CREDIT MARKET IMPERFECTIONS AND THE DISTRIBUTION OF POLICY RENTS: THE COMMON AGRICULTURAL POLICY IN THE NEW EU MEMBER STATES

Pavel Ciaian[1,2] and Johan F.M. Swinnen[1]

[1]LICOS Centre for Institutions and Economic Performance, Katholieke Universiteit Leuven;
[2]Slovak Agricultural University in Nitra

Contact:

LICOS - Centre for Institutions and Economic Performance
Katholieke Universiteit Leuven
Deberiotstraat 34 - bus 3511
B-3000 Leuven
Tel : 32-16-326570
Fax : 32-16-326599
e-mail: pavel.ciaian@econ.kuleuven.be

Paper prepared for presentation at the 107th EAAE Seminar *"Modelling of Agricultural and Rural Development Policies"*. Sevilla, Spain, January 29th -February 1st, 2008

Abstract

This article analyses how credit market imperfections affect the impacts of subsidies by analyzing the effects of agricultural subsidies in the new Eastern Member States of the European Union with a partial equilibrium model which integrates credit and land market imperfections. We show that credit constraints have important implications for the distribution of policy rents. Credit market imperfections may induce very different effects of direct payments and lump-sum transfers.

Key words: agricultural policy, imperfect credit markets, land market, policy rents

1. Introduction

The distortions caused by farm policies and their policy effects on farm incomes has received renewed attention in the current WTO negotiations and policy reforms leading up to it. An important issue is whether "decoupled policies" are truly decoupled (e.g. Chau and de Gorter 2005; de Gorter 2007; Goodwin and Mitra, 2006; Hennessy, 1998; OECD, 2001a; Serra et al, 2005). This not only holds for the impact of policies on production, and hence trade, but also on the distribution of the policy rents. An influential study by the OECD came to the conclusions that only 20% of all market and price support in OECD countries resulted in net farm surplus gains; the rest was dissipated to others, including owners of production factors (OECD, 2001b). Other studies also identified important differences among policy instruments in their costs and benefits (de Gorter and Meilke, 1989; Dewbre, Anton, and Thompson, 2001; Giannakas and Fulton, 2000; Salhofer and Schmid, 2004). There is considerable discussion on whether the standard policy and trade models are sufficiently complex to capture all the effects, and hence to yield accurate conclusions.

The accession of ten Central and Eastern European countries (CEECs) to the European Union (EU) presents an interesting case to analyze some of these issues. Agricultural issues have played a prominent role in the enlargement debate. Crucial issues were whether a reform of the Common Agricultural Policy (CAP) was needed to avoid conflicts with budgetary and WTO constraints when the CAP would be extended to CEECs and whether CEEC farmers would get access to the same subsidies as EU-15 farmers (Hartell and Swinnen 2000; Tangermann and Banse 2000). In fact, the final days before this historic event were spent mostly on intense negotiations on agricultural subsidies and production quotas.

While several studies estimated the impact of EU enlargement in agriculture on EU expenditures, protection levels, commodity markets, trade and WTO (Banse, Münch, and Tangermann 2000; European Commission 2002, 2007; Hertel, Brockmeier, and Swaminathan 1997; Münch 2002), these studies generally ignored imperfections in factor markets and paid relatively little attention to the income distribution effects within the CEEC economies. These were important limitations since much of the policy debate centered on how the implementation of the CAP would affect rural incomes in CEECs, and since rural factor markets in new EU member states (NEMS) were characterized by major imperfections (Rizov and Swinnen 2004; World Bank 2001). The first attempt to address these shortcomings was by Ciaian and Swinnen (2006) who analyzed how imperfections in land markets –

an important problem in CEECs – affect the efficiency implications and the distributional effects of these payments.

However, also rural credit markets were characterized by major imperfections. Credit constraints were a major problem for growth and restructuring during transition (Swinnen and Gow, 1999) and were still considered an important problem at the time of accession in several of the NEMS (Bezemer, 2003; Latruffe, 2005; Petrick, 2004; Petrick and Latruffe, 2003; World Bank, 2001).

The objective of this paper is to analyze explicitly how these credit market imperfections affect the welfare effects of introducing the CAP in the NEMS. In this article we develop a theoretical framework and use a model of the rural credit and land market to analyze how the income and efficiency effects of the implementation of CAP payments are affected by rural credit market constraints in the NEMS. We analyze the effect of both direct (area) payments and of decoupled single farm payments. The first are currently implemented in NEMS and the second will be implemented later in the decade.

We find that credit market imperfections have major implications for the distribution of policy rents. More specifically, we find that when credit constraints are important, farms benefit from the subsidy directly and indirectly as they induce a reduction of the credit constraints. However, this also causes an increase in the land demand, and consequently an increase in land prices. As a consequence, the dissipation of the policy rents to land owners will be larger with farm credit market constraints, and the benefits for farms will be smaller in most cases. We identify situations in which farms may not only gain less, but even lose, from the introduction of subsidies. This may occur both with coupled payments and decoupled payments.

The article is organized as follows. The next section develops a model of the NEMS land market taking into account imperfections in the credit market. The third and fourth section analyses how CAP subsidies affects the land allocation and surplus distribution. The final section concludes.

2. The Model [1]

The current production structure in the NEMS is heavily influenced by the transition process of the 1990s. Before transition, production decisions, factor allocations and property rights in CEECs were largely controlled by the state. Land was used by large-scale state and collective farms.[2] Land reform in the early 1990s reallocated most land property rights to individual households in CEECs. We will

[1] The basic structure of our model builds on Ciaian and Swinnen (2006), but since the prime focus of the present paper is the credit market imperfections, we focus primarily on these and not on land market imperfections. For example, we include land transaction costs, but not imperfect competition, in the land market. This has no significant implications for our findings.

[2] The exceptions to this rule were Poland and the countries of former Yugoslavia, where land use and ownership remained in small private farms during the Communist system.

refer to them as "*landowners*".[3] More or less simultaneous with the land reform, important farm restructuring took place. Farm restructuring included a privatization of the farms and a restructuring of the management structure. This restructuring included a reorganization of collective and state farms into private cooperatives and farming companies. We will refer to them as "*corporate farms*" (CF), which are typically large-scale. The most dramatic restructuring was the break-up of collective and state farms into household plots and family farms. We will refer to these as "*individual farms*" (IF).

Production is assumed to depend on the amount of land (A^i) and on non-land inputs (K^i) which we refer to as "fertilizer" but which captures also other inputs, $f^i(A^i, K^i)$ with $f_j^i > 0$, $f_{jj}^i < 0$, $f_{jn}^i > 0$, for *i* = *I* and *C*, and for *j*, *n* = *A* and *K*. The end season profits of IF and CF are, respectively:

(1) $$\Pi^I = pf^I(A^I, K^I) - \left[(r+t)A^I + kK^I\right](1+i)$$

(2) $$\Pi^C = pf^C(A^C, K^C) - \left[rA^C + kK^C\right](1+i)$$

where *p* is the price of the final product, *r* is the price of land, *t* are transaction costs in the land market, k is the per unit price of fertilisers and i is interest rate.

To keep the analysis tractable we model the land market in a stylized way, following the approach of Ciaian and Swinnen (2006). We start from a situation where all the land is owned by individual households, but still used by the corporate farms[4] and assume that land transactions take place exclusively through rental agreements. This is consistent with the majority of land transactions in NEMS.[5] Landowners receive a rent *r* for each unit of land that they rent to corporate farms. Several households, landowners or not, consider starting up an individual farm for which they need land. They can either withdraw land from corporate farms or rent from landowners who currently rent their land to corporate farms. In both cases the price they have to pay per unit of land is the sum of the rent paid by the corporate farms, *r*, (explicitly for rented land or implicitly as opportunity costs) and the transaction costs, *t*, involved in withdrawing the land from the corporate farms.[6]

[3] Land reform took several forms. The main form in CEECs was restitution of land to former owners (Lerman, Csaki, and Feder 2004; Rozelle and Swinnen 2004). The land reform created a class of new, often absentee, landowners while land is used by a mixture of smaller individual farms and large-scale corporate farms. Large scale corporate farms continue to use large parts of the land because of a variety of reasons. These corporate farms are mostly successor organizations from the former collective and state farms after farm privatization and land reform. They are, on average, between 300 and 1000 hectares, and their share of land use is around 85% in Slovakia, 70% in the Czech Republic, 50% in Bulgaria, 40% in Hungary, and more than 30% in Romania and Estonia. In many countries they use a more than proportionate share of the best agricultural areas, which are especially affected by CAP payments.

