THE SINGLE PAYMENT SCHEME OF THE CAP: ENTITLEMENTS AVALAIBILITY AND FARMERS BEHAVIOR

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Abstract

The way entitlements are originally allocated among farmers and some conditions required to get the payments could affect farmer's willingness to trade land and entitlements.

This paper – using a qualitative approach and some results of a farm based simulation analysis - explores how entitlements availability and other farm specific parameters affect land and entitlement shadow prices and farmers attitude to trade land and entitlement. The conditions under which this occurs, the role of taxing the exchange of entitlements and of both modulation and conditionality on exchange of entitlements are also studied.

1. Introduction

The single payment scheme (SPS) has been recognized as an important change of CAP aimed at decoupling support from production and at fostering the economic efficiency in the farm sector. Indeed, the SPS is based on payment entitlements that, in the non-regional application, are allotted to each farm mainly on the basis of its historical production pattern. Farmers can also obtain entitlements exceeding what should be the case according to such criteria in two different ways. On the one hand, they can obtain them from the market: entitlements can be transfer from a farmer to another by sale or any other definitive way with or without land, or by leasing or other similar non definitive ways. However, this latter case is possible only if traded together with an equivalent number of hectares of land. On the other hand, if some specific conditions apply, Member states can grant entitlements to a farm by using the national reserve. An interesting comparative analysis of all these cases is in Scoppola and Sorrentino (2005). This paper focuses only on the market exchange of entitlements.

The reference to historical behavior should ensure that current production decisions are not affected by the policy. However, the way entitlements are allocated among farmers (i.e. according to historical records and not on current structural characteristics) could generate an uneven distribution of entitlements per hectares of available land. Furthermore, farmers can also differ in terms of how they are affected by modulation and in terms of how it costs to fulfill conditionality. All these factors can affect their land and entitlement shadow prices and, therefore, their willingness to trade those resources. This means that, under some circumstances, the SPS can have some allocative implications. At the opposite, the exchange of entitlements in the market is not expected to have significant distributional effects even if it modifies who holds the entitlements, because buyers of entitlements have to pay to get them (Scoppola et al., 2005). Therefore, most of the benefits of the single payment scheme should remain to who initially received it. This is not the case of those farmers who received a large amount of entitlements and are not able to use all of them because unused entitlements are going to fund the national reserve.

Finally, the exchange of entitlement with and without land can be drastically reduced if Member states decide that part of the sold entitlements revert to the national reserve: different taxation rates can

be established for the exchange of entitlement with and without land. Notice that the leasing of entitlements with land is not taxed.

This paper explores all these factors by means of a qualitative approach based on a simple profit maximisation model (paragraph 2). However, the results of simulation analysis performed on farm based programming models are studied too (paragraph 3 and 4). The last paragraph draws some conclusions on the policy relevance of the finding of this analysis.

2. A simple model of farmer behavior

2.1. The basic model

To keep the theoretical model simple, the case of a farm without livestock is explored. It is assumed that farmer should choose how to allocate a given amount of land between just two crops: one is a crop not eligible to obtain the payment (x_{NE}) while the other one is a crop potentially eligible to payments (x_E). Eligible crops include all non-horticultural crops and uncultivated land provided that compliance conditions are fulfilled. To allow farmers to grow the eligible crop on an area greater than the availability of entitlements (xe), the land devoted to eligible crops is divided into two components such that: $x_E = x_{E1} + x_{E2}$. Under these assumptions, the farmer problem can be described as it follows:

$$\text{Max} \quad \pi = p_{NE}x_{NE} + p_E x_E - c\left(x_{NE}, \left(x_{E1} + x_{E2}\right)\right) + x_{E1}\left(ev - ec\right) - \left(x_{E1}ev - fr\right)m \tag{1}$$

Subject to:

$$x_{NE} + \left(x_{E1} + x_{E2}\right) \le xt \tag{2}$$

$$x_{E1} \le xe \tag{3}$$

and non-negativity constraints.

where:

p_{NE} and p_E are unitary revenues of the two crops;

$c\left(x_{NE}, \left(x_{E1} + x_{E2}\right)\right)$ is a cost function which arguments the amount of land devoted to the two crops;

ev is the unitary nominal entitlement value.

