.*, 2006). In addition, corporate farms rely on in kind rental payments which are typically less transparent. They often depend on yields, which are difficult to control by the landowners, and may result in lower effective rent payments. As a consequence, the capitalization of agricultural subsidies is expected be lower when the share of corporate farms in agricultural land use is higher

Finally, also land market institutions and regulations may affect capitalization of payment in land rental rents. The most obvious case of how regulation is affecting the land market is the case where rental payments are regulated by the government such as it is for example the case in Belgium or France (Ciaian *et al.*, 2010b).

4. ECONOMETRIC ANALYSIS

4.1. Empirical model and variables

The sample used in the empirical analysis includes 6 NMS: the Czech Republic, Poland, Slovakia, Hungary, Lithuania and Latvia. We use yearly data from 1997 to 2009 for the Czech Republic, from 1994 to 2009 for Poland, from 2001 to 2007 for

Slovakia, from 2001 to 2009 for Hungary, from 2000 to 2009 for Lithuania and finally from 2004 to 2009 for Latvia. This results in an unbalanced panel data set with 61 observations.

4.1.1 Baseline model

To econometrically quantify the effect of direct payments on land rents, we estimate the following baseline model:

$$RENTS_{it} = a_0 + a_1 DP_{i,t} + a_2 OUTPUT_{i,t} + a_3 ACC_{i,t} + \delta_i + \varepsilon_{i,t} \quad (1)$$

where the dependent variable $RENTS_{it}$ represent the average rental price of agricultural land in country *i* in year *t*. $RENTS_{i,t}$, is defined as the deflated country average land rental price in euros and data are obtained from national statistics.[5]

First, the main variable of interest is the deflated average level of direct payments per ha expressed in euros ($DP_{i,t}$). Due to data limitations, we aggregated output and area payments, although it is possible that the effect differs between the two types of subsidies.[6] Before EU accession, $DP_{i,t}$ are obtained from OECD and are calculated as the sum of the OECD support categories "Payments based on output" and "Payments based on area planted/ number of animals" divided by the total utilized agricultural area as obtained from Eurostat. After EU accession, $DP_{i,t}$ are calculated as the sum of SAPS payments and national "top up" payments based on national statistics[7], divided by the total utilized agricultural area as obtained from Eurostat. Given the theoretical evidence

[5] VUZE for Czech Republic, GUS, ANR and Zagorski for Poland; VUEPP for Slovakia; the Central Statistical Office for Hungary; Lithuanian Institute of Agricultural Economics and the State Enterprise Centre of Agricultural Information and Rural Business; FADN for Latvia.

[6] See theoretical insights presented in section 3.

[7] Green Report (Ministry of Agriculture) for Czech Republic; ARiMR and ARR for Poland; Green Report (Ministry of Agriculture) for Slovakia; Payment Agency for Hungary; the Lithuanian Institute of Agrarian Economics for Lithuania; Rural Support Service for Latvia.

of the capitalization of direct payments (see section 3), we expect a positive coefficient of the $DP_{i,t}$ variable.

Second, to capture the effect of market returns on land rents, we include the variable $OUTPUT_{i,t}$ which is the deflated agricultural output value per hectare, expressed in euros and based on data obtained from Eurostat. We expect a positive correlation between land rents and agricultural output value per hectare.

Third, EU accession is expected to affect land markets directly by freeing them and integrating them into a single EU market. Indirectly, EU accession will also affect land markets as it improved the functioning of other factor markets (including credit and technology) and stimulated foreign and direct investments in the food industry and agribusiness, with sizeable spillovers on farming. In order to control for these effects, we include a dummy variable $ACC_{i,t}$ which equals one from the year of accession (2004) onwards and zero otherwise.[8]

Finally, we also include country fixed effects (δ_i) in order to control for unobserved heterogeneity that remains fixed over time. Since both coupled and decoupled direct payments are based on regional productivity levels, there is an unobserved country level effect for which we control by relying an a fixed effects estimation such that direct payments are exogenous within the country, but endogenous between the different NMS.[9]

[8] The variable *ACC* is expected to be correlated with the variables *DP* and *OUTPUT*. In addition to the full baseline model, we also estimated a restricted model in which we exclude the *ACC* variable in order to test for the robustness of our coefficients.

[9] In addition to regional productivity, coupled direct payments also depend on the individual production choice of the farmer. However, on a country level we believe that the production structure is relatively stable over the time period that we consider, such that including country fixed effects eliminates a large share of the endogeneity bias.