[4] This reflects a situation where the land reform is formally completed, and the farms have been privatized, but no restructuring to individual farms has occurred.

[5] The share of rented land in total agricultural land is more than 90% in Slovakia and the Czech Republic, and around 60% in Estonia, Hungary, Lithuania and Bulgaria. Moreover, corporate farms in NEMS usually rent more than 90% of their land (Swinnen and Vranken, 2007a).

[6] Land markets in the NEMS were characterized by important transaction costs constraining efficiency enhancing land exchanges (Dale and Baldwin 2000; Lerman, Csaki, and Feder 2004; Swinnen and Vranken 2005; World Bank 1999). An important reason for the continued large share of large scale corporate farms in the land market is that historically, the large-scale farms were the users of the land and that new owners of the land face significant transaction costs if they want to withdraw their land from the farms and reallocate it. Transaction

An important issue is the timing of the various activities and payments throughout the season. In this paper we assume that fertilizers have to be paid at the start of the season while payment of land rents to owners and farms' revenues from selling the harvest occur at the end of the season, after harvest. According to our information, these assumptions are consistent with reality in the NEMS. Land rents are generally paid at the end of the season.[7] In several NEMS land rents are sometimes paid in kind or through sharecropping – effectively implying that they are paid after the harvest.[8] Hence, credit is needed to finance other inputs, i.e. fertilizer K, at the start of the season.

2.1. Perfect Credit Market

To establish a point of comparison let us first identify the equilibrium without credit market constraints. With perfect credit markets, farms are not constrained on the quantity of inputs they use. Farms will choose the quantity of land and fertilisers that will maximise their profits given by equations (1) and (2), respectively. This implies the following equilibrium conditions (for notational simplicity the interest rate i is set equal to zero ($i = 0$)): [9]

(3) $pf_A^I - (r+t) = 0$

(4) $pf_K^I - k = 0$

(5) $pf_A^C - r = 0$

(6) $pf_K^C - k = 0$

(7) $A^I + A^C = A^T$

Farms increase the quantity of land and fertilisers until marginal value products are equal to economic costs for both inputs. The conditions (3) – (6) also determine farms input demands. As illustrated in figure 1, IF and CF land demands with zero transaction costs ($t = 0$) are given by D^I and D^C, respectively. The equilibrium is (A^*, r^*). With transaction costs ($t > 0$) IF land demand shifts

costs include costs involved in bargaining with the farm management, in obtaining information on land and tenure regulations, in implementing the delineation of the land and dealing with inheritance and co-owners (Mathijs and Swinnen 1998; Prosterman and Rolfes 2000). See Ciaian and Swinnen (2006) for a more extensive discussion on how to model land transaction costs.

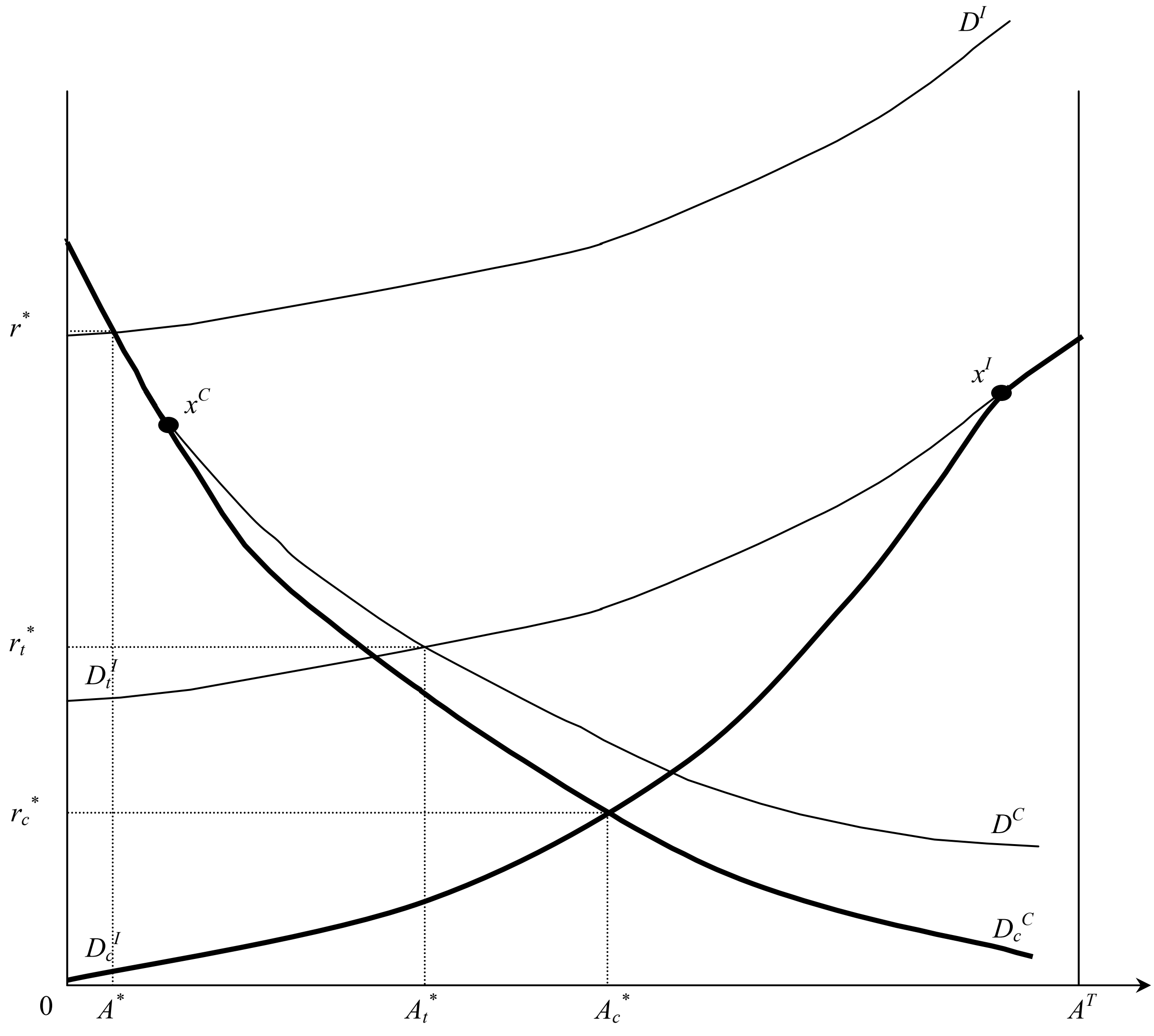
[7] We have analyzed how the results change when land rents also have to be paid at the start of the season. We did not include these because of space constraints (given that this assumption is less realistic), but the derivations and analysis can be obtained from the authors.

[8] Survey evidence shows that payment in kind varies among NEMS but in general CF are more likely to pay in kind than IF (Swinnen and Vranken, 2007a)

[9] While this may appear at first sight as a strange assumption in an analysis of credit market imperfections, this assumption does not affect the results because credit market imperfections in this paper are modelled as constraints on the amount of credit rather then its cost, as is standard in the literature (see further). Hence setting i=0 merely simplifies the notation, but does not affect the results.

downwards to D_t^I. The new equilibrium is (A_t^*, r_t^*). Land rents are lower and IF use less land with transaction costs.[10]

Figure 1. Equilibria in the land market with credit constraints



2.2. Imperfect Credit Market

To model the imperfect credit market, we use the approach of Feder (1985) and Carter and Wiebe (1990) by introducing a farm credit constraint. It is assumed that the maximum amount of credit available to farm *i*, S^i, depends on farm characteristics (W^i) such as reputation, farm size and wealth. That is $S^i = S^i(W^i)$ with $S_W^i > 0$, for *i* = *I*, *C*. Larger farms and farms with better reputation have access to more credit.[11] The IF and CF credit constraints, respectively, are then given by:

---

[10] This follows from the fact that $f_{jj}^i < 0$, $f_{jn}^i > 0$, for *i* = *I* and *C*, and for *j*, *n* = *A* and *K*.

[11] Empirical evidence generally supports this assumption in the NEMS. Bezemer (2003) finds in the case of the Czech Republic that long-established and larger CF have better access to credit than small IF. Latruffe (2005) finds in the case of Poland that farmers with more assets were less credit constrained than others. This may differ

(8) $kK^I \leq S^I(W^I)$

(9) $kK^C \leq S^C(W^C)$

With credit constraints the decision-making problem of IF and CF is the maximization of the end-season profit functions, as given by equations (1) and (2), respectively, subject to credit constraints (8) and (9), respectively, as represented by the LaGrangean function:

(10) $\Psi^i = pf^i(A^i, K^i) - r^i A^i - kK^i - \lambda^i \left(kK^i - S^i\right)$

for $i = I$ and C, where $r^I = r + t$, $r^C = r$, and λ^i the shadow price of the credit constraint.