As required by conditionality, eligible land should be managed according to given conditions: therefore, the model accommodates for the possibility to have a constant unitary eligibility cost (ec) that may reduce the net value of payments enjoyed by the farmer (ev - ec).

Furthermore, the model accounts for the modulation of direct payments by subtracting a given percentage of the payments (m) exceeding the exemption level (fr). The modulation rate m will reach the 5% after the implementation period, while the exemption level fr has been set at 5000 € per farm. However, notice that those farms that receive a total amount of payments lower than the exemption level are exempted from modulation: in this case the modulation rate m vanishes.

The first constraint (2) requires that used land cannot exceed the available land (xt). The second constraint (3) requires that the land used to perceive the unitary payments cannot exceed the number of available entitlements (xe).

The Lagrange function for this problem can be written as follows:

$$L = p_{NE}x_{NE} + p_E x_E - c\left(x_{NE}, \left(x_{E1} + x_{E2}\right)\right) + x_{E1}\left(ev - ec\right) - \left(x_{E1}ev - fr\right)m + \tau\left(xt - x_{NE} - x_{E1} - x_{E2}\right) + \delta\left(xd - x_{E1}\right) \tag{4}$$

where symbols τ and δ refer, respectively, to shadow prices of land and entitlement availability constraint.

The Kuhn-Tucker conditions for this function are:

$$\frac{\partial L}{\partial x_{NE}} = p_{NE} - \frac{\partial c}{\partial x_{NE}} - \tau \leq 0; \qquad x_{NE}\frac{\partial L}{\partial x_{NE}} = 0; \qquad x_{NE} \geq 0; \qquad (4.1)$$

$$\frac{\partial L}{\partial x_{E1}} = p_E - \frac{\partial c}{\partial x_E} + \left(ev(1-m)-ec\right) - \tau - \delta \leq 0; \qquad x_{E1}\frac{\partial L}{\partial x_{E1}} = 0; \qquad x_{E1} \geq 0; \qquad (4.2)$$

$$\frac{\partial L}{\partial x_{E2}} = p_E - \frac{\partial c}{\partial x_E} - \tau \leq 0; \qquad x_{E2}\frac{\partial L}{\partial x_{E2}} = 0; \qquad x_{E2} \geq 0; \qquad (4.3)$$

$$\frac{\partial L}{\partial \tau} = xt - x_{NE} - x_{E1} - x_{E2} \geq 0; \qquad \tau\frac{\partial L}{\partial \tau} = 0; \qquad \tau \geq 0; \qquad (4.4)$$

$$\frac{\partial L}{\partial \delta} = xd - x_{E1} \geq 0; \qquad \delta\frac{\partial L}{\partial \delta} = 0; \qquad \delta \geq 0; \qquad (4.5)$$

Notice that, because x_{E1} and x_{E2} refer to the same crop, marginal revenues (p_E) and marginal costs $\partial c / \partial x_E$ for them are just the same in (4.2) and (4.3).

2.2. Entitlements availability and farmers choices: crop patterns and exchange of land

Because entitlements are granted on the basis of historical record, it is likely that, at the start of the new regime (2005 or later), farms will have a structure (i.e. availability of land) that differs from that of the reference period (2000-2002). This is particularly true for those farms engaged on land rental market. Farmers that have rented in (out) land during the reference period may have given (obtained) back the land by now: therefore, those farmers may have an amount of entitlements relatively abundant (scarce) if compared with their current availability of land. This fact underlines that allotment of titles may not be homogeneously distributed among farms according to their current structural characteristics.

If non-eligible and eligible crops are both present on farm (x_{NE} and x_{E1} > 0), according to conditions (4.1) and (4.2) land shadow price is:

$$p_{NE} - \frac{\partial c}{\partial x_{NE}} = p_E - \frac{\partial c}{\partial x_E} + \left(ev(1-m)-ec\right) - \delta = \tau \qquad (5)$$

This means that, under these conditions, the policy affects farmer decisions. In facts, if the net value of payment ($ev(1-m)-ec$) is positive, the policy may increase land shadow price and the share of land devoted to eligible crops.

However, because entitlements are allotted according to land that, in the reference period, has received payments and not to all the available land, in most cases farmers should hold less entitlements than eligible land. This will result in a binding entitlement constraint and in a positive entitlement shadow price ($\delta > 0$). Under these circumstances, the effect of the policy in terms of both crop mix and entitlement land price level is reduced with respect to the previous case.