4.1.2 Extensions of the baseline model

We extend the baseline model in four ways. First, we include two different sets of explanatory variables to control for the prices of substitutes for land on the one hand, and for market imperfections due to incomplete institutional reforms on the other hand. Second, we estimate the impact of market price support measures by disentangle the variable $OUTPUT_{i,t}$ into one variable capturing the market return without subsidies and one variable capturing the market price support per hectare. Third, we analyse the interaction between the level of direct payments and credit market imperfections. Finally, we analyse the interaction between the level of direct payments and the country's farm structure (share of land cultivated by corporate vs. individual farmers).

Control variables[10]

First, in order to control for changes in the prices of substitutes for agricultural land, we will estimate the following model:

$$RENTS_{it} = a_0 + a_1 DP_{i,t} + a_2 OUTPUT_{i,t} + a_3 ACC_{i,t} + a_4 IP_{i,t} + a_5 ALP_{i,t} + \delta_i + \varepsilon_{i,t} \quad (2)$$

where $RENT_{i,t}$, $DP_{i,t}$, $OUTPUT_{i,t}$, $ACC_{i,t}$ and δ_i are defined as in section 4.2 $IP_{i,t}$, is the agricultural input price index, based on fertilizer and fodder prices. Data are obtained from Eurostat. In addition, we include agricultural labour productivity ($ALP_{i,t}$), which is a proxy for agricultural wages. Agricultural output data are obtained from FAO and labour data from the International Labour Organisation (ILO). Most empirical research on land rents do not control for price changes of other inputs which are, to a limited extent, substitutes for agricultural land. However, theoretically, in case the elasticity between substitutes for land is not zero, this affects the level of capitalization

[10] Note that we include the two sets of control variables in two different model specifications and we do not include all control variables in one regression. This is not possible since a fixed effects estimation of our model only allows us to include a limited number of independent variables. This is a important limitation of our study.

of the coupled direct payments (see section 3.1). An increase in $IP_{i,t}$, as well as in $ALP_{i,t}$ is expected to have a positive impact on land rents.

Second, there might still be market distortions in the NMS related to the transition process which started in 1989. In order to control for the progress in the reform process, we estimate the following model:

$$RENTS_{it} = a_0 + a_1 DP_{i,t} + a_2 OUTPUT_{i,t} + a_3 ACC_{i,t} + a_6 EBRD_{i,t} + \delta_i + \varepsilon_{i,t} \quad (3)$$

where $RENT_{i,t}$, $DP_{i,t}$, $OUTPUT_{i,t}$, $ACC_{i,t}$ and δ_i are defined as in section 4.1.1. $EBRD_{i,t}$ equals the EBRD reform indicator, which rates the progress of a country's reforms in several areas.[11] The effect of this $EBRD_{i,t}$ variable remains unclear. We expect that in countries with better reforms in different sectors surrounding agriculture, that landowners feel more secure to rent out land (as for example contracts will be more enforceable). As a result, the supply of land will be increased which will temper land rents. On the other hand, improvements in other surrounding markets, such as the credit market, may result in a higher demand for land which may result in a positive correlation between $EBRD_{i,t}$ and land rents.

Disentangle the effect of market price support and net market return

The variable $OUTPUT_{i,t}$ captures two effects (i) the effect of market price support ($MPS_{i,t}$) and (ii) net market return ($MKR_{i,t}$). In order to disentangle these two effects we include $MPS_{i,t}$ and $MKR_{i,t}$ separately in the regression which results in the following model:

$$RENTS_{it} = a_0 + a_1 DP_{i,t} + a_{2a} MPS_{i,t} + a_{2b} MKR + a_3 ACC_{i,t} + \delta_i + \varepsilon_{i,t} \quad (4)$$

[11] The EBRD transition indicator gives a score from 1 to 4. It aggregates assessments of the privatization of small- and large scale enterprises, enterprise restructuring, price liberalization, trade and foreign exchange system liberalization, competition policy, bank and nonbank financial sector reforms. economies. The general EBRD indicator is the average of the score given to the reforms in each area. A high value of the general indicator is associated with a higher level of reform and hence better working institutions.

where $RENT_{i,t}$, $DP_{i,t}$, $ACC_{i,t}$ and δ_i defined as in section 4.1.1. $MPS_{i,t}$ is a proxy for the market price support and is obtained from OECD.[12] $MKR_{i,t}$ is a measure for market return and is calculated as the difference between $OUTPUT_{i,t}$ and $MPS_{i,t}$. Both $MPS_{i,t}$ and $MKR_{i,t}$ are expected to have a positive impact on land rents.