When the credit constraints are binding farms cannot use the unconstrained optimal level of fertilisers and fertiliser use is determined by, respectively, i.e. $K^I = \frac{S^I(W^I)}{k}$ and $K^C = \frac{S^C(W^C)}{k}$. Farms then choose their land allocation to maximize profits, treating fertiliser use as fixed.

The optimal conditions with binding credit constraints ($\lambda^i > 0$) are given by (7) as well as by:

(11) $pf_A^i + r^i = 0$

(12) $pf_K^i - k\left(1 + \lambda^i\right) = 0$

(13) $kK^i - S^i = 0$.

From equation (12) it follows that the marginal value product of fertilizers is higher than the economic cost of fertilizers k, $pf_K^i > k$: by increasing fertilizer use farms may increase their profits but credit constraints do not allow them to do so. From characteristics of production function $f_{AK}^i > 0$ it also follows that the equilibrium rent declines relative to the equilibrium rent without credit constraints. Further the more credit constrained farms are, the less fertilizers they use and the lower their land demand, ceteris paribus.

The effect of credit constraints on the land allocation and the land market rent is illustrated in figure 1. As explained before, the IF and CF land demand curves without credit constraints are D_t^I and D^C. The equilibrium without credit constraint is (A_t^*, r_t^*). When credit is constrained, IF and CF land demands shift to D_c^I and D_c^C, respectively. The new equilibrium shifts to (A_c^*, r_c^*). The land market rent declines, $r_c^* < r_t^*$. The change in land allocation depends on the relative farms credit constraints. In

from the situation in more developed market economies. For example, Bierlen and Featherstone (1998) find in the US that a farms' debt levels are the strongest determinant of credit constraints, while asset size and age are less important. Benjamin and Phimister (2002) find that differences in the structure of agricultural credit markets alter farm credit constraints. They find that in the case of the UK where non-specialized commercial banks dominate and with little government interventions, farms with less collateral were more credit constrained, while in France with dominant specialized agricultural cooperative bank and with extensive government interventions, farm credit is less dependent on collateral. Closer relationships between the cooperative bank and farms in France address better information asymmetry and reduce the reliance on collateral.

the case shown in figure 1, IFs are assumed to be more credit constrained than CFs. As a result, IF renting declines by $A_c^* - A_t^*$.

At low levels of output (and thus land use) the credit constraint is not binding, and the constrained demand curves D_c^I and D_c^C coincide with the unconstrained demand curves D_t^I and D^C. This is up to the points x^i (i= I,C) where the constraint becomes binding and the constrained demand curve shifts below the unconstrained demand curves. In the figure we assume that the credit constraints are more important for the (smaller) individual farms than for the (larger) corporate farms.

3. Impact of CAP payments

Since the 1992 MacSharry reform and the Agenda 2000 reforms, the vast majority of CAP subsidies are so-called direct payments (DPs). These CAP subsidies were a hotly disputed issue in EU enlargement, as the NEMS insisted on getting full access to these direct payments (DPs), while EU-15 member states only wanted to give partial DPs. The ultimate agreement, reached in Copenhagen in 2002, allowed for DPs to be partially introduced from the date of accession and then gradually increased, from maximum 55% in 2004 to 100% in 2010.[12]

In 2006 34.8 billion Euros were spent in the EU on DPs alone (European Commission, 2006). They make up around two-thirds of the CAP budget and include both per hectare payments for crops and payments per animal for livestock activities, and single farm payments. The latter result from the decision in 2003 to decouple CAP subsidies such that subsidies will be given as a fixed set of payments per farm, so-called single farm payments (SFP). The implementation of the SFP started in 2005 in the EU-15 (the pre-2004 member states), and later in the NEMS. By 2011 all EU countries, including the NEMS, must have shifted their direct payments to single farm payments. We first analyze the impact of the DPs as they have been introduced in the NEMS and afterwards we analyze the effect of SFPs which will be implemented in the future.

3.1. Impact of area payments

Define s as the subsidy (area payment) per unit of land, and assume that all land in the analysis qualifies for the subsidies. The objective function of the IF then changes to

(14) $$\Pi^I = pf^I(A^I, K^I) - (r + t - s)A^I - kK^I .$$

The objective function for the CF changes analogously.

However, not only the objective function will change; also the credit constraints are affected. The payments will alleviate the credit constraints of the farms. If farms receive the subsidies at the beginning of the season, they can use the funds directly to pay for the fertilizer. However, in reality

[12] The EU budget only pays for 25% in 2004 and gradually increases to reach 100% in 2013. However, NEMS governments are allowed to add subsidies from their own budget (the so-called “top-ups”) to a combined maximum of 55% in 2004, gradually increasing to 100% by 2010. Also, NEMS have an option to combine the total direct payments envelope and grant it on a per hectare bases, instead of separating for animals and crops.

farms seem to receive the subsidies most often at the end of the season because of administrative reasons needed to check the eligibility as well as to enforce policy objectives (eg cross compliance). For example, in February 2005 the media reported demonstrations by angry Hungarian farmers who were angry that the government was not following up on earlier promises to pay the direct payments in advance (Czech Radio International Services, 25 February, 2005).

Still, if farms receive subsidies at the end of the season, this can also improve their access to credit. We found from field interviews that banks and other lenders are more willing to provide credit to farms when they know that such subsidies will be paid. In a sense, (the promise of) subsidies are used as collateral for credit. In fact, banks in Slovakia provide credit to farms to pre-finance up to 100% of their direct payments in 2007, so they can use the funds to finance expenses at the start of the growing season. The farms need to have an account at the bank where the direct payments will be deposited later by the official paying agency, and where the banks have control over to recuperate the pre-financing with interest.

In our analysis, we allow for subsidies to arrive either at the start of the season or after harvest. With area payments the IF and CF credit constraints are given as follows:

(15) $kK^I \le S^I(W^I) + \alpha^I sA^I$,

(16) $kK^C \le S^C(W^C) + \alpha^C sA^C$.

where $0 \le \alpha^i \le 1$ (for $i = I$ and C), and α^i measures to what extent farmers can use subsidies to alleviate their credit constraints. If farmers receive subsidies at the beginning of the season, farmers can use all subsidies to alleviate their credit constraints. In this case $\alpha^i = 1$. However, if farms receive subsidies at the end of the season, they may obtain an amount of credit equivalent to the size of subsidies or less, depending on the farms' ability to borrow. In this case $0 \le \alpha^i \le 1$.

In their analysis of NEMS land market imperfections, Ciaian and Swinnen (2006) found that, with and without land market imperfections, all the benefits of area payments go to landowners. However, with credit constraints this is no longer the case. The effects differ both in terms of rent distribution and land allocation. The results are summarised in proposition 1.

Proposition 1: *When farms are credit constrained it holds that with the introduction of area payments (and with $\alpha^i > 0$):*

a. *Landowners gain disproportionably since land rents go up more than the subsidy.*
b. *On aggregate farms may gain or loose.*
c. *Some farms will loose and some farms may gain, depending on their relative credit constraint and α^i.*

Proof: see Ciaian and Swinnen (2007).

Land rents will increase with area payments, but contrary to when there are no credit constraints, the increase in rent is higher than the allocated subsidy, *s*. This is because the payments have two effects on land rents, a direct and an indirect one. First, because farms are granted subsidies per hectare they rent, this increases marginal returns to land, and increases farms' willingness to pay a higher rent equivalent to the size of the subsidy s. Second, the land market rent increases because the subsidies relax farms' credit constraints which allows them to use more fertiliser. This increases the farms' marginal land value product which further induces farms to hire more land, thereby inducing a higher rent, reinforcing the first effect.

With credit constraints, area payments may change the land allocation in either direction, depending on the relative importance of the credit constraints and on the ability of farmers to use subsidies to alleviate credit constraints. If all farms are equally credit constrained and/or if all farms can use an equivalent amount of subsidy to buy additional fertilisers then there is no change in land allocation. However, if some of them are more constrained and/or if some can use more subsidies for credit alleviation, then the land allocation changes.