This last result has a direct implication on farmers' behavior in terms of willingness to exchange land: a limited availability of entitlements, reducing the land shadow price, can induce farmers to lease out land. Notice that, because of the different availability of entitlements, exchange of land may became relevant even between two identical farms if they have an uneven distribution of entitlements. In this regard, the policy may have distorsive effects on land market.

2.3. The perceived value of entitlement

Since EC Regulation N. 1782/2003 allows exchange of entitlements among farmers of the same Country or region, it seems relevant to analyze what can be farmers' perceived value of those entitlements, what is affecting this value and under which conditions trade of entitlements may arise.

The value of entitlement perceived by a farmer refers directly to the notion of its shadow price. Obviously, it should increase as long as the availability of entitlements decreases: however, given the nature of the entitlement (that is not a right to produce such as a production quota) the maximum value attached to an extra unit entitlement is the net value of payment ($\partial^{max} = (ve(1-m)-ce)$).

This is always true for a farmer that grows the eligible crop beyond the amount of entitlements he/she holds ($x_{E2} > 0$). Indeed, in this case, by using conditions (4.3) and (4.2):

$$p_E - \frac{\partial c}{\partial x_E} = \tau \qquad \text{and} \qquad p_E - \frac{\partial c}{\partial x_E} + (ev(1-m)-ec) - \tau = \delta \qquad (6)$$

However, in all other cases, the perceived value is given by the following equation:

$$(ev(1-m)-ec) - \left[\left(p_{NE} - \frac{\partial c}{\partial x_{NE}} \right) - \left(p_E - \frac{\partial c}{\partial x_E} \right) \right] = \delta \qquad (7)$$

Entitlement shadow price is largely the result of policy decisions. It increases if the unitary value of the entitlement (*ev*) increases, but also if policy makers require compliance conditions that decreases eligibility cost (*ec*) or if the modulation rate (*m*) is reduced. However, the value of the entitlement shadow price also depends on the term in squared brackets in (7), which can only be greater or equal to zero. This term refers to the opportunity cost (forgone profit) of moving a unit of land from non-eligible to eligible crops: it is given by the difference between the marginal profit of the non-eligible crop and the marginal profit of the eligible crop net of payment. Notice that this term can be greater than zero if the opportunity to obtain the payment granted by the policy force farmers to move a unit of land to eligible crops. Even if this causes a loss of market driven profit, the payment deriving from an extra entitlement more than compensates this loss. However, when the term in squared brackets becomes equal to the net value of the payment, entitlement shadow price vanishes. This occurs in those farms where entitlement constraint is not binding. For these reasons, the perceived value of an entitlement should lie in the following range:

$$(ev(1-m)-ec) \geq \delta \geq 0 \qquad (8)$$

2.4. Exchange of entitlements

This latter condition leads to the topic of the exchange of entitlements between farmers. Here, the exchange of entitlements is modeled as an annual leasing. If a gap between shadow prices of entitlement of two farms (lets say farm a and farm b) occurs, it may lead to a voluntary exchange of entitlements given that the following condition holds:

$$\delta^a = \left(p_E - \frac{\partial c}{\partial x_E} + (ev(1-m)-ec) - \tau \right)_a \geq ep \geq \left(p_E - \frac{\partial c}{\partial x_E} + (ev(1-m)-ec) - \tau \right)_b = \delta^b \quad (9)$$

where *ep* represents entitlement exchange price.

Assuming that the unitary entitlement is the same in the two farms, the gap between entitlement shadow prices in the two farms can increase under the following circumstances: when the marginal market profit for the eligible crop is relatively greater in farm a than in farm b, or when modulation

parameter (m), unitary eligibility cost (ec) or land shadow price (τ) are smaller in farm a than in farm b.

The exchange of entitlements could therefore have an allocative effect that depends on the reasons why this gap occurs. If the shadow price of entitlements in farm a is greater than in farm b because the marginal market profit from farming an extra unit of land with the eligible crop in farm a is greater than in farm b, the exchange of one entitlement (from farm b to farm a) may increase efficiency.

If the shadow price of entitlements in farm a is greater than in farm b because the first farm is exempted from modulation, entitlements move towards those latter farms. This also means that the exchange of entitlements may result in a way to elude modulation policy.