Interaction between direct payments and credit market imperfections

Credit market imperfections may affect the capitalization of direct payments in land rents as explained in section 3.2. In order to test the interaction between direct payments and credit market interaction we estimate the following model:

$$RENTS_{it} = a_0 + a_1 DP_{i,t} + a_2 OUPUT_{i,t} + a_3 ACC_{i,t} + a_7 CREDIT_{i,t} + a_8 CREDIT * DP_{i,t} + \delta_i + \varepsilon_{i,t} \quad (5)$$

where $RENT_{i,t}$, $DP_{i,t}$, $OUTPUT_{i,t}$, $ACC_{i,t}$ and δ_i are defined as in section 4.1.1. $CREDIT_{i,t}$ equals the EBRD's index, which rates the progress in the country's bank and nonbank financial sector reforms. The index ranges between 1 and 4, where a higher value of the index indicates more reform in the financial sector and this is usually associated with better access to credit. Reduced credit constraints and improved access to credit are expected to result in a higher demand for agricultural land and therefore we expect a positive correlation between $CREDIT_{i,t}$ and land rents. In addition, we include an interaction term between the variables $CREDIT_{i,t}$ and $DP_{i,t}$. As predicted by the theoretical work of Ciaian and Swinnen (2009), we expect that in the presence of credit constraints capitalization of direct payments in land rents is more important since direct payments may help to improve farmers' access to credit (e.g. use of direct payments as

[12] For the pre-accession period, data on market price support are provided by OECD for each country. For the post-accession period, OECD provides data for producer support equivalents for the EU as a whole without making a disaggregation at country level. Therefore we calculate for the most important commodities, the difference between the internal price, which is the EU price, and the world market price. This price difference can be seen as a measure of the magnitude of the price support per unit of a specific commodity. This price difference is then multiplied by the country level output of the specific commodity. In addition, we determined the magnitude of the market price support for the "other commodities", which is provide by OECD for the EU as a whole, based on the country's share in total EU production.

collateral for bank loans). Therefore we may expect a negative impact of the interaction term on land rents.

Interaction between direct payments and farm structure

The structure of the farm sector (agricultural land use by corporate vs. individual holdings) may affect the capitalization of direct payments in land rents as explained in section 3.2. In order to test the interaction between direct payments and the farm structure we estimate the following model:

$$RENTS_{it} = a_0 + a_1 DP_{i,t} + a_2 OUPUT_{i,t} + a_3 ACC_{i,t} + a_9 CF_t + a_{10} CF * DP_{i,t} + \delta_i + \varepsilon_{i,t} \qquad (6)$$

where $RENT_{i,t}$, $DP_{i,t}$, $OUTPUT_{i,t}$ and δ_i are defined as in section 4.1.1. CF_i is the share of agricultural land used by corporate farmers and is based on data obtained from Eurostat. Since the share of land used by corporate farms hardly varies over time, we included CF_i as time-invariant variable.[13] When agricultural land use is dominated by corporate farms, landowners face significant transaction costs, such as bargaining costs with the farm management of the corporate farms, to change the allocation of the land, which is expected to be reflected in lower land rental prices (Ciaian and Swinnen, 2006). In addition, we include an interaction term between $CF_{i,t}$ and $DP_{i,t}$ since we expect that capitalization of direct payments will be stronger when more land is used by individual farms (see section 3.2).

Table 2 gives an overview all variables used in the estimation.

[13] When we estimate the model by a fixed effects model estimation, CF_i will be drop since this time invariant variable is multicollinear with the fixed effect (δ_i).

4.2. Regression results

4.2.1 Baseline model results

The regression results are presented in Table 3. The first column (model A) presents the estimation results of a restricted fixed effects model in which we only include direct payments (*DP*) as an explanatory variable. The second column (model B) presents the estimation results of a restricted model in which we include in addition to direct payments (*DP*) also agricultural output (*OUTPUT*) as an explanatory variable. Finally, the third column (model C) presents estimation results of the full baseline model.[14]

Direct payments (*DP*) are found to have a positive and significant impact on land rents, indicating that there is rent extraction of government payments by landowners. The impact is not only statistically significant, it is also economically significant. An increase of one additional euro per ha in direct payments, increases land rents by 13 to 25 eurocents. The sign and magnitude of the impact of direct payments on land rents is similar to the findings of Ciaian and Kancs (2009), who analysed capitalization in land in the NMS during the period 2004-2005 using farm level data.