These effects are illustrated in figure 2 where it is again assumed that IF are more credit constrained than CF and that farms can use all subsidies to alleviate their credit constraints: $\alpha^I = \alpha^C = 1$. The initial equilibrium with credit constraints is (A_c^*, r_c^*). With area payment s, the IF land demand shifts upwards, from D_c^I to D_{cs}^I. The CF demand shifts from D_c^C to D_{cs}^C. First, the direct subsidy effect shifts the demands of IF and CF to D_{cs1}^I and to D_{cs1}^C, respectively, because of subsidies which increase marginal returns to land. This results in higher land market rent, r_{cs}^s. The increase in rent is equal to the size of subsidy s, $r_{cs}^s - r_c^* = s$. Second, because farms can use subsidies to buy more fertilisers, this increases land marginal productivity and increases farms' willingness to pay a higher rent. This indirect effect results in a further shift of IF land demand from D_{cs1}^I to D_{cs}^I, and for CF from D_{cs1}^C to D_{cs}^C. The equilibrium is (A_{cs}^*, r_{cs}^*). It is clear from figure 2 that the rent rises by more than the subsidy, $r_{cs}^* - r_c^* > s$. Moreover, the farms which are most credit constrained before receiving the subsidy, i.e. the IF, will use more land because they benefit most from increased fertiliser use and higher land marginal productivity.

Landowners gain from higher rental price equal to area *ABCD*. Their gains are larger than the total amount of subsidies given. The farms which are less credit constrained, i.e. the CF, loose because their land rental costs increase $(r_{cs}^* - r_c^*)$ by more than the increase in marginal return of land (the distance between D_{cs}^C and D_c^C). Their total losses are equal to area $E - A$ (<0). [13] The farms which are most credit constrained, i.e. the IF in figure 2, may gain or lose, depending on whether the increase in

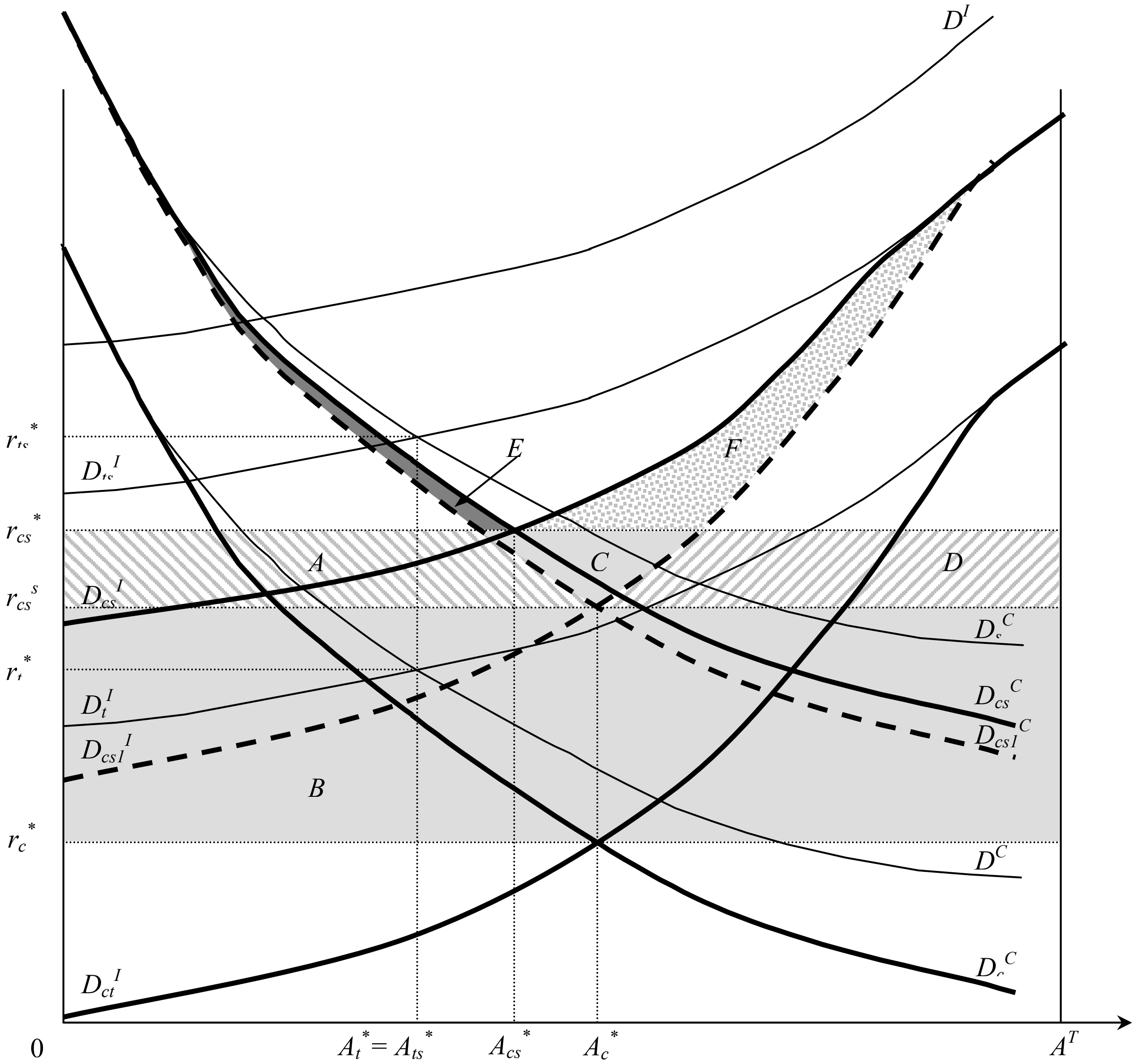
---

[13] Note that D_c^C. is parallel with D_{cs1}^C. While, D_c^C. is not parallel with the demand with subsidies and with credit constraint D_{cs}^C. The more CF rent land, the more scares (more voluble) fertilizers become relative to land. This implies that when using subsidies to buy more fertilizers land marginal productivity increases more when renting more land than when renting less land. Hence, farmers are willing to increase the rent more when renting more land than when renting less land. This implies that the vertical distance between D_c^C. and D_{cs}^C increases with land renting, and D_{cs}^C shifts closer to the CF land demand with no credit constraint and with subsidies D_s^C. The same holds for IF.

As illustrated in figure 1 then it follows that CF loose from subsidies, because in equilibrium the rent increases by more than it is the increase in the CF marginal land return (subsidies plus productivity rise due to more fertilizer use) for every hectare that CF rent: the distance between D_{cs}^C and D_c^C is smaller than the rent increase $r_{cs}^* - r_c^*$ for every rented hectare up to A_{cts}^*. IF may gain because for some hectares that IF rent, the rent increases by less than is the increase in IF marginal land return (subsidies plus productivity rise due to more fertilizer use): for some hectares in the interval A_{cs}^* A^T, the distance between D_{cs}^I and D_c^I is larger than the rent increase $r_{cs}^* - r_c^*$.

returns to land (the distance between D^I_{cs} and D^I_c) are larger or smaller than the increase in land rents $(r^*_{cs} - r^*_c)$. In figure 2 it is unclear whether *F-D* is positive or negative – and this result holds in general (see proof in Ciaian and Swinnen 2007).

Figure 2. Equilibria in the land market with credit constraints and area payments