If the shadow price of entitlements in farm a is greater than in farm b because unitary eligibility cost in farm a is smaller than in farm b, entitlements move towards farm/land types where compliance conditions generates lower eligibility costs. This could also mean that entitlements move where those conditions are less stringent: in this sense, the exchange of entitlements may also be seen as a way to elude conditionality (Scoppola et al., 2005). A movement of entitlements from more intensive areas to less intensive areas may provide an example of such case.

If the shadow price of entitlements in farm a is greater than in farm b because land shadow price in farm a is smaller than in farm b ($\tau_a < \tau_b$), entitlements move towards farm/land types where land productivity (τ) is low. Notice that when the non-eligible crop is grown ($x_{NE} > 0$), $\tau = p_{NE} - \dfrac{\partial c}{\partial x_{NE}}$, therefore the level of land shadow price is directly linked to the marginal profitability of the non-eligible crop. When this crop is an intensive crop such as horticultural ones, moving entitlements (in this direction) may result in an increase on farming intensity in the more productive areas. Furthermore, this flow of entitlements may generate an increase of land shadow price in the less productive areas (and vice-versa) (Scoppola et al., 2005).

Notice that if a perfectly competitive market for land exists, land shadow price should tend to be the same in all farms (at least for the same land type). Therefore, under these conditions, this factor is not going to generate – per-se – entitlement transfers.

In all cases, there are three major constraints to the exchange of entitlements. EC Regulation N. 1782/2003 allows Member states to tax the definitive exchange of entitlements in order to fund the national reserve. Notice that this may result in reducing the willingness to trade in all those cases when the gap between entitlement shadow prices of two farms is lower than the taxation rate. Notice that lease or other non-definitive transfer of entitlement is not taxed.

Secondly, notice that payment entitlements may be transferred by sale or any other definitive transfer with or without land. In contrast, lease or similar types of transactions are allowed only if the entitlements are accompanied by an equivalent number of eligible hectares. In this case the voluntary exchange of entitlement with land may occur when the following condition holds:

$$\delta^a + \tau^a = \left(p_E - \frac{\partial c}{\partial x_E} + \left(ev(1-m) - ec \right) \right)_a \geq elp \geq \left(p_E - \frac{\partial c}{\partial x_E} + \left(ev(1-m) - ec \right) \right)_b = \delta^b + \tau^b$$

(10)

where elp represents the price of on an entitlement with land.

Finally, the transfer of entitlements with land can be more complicated than expected when land market is affected by relevant transaction costs. Given the heterogeneity of entitlement values and the innovative nature of the exchanged goods, transaction costs may be also relevant in the case of transfer of just entitlements. Because in the non-regional application of the single payment scheme almost each farm of a region have a specific unitary value, this may result in a very fragmented market with non-negligible transaction costs.

3. Empirical Analysis

3.1 Farm models

The empirical analysis has been performed on 119 FADN farm specialized on non-irrigated cereal production and located in central Italy (Severini, 2003). These farms have been grouped according to their farm size into 3 groups (small, medium, large). In each farm group a PMP model has been developed obtaining a full-matrix cost function using Maximum Entropy (Golan, Judge and Miller, 1996) according to the approach developed by Paris and Arfini (2000). We would like to thank F. Arfini for handing us the models he developed under pre-reform conditions. Furthermore, we thank F. Arfini and M. Donati for the help we got at the beginning of our research activity. Only the Authors are responsible for the opinions expressed, for how the models have been modified and used, and for any error present in this paper.. An useful review of the state-of-art on PMP is in Heckelei and Britz (2005). For the debate on this methodology and its use in Italy, see Cafiero (2004).

The structural constraints of the models are land availability, relationships between land uses and production levels, mandatory set-aside. After the 3 traditional PMP steps, the quadratic models have been modified to account for the new instruments introduced by the SPS as described in Severini (2003). In this paper farm models have been modified to allow the exchange of land, entitlements and land with entitlements among them. The exchange of these resources has been modeled by using a simplified regional programming model (Hazell and Norton, 1986). This way of representing exchange of resources is not intended to obtain accurate previsions of future farmer behaviors, but to perform a simplified simulation exercise with the goal of providing numerical examples about the topics explored in the qualitative analysis.