Further, we find that higher levels of agricultural output (*OUTPUT*) are correlated with higher rental prices. An increase of one additional euro per ha of agricultural output is expected to lead to an increase of the land rental price by 5 eurocents.

Next, EU accession (*ACC)* significantly increases land rents, indicating that since 2004, the year of EU accession for all selected NMS, land rents increased by almost 5,51 euro per ha. The coefficient of *DP* remains stable (significantly positive and of the same order of magnitude) when the variable *ACC* is included in the baseline model (see

[14] We also estimated a model with time-fixed effects but the results of the F-test indicate that the time-fixed effects are jointly equal to zero. We therefore present the results of the model with country-fixed effects only. In addition, we report all regression results using clustered standard errors.

model B and C in Table 3). This clearly indicates that the variable *ACC* is capturing "other" effects of accession, beyond the direct subsidy or output price effects.

4.2.2 Extensions of the baseline model

The extensions to the baseline model are include in Table 4. The control variables IP and ALP are added in model D, while model E includes the control variable EBRD. In model F, we disentangle of the land productivity variable into the effect of net market return (MKR) and market price support (MPS). The extension in which we analyse the interaction between the level of direct payments and credit market imperfections is given by model G and finally the results of the estimation in which we include the interaction between the level of direct payments and the country's farm structure are displayed in model H.

The results of the extended model estimations confirm the finding of the baseline model that direct payments have a statistically and economically significant impact on land rents. In addition, we also find consistent coefficient estimates for the variables OUTPUT and ACC. In the extended models D,E and F, the coefficients for these variables are close to the coefficients in the baseline model, suggesting robust findings.

We do not find a significant impact of the control variable IP on land rents, while the ALP variable has positive impact on land rents. This means that when agricultural labour productivity is higher, land rents are higher ceteris paribus. The EBRD has a significantly negative coefficient which implies that average land rents are lower in case of more institutional reforms (e.g. better functioning input and output markets). This is an indication that the positive effects of institutional reforms on land supply seem to outweigh the potential effects on land demand. This is not surprising as land owners will be for example more likely to rent out their land when proper institutions are in

place to enforce contracts. As a consequence land supply will increase and hence rental prices will decline so that the capitalization is tempered.

When we disentangle output into MPS and MKR, we do not find a significant coefficient for MPS, while for the MKR variable we find a significant positive coefficient which is of the same order of magnitude as the coefficient of the OUTPUT variable. Hence, an increase of one additional euro in net market return increases the average land rental price by 5 eurocents.

The results of model G with the interaction between direct payments and credit market constraints show that, in the presence of credit market constraints, direct payments will be more capitalized in land rental prices than in the presence of well-functioning credit markets. As such our results confirm the theoretical work on the interaction of direct payments and credit constraints by Ciaian and Swinnen (2009). In case of poor functioning credit markets (i.e. no reforms in the financial sector or CREDIT = 1), an additional euro of direct payments results in an increase of 40 eurocents in the average land rental price. While in case of well-functioning credit markets (CREDIT = 4), only 16 eurocents per additional euro of direct payments is capitalized in land rents. On the mean level of CREDIT variable in the sample (CREDIT = 3.59), an additional euro of direct payments is reflected in an increase of 19 eurocents in the average rental price.

Finally, the regression results confirm our expectation regarding the impact of a country's farm structure. We find that in countries where a larger share of the agricultural land is used by corporate entities (and hence more imperfect competition), a lower share of the direct payments is capitalized in the average rental price. In case all agricultural land is used by individual farmers (CF = 0), an additional euro of direct payments is reflected in an increase of 21 eurocents in the average rental price, while in

case all agricultural land is used by corporate farms (CF = 1), only 4 eurocents are capitalized in the average rental price. On the mean level of CF in the sample (0.38), an additional euro of direct payments is reflected in an increase of 15 eurocents in the average rental price.