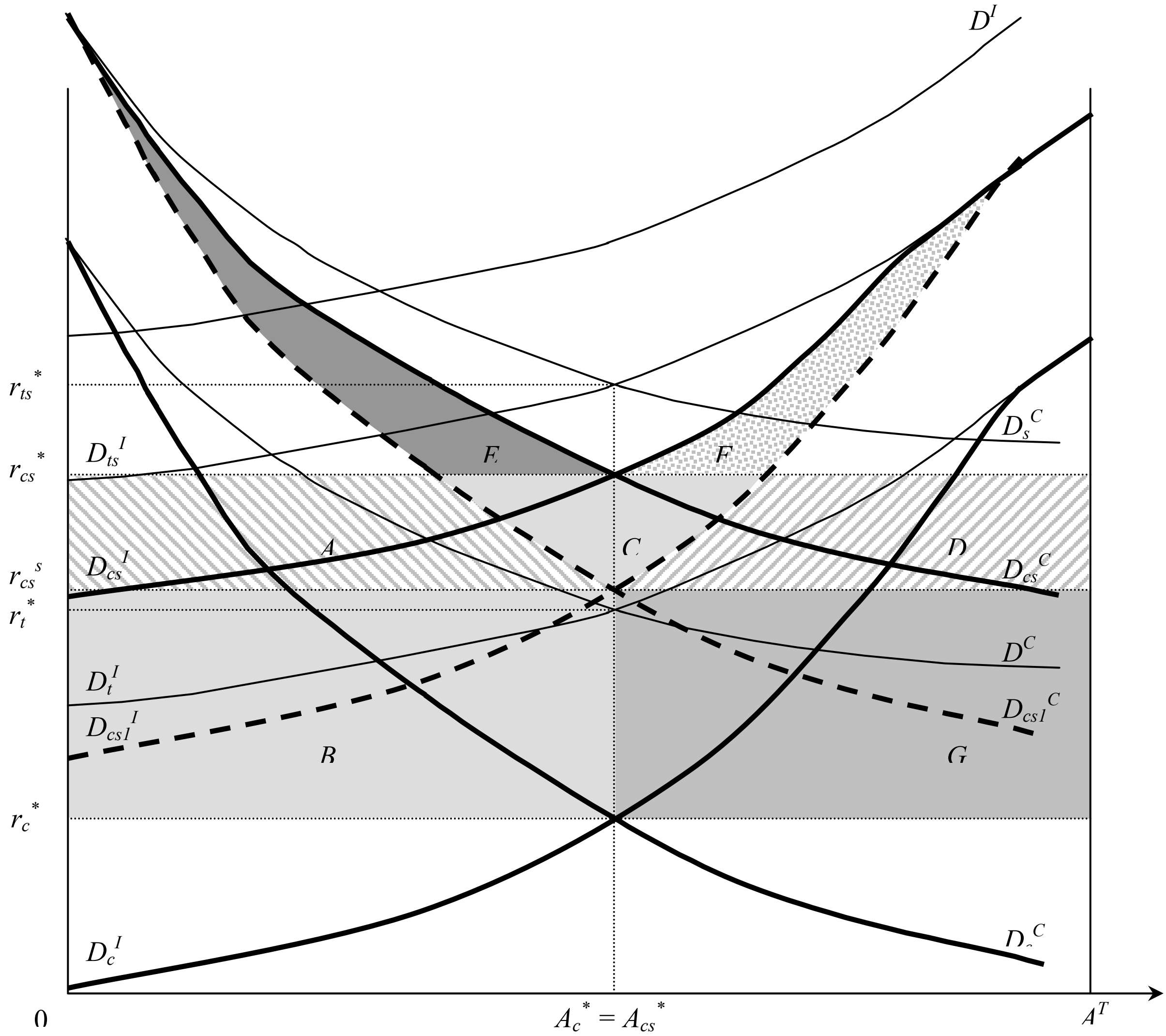


Whether more credit constrained farms lose depends on the heterogeneity of the farms in terms of credit constraints and on the elasticities of their land demand.

If there is no variation in credit constraints among farms then all farms will lose from area payments. This result is illustrated in figure 3, which is a similar analysis as figure 2, but where farms are equally credit constrained and for $\alpha^I = \alpha^C = 1$. In this case the land allocation does not change with subsidies. The initial equilibrium is (A_c^*, r_c^*). With subsidies the equilibrium shifts to (A_{cs}^*, r_{cs}^*). Landowners again gain proportionally more than the size of subsidies (area *ABCDG*) because the rent rises by more than the s, $r_{cs}^{*} - r_{c}^{*} > s$. However now all farms loose because for all the increase in the land rent is higher than the farms' increase in marginal return of land for every hectare that they rent. IF losses equal to area $F - D$ (<0) and CF losses equal to area $E - A$ (<0).[14]

When farms are heterogeneous, the most credit constrained are more likely to gain, but even then it is not certain since it depends on the land demand elasticities (see Ciaian and Swinnen (2007) for more details).

Figure 3. Equilibria in the land market with credit constraints and area payments



3.2. Impact of single farm payments

As explained above, the EU decided in 2003 to decouple CAP subsidies such that subsidies will be given as a fixed set of payments per farm, the so-called single farm payments (SFP). The SFP for a

---

[14] As long as there is no change in land allocation with s, this result holds for all cases with equal or unequal farms credit constraint or α^i, for $\alpha^I > 0$ or/and $\alpha^C > 0$.

specific farm equals the support the farm received in the previous "reference" period. The SFP is an entitlement, but future SFP payments depend on the farm operating an amount of "eligible hectares", equivalent to the size of the entitlement.

To model this, define E^C as the total payment for the corporate farm after CAP reform, and A_E^C as the amount of eligible area for payments. Assuming that E^C equals the total subsidies the corporate farm received with the area payment system, and that all the land it used qualifies as eligible land, we have $E^C = sA_E^C$, which is equal to area *B*, with $A_E^C = A_c^*$ in figure 3. Making similar assumptions for the individual farms, $E^I = sA_E^I$, where $A_E^I = A^T - A_c^*$, which equals area *G* in figure 3. Hence, payments per eligible hectare, *e*, are equal in this case: $e = e^C = e^I$.

The policy reform has important impacts on the distribution of policy rents. Without credit constraints, Ciaian and Swinnen (2006) find that policy rents shift entirely from landowners to farms with the new CAP support system. However, as we will show below, this will no longer be the case when farms are credit constrained. The results are summarized in Proposition 2.

Proposition 2: *When farmers are credit constrained it holds that with the introduction of SFP (and with $\alpha^i > 0$):*

a. *Landowners gain.*
b. *Farm gains may be smaller than the SFP and some farms may even loose.*

Proof: see Ciaian and Swinnen (2007).

The provision of SFP affects the credit constraints of the farms in the following way:

(17) $kK^I \leq S^I(W^I) + \alpha^I eA_{FP}^I$,

(18) $kK^C \leq S^C(W^C) + \alpha^C eA_{FP}^C$.

where A_{FP}^i (*i=I,C*) is the amount of eligible land effectively used by the farm.[15] When credit constrained farms receive SFP these subsidies will thus relax the credit constraints and will allow farms to purchase more fertilisers. As with area payments, this results in higher marginal land productivity and therefore an upward shift in the land demand function (over the interval where the farm is credit constrained). However, in contrast to area payments, the only driving force behind the increase in land demand – and hence behind the resulting increase in land rents – is the marginal productivity increase from reduced credit constraints. In other words, there is only an indirect effect, while with area payments there was also a direct effect on land demand from the subsidies themselves.

[15] Three cases can occur: (1) $A_{FP}^I = A_E^I$ and $A_{FP}^C = A_E^C$ if in equilibrium IF and CF rent their eligible area: $A^I = A_E^I$ and $A^C = A_E^C$; (2) $A_{FP}^I = A_E^I$ and $A_{FP}^C = A^C$ if in equilibrium IF rent more land than their eligible area ($A^I > A_E^I$), and hence CF rent less than their eligible area ($A^C < A_E^C$) and (3) $A_{FP}^I = A^I$ and $A_{FP}^C = A_E^C$ if in equilibrium IF rent less land than the eligible area ($A^I < A_E^I$), and hence CF rent more than their eligible area ($A^C > A_E^C$). We discuss further when these cases may occur – see Ciaian and Swinnen (2007) for a more formal analysis.