5. CONCLUSION

While agricultural subsidies were introduced to increase the income of farmers, agricultural subsidies also induce second-order adjustments so that they alter farmers' production incentives and thus factor demand. In this paper, we estimate the second order effect of direct payments on the rural land market in selected NMS. EU accession resulted in a considerable change in the level of subsidies paid in the NMS, which allows us to estimate the impact of the increase in direct payments on land rental prices. We find that direct payments have a positive and significant impact on land rents, indicating that there is rent extraction of government payments by landowners. This impact is not only statistically significant, it is also economically significant. An increase of one additional euro per ha in direct payments, increases land rents by 13 to 25 eurocents. Since renting is widespread in several NMS and since most landowners are often absentee landowners who live in urban areas or who are no longer active in agriculture, the payments will flow out of the agricultural sector and are to a large extent missing their goal of improving the livelihoods of rural inhabitants in the NMS.

In addition, we find that the level of capitalization depends on market imperfections, in particularly credit market imperfections, and the country's farm structure, which affects transaction costs and imperfect competition in the land rental market.

Capitalization of direct payments is higher in more credit constrained markets, with the level of capitalization ranging from 40 eurocents (in the case of poor functioning credit markets) to 16 eurocents per additional euro of direct payments (in the case of well-functioning credit markets). Direct payments may reduce farmers' credit constraints, for example because farmers may use the direct payments as collateral for bank loans. As consequence, the marginal productivity of agricultural land increases which will in turn boost the demand for agricultural land as theoretically shown by Ciaian and Swinnen (2009).

With respect to the farm structure, we find that capitalization of direct payments is lower in countries characterized by significant share of agricultural land used by corporate farms. Per additional euro of direct payments, the level of capitalization in the land rental price ranges from 21 eurocents if all land used by individual farmers to 4 eurocents if all land used by corporate farms. Hence, in the countries, where the farm structure is dominated by corporate farms, the level of capitalization of direct payments is found to be lower, suggesting that transaction and imperfect competition temper capitalization. Corporate farms typically pay lower rental prices than family farms, are more likely to pay rents in kind than family farms (who pay cash), have rental contracts of longer duration (locking in land), and often use their political powers/relationships to influence policies that shift effective land property rights in their favor. While government policies may not directly favour corporate farms, they may still be biased towards corporate farm interests because of technical requirements related to land exchange and withdrawal procedures, because of complex and expensive land registration procedures, and because of established relations between farms (managers), officials and firms up- and downstream such as agribusiness and food processors.

All this clearly illustrates the importance of reforms focused on market institutions and on improving access to input and output markets, as well as of reforms of sectors

"surrounding agriculture". Such reforms are crucial to improve access to land by farmers, to induce structural change in the sector and to ensure that agricultural subsidies are not missing their goal of improving the livelihoods of rural inhabitants in the NMS .

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Table 1: Share of rented agricultural land and land used by corporate farms in the EU-27 (%)

	Share rented land		Share used by corporate farms	
	2005	**2007**	**2005**	**2007**
Belgium	67	67	5	10
Bulgaria	**76**	**79**	**53**	**53**
Czech Republic	**86**	**83**	**71**	**71**
Denmark	25	29	2	5
Germany	62	62	31	32
Estonia	**48**	**50**	**44**	**48**
Ireland	18	18	0	0
Greece	32	32	0	0
Spain	28	27	31	32
France	72	74	50	54
Italy	23	28	18	13
Cyprus	50	54	7	8
Latvia	**24**	**27**	**10**	**9**
Lithuania	**53**	**48**	**12**	**14**
Luxembourg	54	57	0	0
Hungary	**57**	**56**	**51**	**52**
Malta	80	81	7	7
Netherlands	26	25	8	7
Austria	26	27	17	19
Poland	**20**	**20**	**10**	**10**
Portugal	24	23	25	28
Romania	**14**	**17**	**35**	**35**
Slovenia	**30**	**29**	**5**	**5**
Slovakia	**91**	**89**	**82**	**80**
Finland	34	34	8	9
Sweden	40	39	18	19
United Kingdom	31	32	15	13

Source: Eurostat

Table 2: Description of the variables in the land rents regression

Variable	Definition	Mean	Std. dev.
Dependent variable			
RENTS	Deflated average land rents (€/ha)	42.51	28.6
Main variable of interest			
DP	Deflated direct payments per ha (€/ha)	79.97	57.99
Control variables			
MKT	Deflated market value output (€/ ha)	746.84	361.78
ACC	Accession dummy (0/1)	0.56	0.50
IP	Agricultural input price index (100=2007)	89.38	14.66
ALP	Agricultural Labor Productivity (deflated €/worker)	745.34	1558.64
EBRD	EBRD transition indicator (score 1 to 4)	3.52	0.28
MPS	Market Price Support (€/ha)	105.93	61.79
MKR	Market Return (€/ha)	640.92	354.58
CREDIT	EBRD indicator for financial reform (score 1 to 4)	3.59	0.36
CREDIT_DP	Interaction term CREDIT and DP	302.47	235.44
CF	Share of land cultivated by corporate farms (0 to 1)	0.38	0.29
CF_DP	Interaction term CF and DP	35.04	39.71

Table 3: Regression results of the fixed effects baseline model

	Model A		Model B		Model C	
	Coefficient	**t-value**	**Coefficient**	**t-value**	**Coefficient**	**t-value**
DP	0.25	(5.88)***	0.17	(9.50)***	0.13	(10.96)***
OUTPUT	-	-	0.05	(2.32)*	0.05	(2.07)*
ACC	-	-	-	-	5.51	(2.62)**
Constant	22.61	(6.68)***	-8.37	(-0.51)	-7.23	(-0.42)
R^2	0.71		0.79		0.80	
Observations	61		61		61	

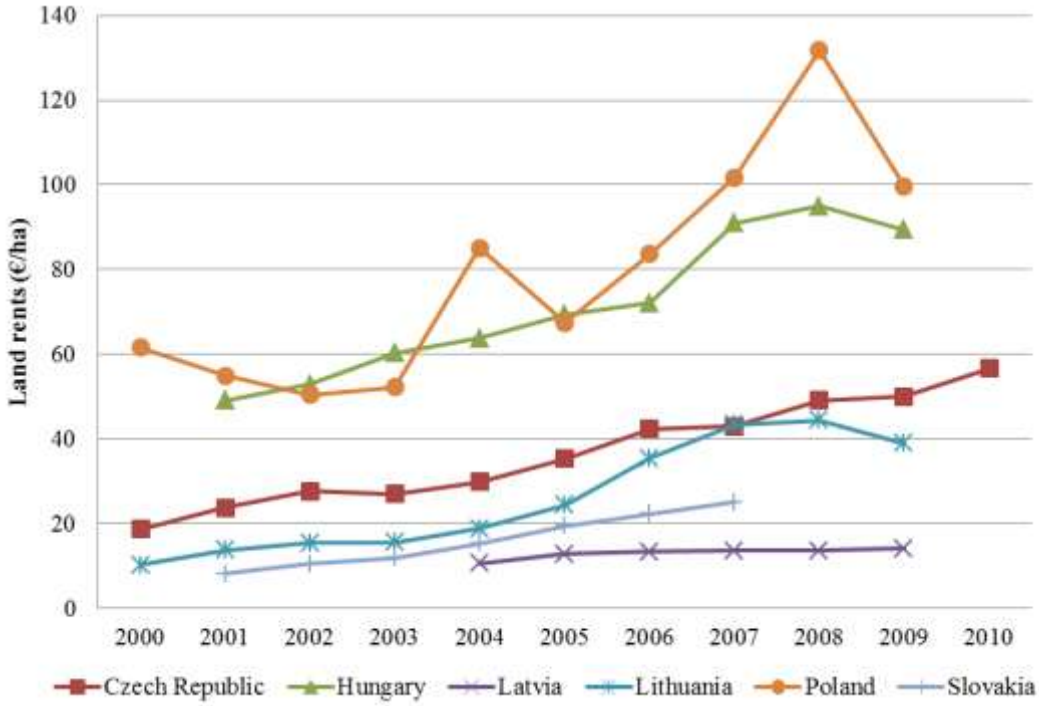
*significant on 10%, **significant on 5% and *** significant on 1%
We used clustered standard errors and within R^2.
Source: authors' calculations based on the constructed sample

Table 4: Regression results of the fixed effects model of the extensions to the baseline model