Figure 4. Equilibria in the land market with credit constraint and SFP

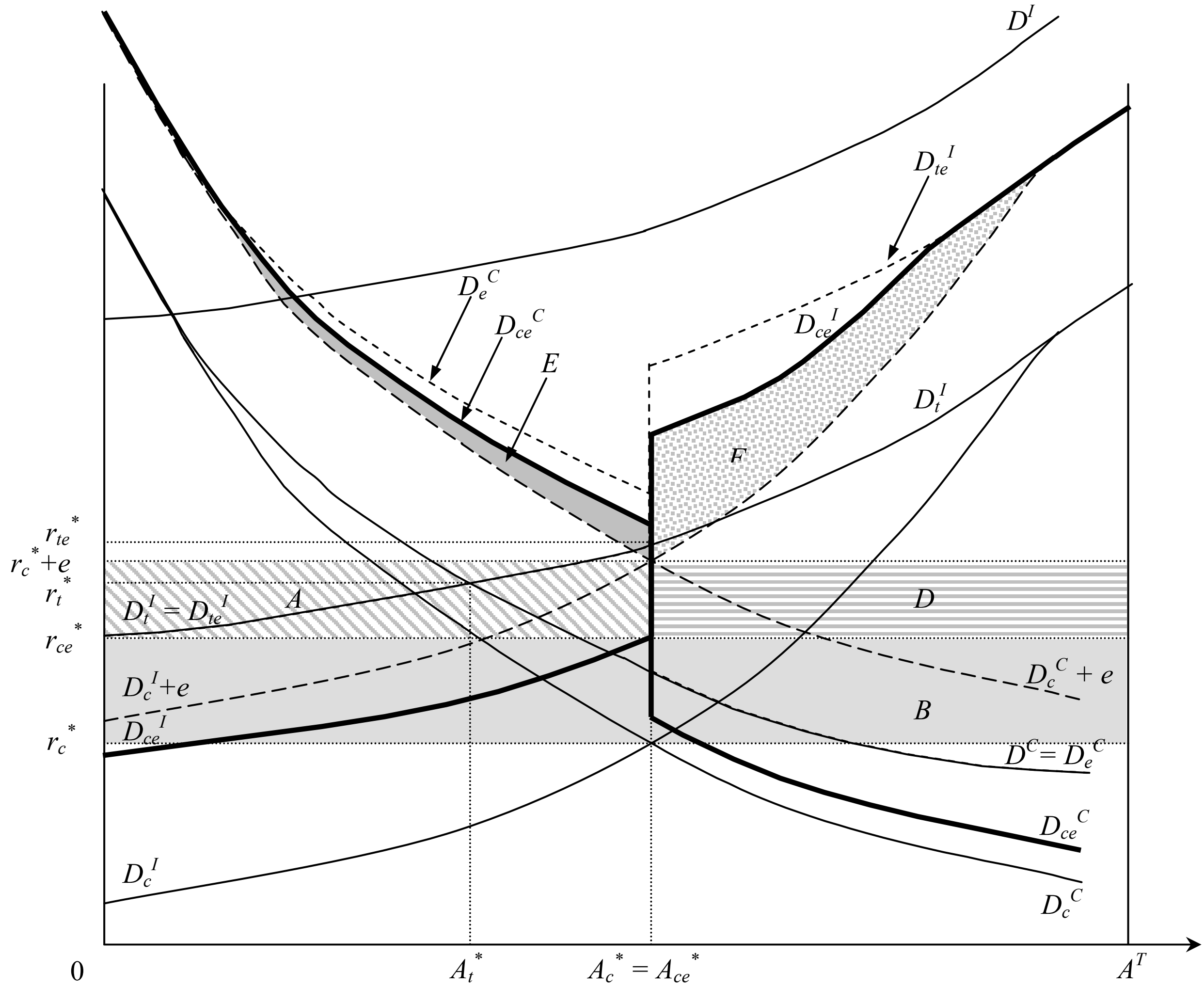


Figure 4 illustrates how SFP affect the equilibrium allocation of land and the distributional effects (assuming that farms can use SFP to alleviate their credit constraints, i.e. $\alpha^I > 0$ and $\alpha^C > 0$).[16] The equilibrium without SFP is (A_c^*, r_c^*), the same as the one showed in figure 3. The eligible area of IF and CF is $A_E^I = A^T - A_c^*$ and $A_E^C = A_c^*$, respectively. Starting in the left hand side of the figure and following the thick lines, IF demand with SFP is given by D_{ce}^I. Analogously, CF demand with SFP is given by D_{ce}^C.[17] At A_c^* the demands are represented by the thick vertical lines. Note that this vertical

---

[16] If farms cannot use subsidies to buy more fertiliser, i.e. if $\alpha = 0$, there is no impact: their marginal land productivity will not be affected by *e*, and hence neither the rent nor the land allocation will change and all subsidies will benefit farms.

[17] With SFP, the CF and IFs do not receive payments for land that they rent above the eligible area, A_E^C and A_E^I respectively. Consider first the case when the IFs want to rent more land, $A^I > A_E^I$. Since the total land supply is fixed, it implies that the CF would then rent less land than its eligible area, $A^C < A_E^C$. For the extra land (area $A^I - A_E^I > 0$), IFs cannot pay more than the marginal production value of the land. In contrast the CF is willing to pay a higher rent, by *e* or more. CF are willing to pay minim *e* because with the reduction of renting below the eligible area, they lose *e* as well as land marginal productivity declines as long as $\alpha^C > 0$ because fertilizer use declines when loosing *e*. Then, consider the case when land rented by IFs is less than the eligible area, $A^I < A_E^I$

shift at A_c^* is larger than the subsidy *e* when $\alpha^i > 0$, because with each unit of land they rent less than the eligible area farms loose not only *e* (i.e. the direct effect) but lose also because of a decline of their land marginal productivity (as farms cannot buy as much fertilizer without *e)*. With SFP the equilibrium shifts to (A_{ce}^*, r_{ce}^*).

In the situation illustrated in figure 4 landowners benefit from SFP – in contrast to when there are no credit constraints when all the benefits from SFP go to the farms. By reducing credit constraints and increasing marginal productivity of land, SFP will lead to higher land productivity, thereby increasing land demand and, consequently, land rents, and therefore benefit landowners: their gains equal area *B*. Farms gain for two reasons: they benefit from the direct subsidy effect and from the increase in land productivity, but they also have a loss with the increase of rents. The net effect on farm profits is not clear ex ante. In the case illustrated in figure 4, the land rent increases by less than the size of subsidies, $r_{ce}^* - r_c^* < e$, and farms retain part of the subsidies, equal to area *A* for CF and *D* for IF. In addition, IF gain *F* because of the increase in land productivity, so their net gains are *D*+*F* (>0). CF gain *E* from increased productivity so their net gains are equal to area *A*+*E* (>0).

As with the area payments, the benefits from the productivity increases are higher for the farms which are more credit constraint and/or have the strongest reduction in their credit constraint (ie higher α^i). In figure 4, IF are more credit constraint than the CF and they benefit more on a per hectare basis. Whether they benefit more in total than CF obviously depends also on their share of land use, which does not change by the SFP in the case analyzed in figure 4.

If the impact of the SFP on farms' credit constraint is even stronger than in the case illustrated in figure 4, it is possible that both the land allocation may be affected and/or that farms may even lose from the SFP introduction. In figure 4 the rent rises by less than the size of the subsidy *e* because at the equilibrium land allocation, farmers' marginal land productivity increase is smaller than the average per hectare SFP payment, *e*. However, if productivity increases are such that the rent would increase by more than *e*, to $r_c^* + e$ or above, not only could the SFP affect the land allocation, they can also have the effect that some farms may lose from the SFP introduction.

Figure 5 illustrates the situation where the increase in IF marginal land productivity is large relative to the increase in CF marginal land productivity and relative to the subsidy *e*. In this case IF can offset the subsidy *e* that CF get for the eligible area and in equilibrium IF rent more land. Land demands with SFP are given by D_{ce}^I and by D_{ce}^C respectively for IF and CF and the equilibrium shifts to (A_{ce}^*, r_{ce}^*). IF use more land (A^T - A_{ce}^* > A^T - A_c^*), and the rent rises to r_{ce}^*. The rent rises by more than the size of the subsidy: $r_{ce}^* - r_c^* > e$. Therefore land owners gain: their benefits equal area *ABCDEFGHL.* The CF lose because their gains from productivity increases (area *K*+*L*) and from the SFP (area *E*) are smaller than the increase in rental costs (area *A*+*E*+*L*) and losses due to land renting decrease (area *F*): their net effect is *K*+*L*+*E*-(*A*+*E*+*L*+*F*) = *K* – (*A*+*F*) <0. The IF gain from productivity increases by

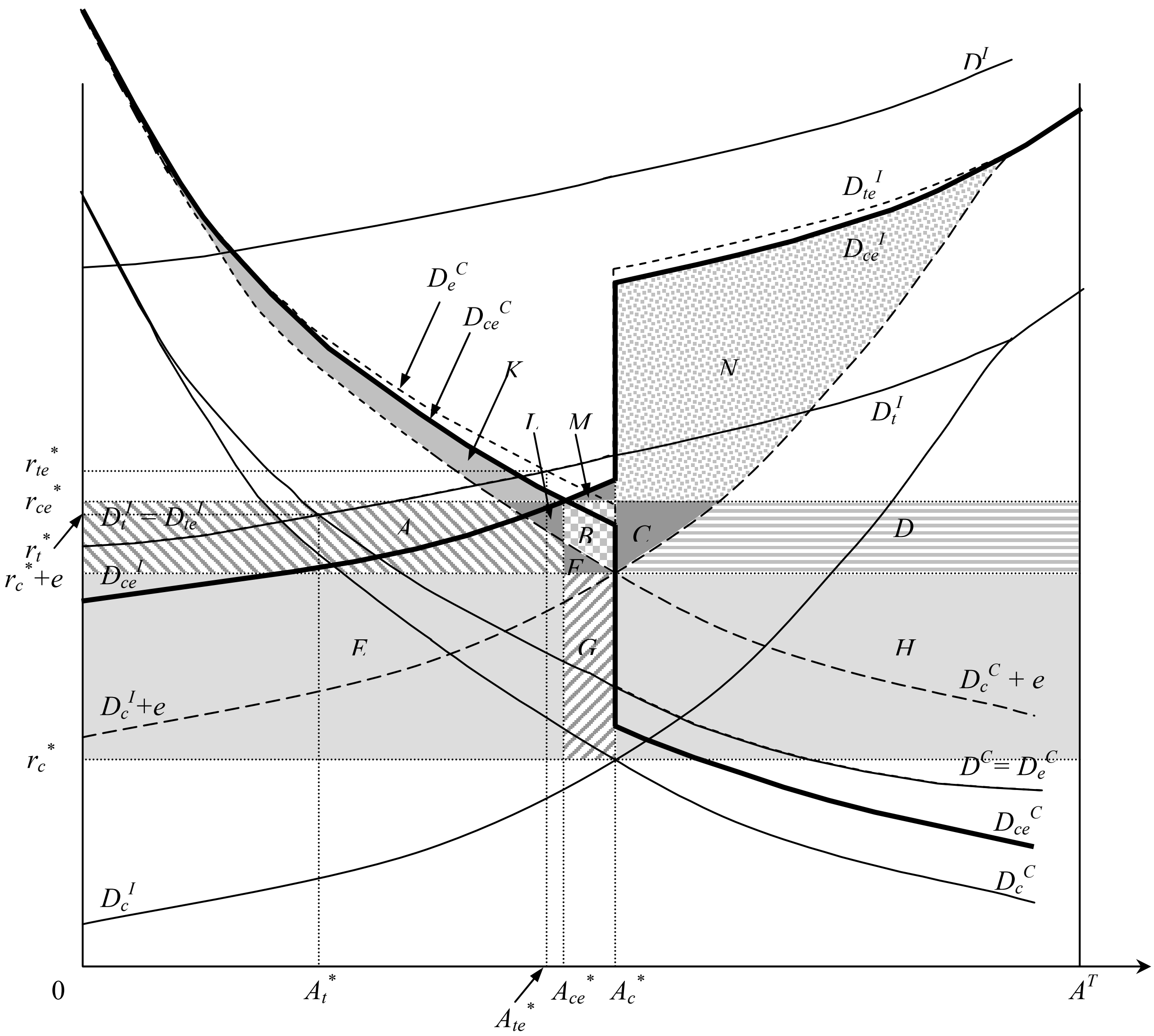
---

and $A^C > A_E^C$. In this case the reverse logic holds. The payments increase the IF land demand. The rent that IF is willing to pay is increased by *e* or more. In combination, this implies that both type of farms have kinked land demand functions with the SFP.

area $N+C$, from subsidies by area H, and from renting more land by area M. Their loss from increased rental costs is area $C+D+H$. The net effect is area $N+M-D$ which could be positive or negative.

In summary, landowners gain from the SFP and the gains may or may not be proportionally higher than the size of the allocated SFP to the farm sector. IF and CF may loose from the area payments. The effect on farm profits depends on the farms' credit constraints, on the extent to which farms can use subsidies to alleviate their credit constraint, on the size of subsidies, and on the (unconstrained) land demand elasticities, all affecting the relative increase in land market rents. These results, illustrated in figures 6 and 7, hold in general – see proof in Ciaian and Swinnen (2007).

Figure 5. Equilibria in the land market with credit constraint and SFP



4. Discussion and Conclusions

The distortions caused by farm policies and their effects on farm incomes has received renewed attention in the current WTO negotiations and policy reforms leading up to it. There is considerable discussion on whether the standard policy and trade models are sufficiently complex to capture all the policy effects which occur in reality, and hence to yield accurate conclusions.

The Eastern enlargement of the EU provides an interesting experiment to study these issues. Eastern enlargement implied integration of the agricultural economies of the NEMS in the CAP. As a consequence, farmers in the NEMS now receive subsidies per hectare of land they use, gradually increasing over a transition period. In well functioning markets such payments get incorporated in land values and thereby benefit mainly landowners and lead to increases in input costs for farmers. In the future NEMS farms will receive single farm payments, which are argued to be (more) decoupled. In well functioning markets such payments do not get incorporated in land values and benefit farms.

However, NEMS rural factor markets are characterized by important imperfections. In an earlier study Ciaian and Swinnen (2006) demonstrated that imperfections in land markets do not change these conclusions and that the distribution of policy rents remains the same even with important transaction costs and imperfect competition in land markets.

In this article we have shown that imperfections in rural credit markets may lead to very different outcomes. When farms are credit constrained, the introduction of area payments will lead to even larger gains for landowners as land rents will increase by more than the subsidy. This is because the subsidies will reduce farms' credit constraints – for example because banks in some NEMS offer to provide credit with the subsidy payments as collateral – and thereby increase marginal productivity of land and thus land demand, in addition to the direct subsidy effect. The effect of area payments on farm profits can be positive or negative. Farms gain directly from the subsidy and indirectly from the increase in productivity. However they lose from the increase in land rents. Under certain conditions the land rent increase may be larger than their gains, causing a negative net impact. In general, the most credit constrained farms (ex ante) and those which are most effective in using the subsidies for the reduction of their credit constraints are most likely to gain.

Similar effects occur even with subsidies which are decoupled from current input use or output, such as the single farm payments in the CAP. While farms are better off with SFP than with area payments, since the SFP does not directly lead to an increase in land rents, the SFP will also induce an increase in land rents through their impact on the farms' credit constraints and, hence, on land productivity. As a consequence, landowners gain from the SFP when farms are credit constrained. Moreover, we have illustrated in this paper that in extreme cases farms may actually be net losers even with so-called decoupled payments such as the SFP. The effect on farm profits depends on how much farms are credit constrained, to what extent farms can use subsidies to alleviate their credit constraint, on the size of subsidies, and on the (unconstrained) land demand elasticities, all affecting the relative increase in land market rents.

We should caution against simplistic interpretations of our results. The effects on rural households depend on whether the households are landowners or farmers, or both, and on the importance of credit constraints. These structural conditions differ strongly between NEMS (Lerman, Csaki, and Feder 2004; Rozelle and Swinnen 2004). For example, farming in countries like Slovakia and the Czech Republic is concentrated on large-scale corporate farms, who rent most of their land. Land ownership is fragmented and many landowners are living in urban areas. In contrast, in countries such as Poland and Slovenia, farming is dominated by small family farms (IFs), owning most of their land. Most other countries, such as Hungary and Bulgaria, have a mixed structure. In Hungary, IFs use 59% of farm land and CF use 41%. CF rent most of the land they use, while IFs use both owned and rented land. The share of rented land typically increases with the size of the IF (Csaki and Lerman, 2002; Vranken and Swinnen, 2006).

Obviously, the implications of our analysis are different for these countries, with such different structures. Leakages of policy rents to land owners through increased rental rates is a major issue in countries like Slovakia and Hungary, while less of a problem in Poland since most farms are IFs who themselves own the land. However, also in Poland this analysis is relevant since (a) the most dynamic farmers are typically younger and land ownership is typically concentrated in older rural households, and (b) there are important regional variations: in the north and western regions of Poland, many larger farms operate on rented land (Csaki and Lerman, 2001; Fałkowski, 2005; Sabates-Wheeler, 2002).

Finally, an issue which needs further analysis is the interaction of the credit and land market imperfections and the subsidy systems with labor market imperfections. Labor market imperfections have an important impact on land allocation and farm structures in NEMS (Baum et al, 2006; Lerman and Schreinemachers, 2002; Rizov and Swinnen, 2004; Swinnen, Dries, and Macours, 2005). There are interactions between these imperfections and the subsidy effects. For example, labor market constraint will affect the farm restructuring and land reallocation impact of the various subsidies. These interactions are beyond the scope of analysis in this article. This is the topic of our future research.

Acknowledgment
This paper is part of the LUMOCAP project. This research was undertaken with support from the European Union's sixth Framework Research Programme. The content of the publication is the sole responsibility of the authors and it in no way represents the views of the Commission or its services.

References

Banse, M., W. Münch, and S. Tangermann. (2000). "Eastern Enlargement of the EU: A General and Partial Equilibrium Analysis." Contributed paper, IAAE Congress, Berlin, 13–19 August.

Baum, S., P. Cook, H. Stange, and P. Weingarten. (2006). "Agricultural Employment Trends in an Enlarged European Union: Does The Cap Reform / Introduction Matter?" Paper presented at the 46th Annual Conference, Giessen, Germany, October 4-6, 2006.

Bezemer, D.J. (2003). "Credit Allocation and Farm Structures in the Czech Republic, 1993-1997." *Comparative Economic Studies* 45:25-43.

Benjamin, C. and E. Phimister. (2002). "Does Capital Market Structure Affect Farm Investment? A Comparison Using French and British Farm-Level Panel Data." *American Journal of Agricultural Economics* 84(4): 1115–1129.