	Model A		Model B		Model C		Model D		Model E	
	Coefficient	**t-value**	**Coefficient**	**t-value**	**Coefficient**	**t-value**	**Coefficient**	**t-value**	**Coefficient**	**t-value**
DP	0.12	(15.54)***	0.15	(12.86)***	0.13	(29.42)***	0.48	(4.34)***	0.21	(4.89)***
OUTPUT	0.04	(2.54)*	0.05	(2.15)*	-	-	0.06	(2.28)*	0.04	(2.04)*
ACC	6.22	(3.04)**	7.10	(3.04)**	5.71	(2.37)*	6.80	(1.70)	4.47	(1.42)
IP	0.09	(0.71)	-	-	-	-	-	-	-	-
ALP	0.00	(2.04)*	-	-	-	-	-	-	-	-
EBRD	-	-	-12.24	(-3.03)**	-	-	-	-	-	-
MPS	-	-	-	-	0.05	(2.08)*	-	-	-	-
MKR	-	-	-	-	0.04	(1.87)	-	-	-	-
CREDIT	-	-	-	-	-	-	-13.05	(-1.44)	-	-
CREDIT_DP	-	-	-	-	-	-	-0.08	(-3.33)**	-	-
CF_DP	-	-	-	-	-	-	-	-	-0.17	(-2.83)**
Constant	-13.46	(-0.62)	29.73	(2.82)**	-6.30	(-0.39)	29.81	(2.00)	-4.06	(-0.29)
R^2	0.82		0.81		0.80		0.84		0.83	
Observations	61		61		61		61		61	

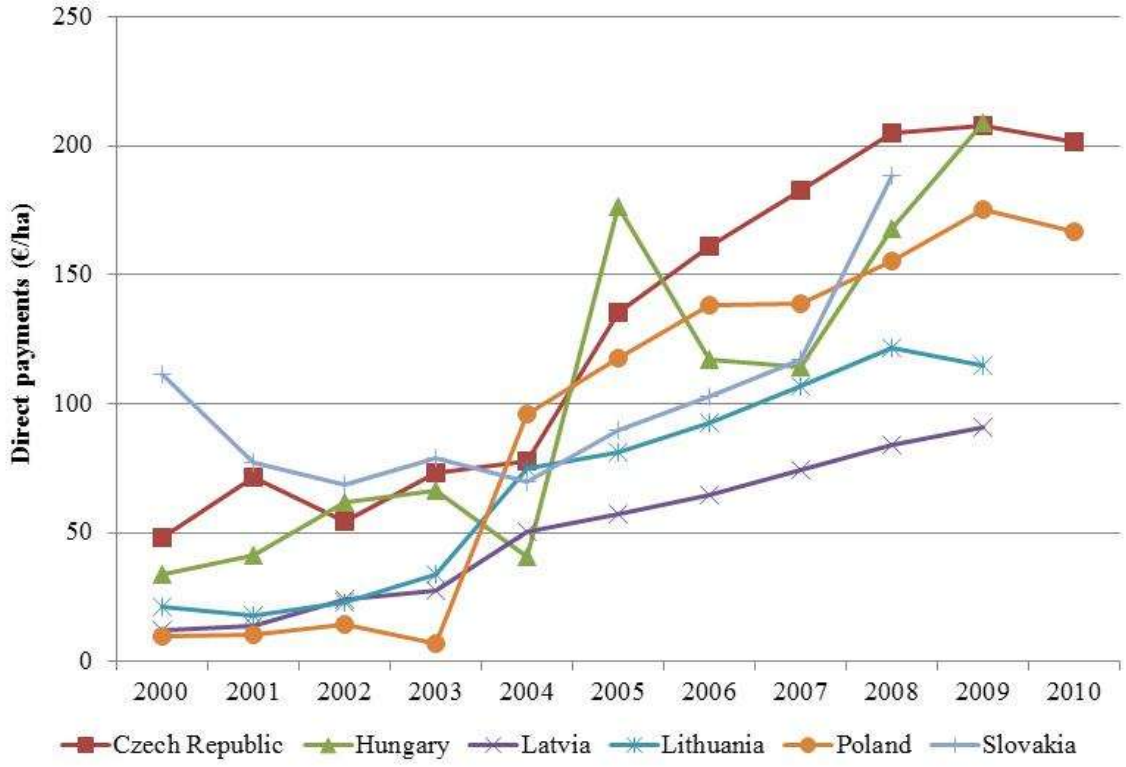
*significant on 10%, **significant on 5% and *** significant on 1%
We used clustered standard errors and within R^2.
Source: authors' calculations based on the constructed sample

Figure 1: Evolution of land rents in the selected NMS (€/ha)



* Rental prices are real 2010 prices
Source: Authors' calculations based on the constructed sample

Figure 2: Evolution of direct payments in the selected NMS (€/ha)



* Direct payments are real 2010 prices
Source: Authors' calculations based on the constructed sample