Bierlen, R. and A. M. Featherstone. (1998). "Fundamental q, Cash Flow, and Investment: Evidence from Farm Panel Data." *Review of Economics and Statistics* 80: 427–435.

Carter, M. R. and K.D. Wiebe. (1990). "Access to capital and its impact on agrarian structure and productivity in Kenya." *American Journal of Agricultural Economics*, 72 (5): 1146-1150.

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. and J.F.M. Swinnen. (2007). "Credit Market Imperfections and the Distribution of Policy Rents: The Common Agricultural Policy in the New EU Member States." LICOS Discussion Paper 183/2007.

Csaki, C., and Z. Lerman. (2001). "Land and Farm Structure in Poland." Discussion Paper, Center for Agr. Econ. Research, Hebrew University of Jerusalem, Jerusalem.

—. (2002). "Land and Farm Structure in Transition: The Case of Poland." *Eurasian Geography and Economics* 43(4): 305-323.

Chau, N. H. and H. de Gorter. (2005). "Disentangling the Consequences of Direct Payment Schemes in Agriculture on Fixed Costs, Exit Decisions, and Output." *American Journal of Agricultural Economics*. 87: 1174-1181

Cocks, J. and H. R. Gow. (2003). "Supplier Relationship Development in the Food Industry of Transition Economies: The Case of Interbrew." *Journal of Food Distribution Research* 34(1): 63-68.

Dale, P., and R. Baldwin. (1999). "Emerging Land Markets in Central and Eastern Europe." in: *Structural Change in the Farming Sectors in Central and Eastern Europe: Lessons for EU Accession,* Second World Bank/FAO Workshop, Warsaw, Poland, June 27-29.

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.

de Gorter, H. (2007) "The potential Benefits to Developing Countries from Domestic Support Reductions in Development Countries." In Morrison, J. and Sarris, A. (eds.) WTO Rules for Agriculture compatible with development Rome: FAO, pp. 241-261.

Dewbre J., J. Anton, and W. Thompson. (2001). "The Transfer Efficiency and Trade Effects of Direct Payments" *American Journal of Agricultural Economics* 83(5): 1204-1214.

Dries, L. and J. Swinnen. (2004). "Foreign direct investment, vertical integration, and local suppliers: Evidence from the Polish dairy sector." *World Development* 32(9): 1525-1544.

European Commission. (2002). *Analysis of the Impact on Agricultural Markets and Incomes of EU Enlargement to the CEECs*. Brussels.

European Commission. (2006). *General Budget of the European Union for the Financial Year 2006*. Directorate-General for the Budget, Brussels-Luxembourg.

European Commission. (2007). *Prospects for Agricultural Markets and Income in the European Union 2006 – 2013*. Brussels.

Fałkowski, J. (2005). "Key Determinants of Land Rentals in Poland." Paper presented at the 99th seminar of the EAAE on "The Future of Rural Europe in Global Agri-Food System", Copenhagen, Denmark, August 24-27, 2005.

Feder, G. (1985). "The relation between farm size and farm productivity - The role of family labour, supervision and credit constraints." *Journal of Development Economics*, 18 (2-3): 297-313 1985.

Giannakas, K. and M. Fulton. (2000). "Efficient Redistribution Using Quotas and Subsidies in the Presence of Misrepresentation and Cheating." *American Journal of Agricultural Economics* 82(2): 347-359.

Goodwin, B. K. and A. K. Mishra. (2006). "Are "Decoupled" Farm Program Payments Really Decoupled? An Empirical Evaluation." *American Journal of Agricultural Economics* 88: 73-89.

Gorton, M., M. Dumitrashko, and J. White. (2006). "Overcoming Supply Chain Failure in the Agri-food Sector: A Case Study from Moldova." *Food Policy* 31: 90–103.

Hartell, J., and J.F.M. Swinnen, eds. (2000). *Agriculture and East-West European Integration*. Aldershot: Ashgate.

Hertel, T.W., M. Brockmeier, and P.V. Swaminathan. (1997). "Sectoral and Economy – Wide Analysis of Integrating Central and Eastern European Countries into the EU: Implications of Alternative Strategies." *European Review of Agricultural Economics* 24:359–386.

Hennessy, D.A. (1998). "The Production Effects of Agricultural Income Support Policies Under Uncertainty." *American Journal of Agricultural Economics* 80 pp. 46-57.

Latruffe, L. (2005). "The Impact of Credit Market Imperfections on Farm Investment in Poland." *Post-Communist Economies* 17(3): 349-362.

Lerman, Z., C. Csaki, and G. Feder. (2004). *Agriculture in Transition: Land Policies and Evolving Farm Structures in Post-Soviet Countries*. Lanham, MD: Lexington Books.

Lerman, Z. and P. Schreinemachers. (2002). "Individual Farming as a Labor Sink: Evidence from Poland and Russia." Paper presented at the Annual Meeting of the American Agricultural Economics Association, Long Beach, CA, July 28-31, 2002.

Mathijs, E., and J.F.M. Swinnen. (1998). "The Economics of Agricultural Decollectivization in East Central Europe and the Former Soviet Union." *Economic Development and Cultural Change* 47:1-26.

Münch, W. (2002). *Effects of EU Enlargement to the Central European Countries on Agricultural Markets*. Frankfurt: Peter Lang.

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

OECD. (2001b). *Market Effects of Crop Support Measures*. Paris: OECD

Petrick, M. (2004). "Farm investment, credit rationing, and governmentally promoted credit access in Poland: a cross-sectional analysis." *Food Policy* 29: 275–294

Petrick, M. and L. Latruffe. (2003). "Credit Access and Borrowing Costs in Poland's Agricultural Credit Market: A Hedonic Pricing Approach." IAMO Discussion Paper No. 46, Halle: Institute of Agricultural Development in Central and Eastern Europe (IAMO).

Prosterman, R.L., and L. Rolfes (Jr.). (1999). "Review of the Legal Basis for Agricultural Land Markets in Lithuania, Poland and Romania." in: *Structural Change in the Farming Sectors in Central and Eastern Europe: Lessons for EU Accession,* Second World Bank/FAO Workshop, Warsaw, Poland, June 27-29.

Rizov, M., and J. Swinnen. (2004). "Human Capital, Market Imperfections, and Labor Reallocation in Transition." *Journal of Comparative Economics* 32:745–774.

Rozelle, S., and J. Swinnen. (2004). "Success and Failure of Reforms: Insights from Transition Agriculture." *Journal of Economic Literature* 42: 404–456.

Sabates-Wheeler, R. (2002). "Farm Strategy, Self-Selection and Productivity: Can Small Farming Groups Offer Production Benefits to Farmers in Post-Socialist Romania?" *World Development* 30(10): 1737–1753.

Serra, T., D. Zilberman, B. K. Goodwin, and A. M. Featherstone. (2005). "Decoupling Farm Policies: How Does this Affect Production?" Paper presented at the American Agricultural Economics Association Annual Meeting, Providence, Rhode Island, July 24-27, 2005.

Salhofer, K. and E. Schmid. (2004). "Distributive Leakages of Agricultural Support: some Empirical Evidence." *Agricultural Economics* 30(1): 51-63.

Swinnen, J. (1996). "Endogeneous price and trade policy developments in Central European agriculture." *European Review of Agricultural Economics* 23(2): 133-160.

Swinnen, J., Dries, L., and K. Macours. (2005). "Transition and Agricultural Labour." *Agricultural Economics* 32(1): 15-34.

Swinnen, J. F. M. and H. R. Gow. (1999). "Agricultural Credit Problems and Polices During the Transition to a Market Economy in Central and Eastern Europe." *Food Policy* 24: 21-47.

Swinnen, J. and L. Vranken. (2007a). "Patterns of Land Market Developments in Transition", LICOS Discussion Paper, No 179.

Swinnen, J. and L. Vranken. (2007b). "Land Markets in New Member States." Unpublished Report Prepared for the European Commission.

—. (2005). "Land Rental Markets in Europe and Central Asia." Report prepared for the World Bank, LICOS Center for Transition Economics, Leuven.

Tangermann S., and M. Banse. (20000. *Central and Eastern European Agriculture in an Expanding European Union*. Wallingford: CABI Publishing.

Vranken, L., and J. Swinnen. (2006). "Land Markets and Household Farms in Transition: Theory and Evidence from Hungary." *World Development* 34(3): 481-500.

World Bank. (2001). "Poland, The Functioning of Labor, Land and Financial Markets: Opportunities and Constraints for Farming Sector Restructuring." World Bank Report, Washington DC.

—. (1999). "Legal Impediments to Effective Rural Land Relations in Eastern Europe and Central Asia." World Bank Technical Paper 436, Washington DC.