3.2 Simulation scenarios

The basic simulation scenarios are three and they differ in terms of resource exchange possibilities. Under the first scenario, only the exchange of land is permitted (*l*); a second scenario allows the exchange of land and land with entitlements (*l+le*); the third scenario allows the exchange of land with and without entitlements but also the exchange of entitlements without land (*l+le+e*). Other two additional scenarios have also been considered: one allows for the exchange of only entitlements but not of land (*e*); another allows for the exchange of land (without entitlements) and of entitlements without land (*l+e*). Finally, in some type cases, a scenario in which farmers do not exchange neither land nor entitlement is considered (*No-trade* conditions).

To explore the likely impact of different initial entitlement allocations on farmers' behavior, each farm model has been divided into two models. Each couple of models only differs in terms of availability of entitlements, provided that the sum of entitlements allotted to each couple of models is equal to the original level of entitlements.

There are, therefore, two types of farms for each group (small, medium, large): farms A, with limited availability of entitlements, and farms B, with abundant entitlements availability. Two situations with heterogeneous allocation of entitlements have been considered: in the first one, farms A have 50% less and farms B 50% more entitlements than in the original situation (A = 0.5 *No-Trade*, B = 1.5 *No-Trade*). In the second, farms A have only 20% of the entitlements in the original situation and farms B 80% more entitlements than in the original situation (A = 0.2 *No-Trade*, B = 1.8 *No-Trade*).

To examine the role of eligibility costs (*ec*), a simulation scenario has been considered where farms A and B have a homogeneous availability of entitlements but, while farms B have no eligibility costs, farms A have eligibility costs of 100 Euros per hectare (*ec100*).

The last aspect considered relates to the taxation of entitlement transfer. Two different taxation levels are considered: equal to 25% and to 50% of the maximum level of taxation foreseen by EC Reg. 795/2004. Therefore, in the first case taxation rates are: 7.5% on transfer of only entitlements and 2.5% if entitlement transfer occurs with land (*TX 0.25*); 15% and 5% respectively (*TX 0.50*) in the second case.

4 Simulation results

4.1 Land and entitlement shadow prices under no trade conditions

In this paragraph, the relative level of land and entitlement shadow prices under no trade conditions are studied. Furthermore, the likely effect of factors such as entitlement nominal value (*ev*), modulation rate (*m*), eligibility costs (*ec*), as well as the distribution of the rights are considered. This will open the discussion on the trade of both land and entitlements that is considered in the following paragraphs.

Under no trade conditions, land shadow price is lower in small farms than in larger farms (Table 1). The shadow price of entitlement availability constraint equals to the entitlement nominal value net of modulation. In facts, because medium and large farms are subject to such policy, here entitlement shadow price equals to 95% of entitlement nominal value, while in small farms (not affected by modulation) it equals to entitlement nominal value (Table 1).

If unitary eligibility costs exist (e.g. 100 Euros/ha in farm A and 0 Euros/ha in farm B) entitlement shadow prices decrease of the same amount of unitary eligibility cost (Table 1).

Finally, the effect of how entitlements are distributed among farms is considered. If some farms (A) have relatively less entitlements than others (B), entitlement shadow price of farms with large amount of entitlements decreases (Table 1). Notice, that in some case (small farms, B) it turns out to be zero showing that entitlement constraint becomes not binding. When the skewness increases (e.g. *AB 80*), this phenomenon also appears in medium and large farms with limited amount of entitlements (Farms B).

Table 1. Land shadow prices, entitlement nominal values and shadow prices under no trade conditions regarding eligibility costs and distribution of entitlements among farms (Euros/ha).

	Land shadow price	Entitlement value	Entitlement shadow prices				
			No-Trade	With elegibility costs in farm A (*ec 100*)		With skewed distribution of entitlements (*AB 50*)	
				A	B	A	B
Small farms	178.60	448.55	448.55	348.55	448.55	448.55	0.00
Medium farms	264.20	388.69	369.26	269.26	369.26	388.69	369.26
Large farms	220.70	410.34	389.82	289.82	389.82	389.82	389.82

4.2 Shadow price and exchange of land

Differences in land shadow prices are responsible for the exchange of land. In facts, when the models are allowed to exchange land it flows from small (and partly from large) toward medium farms up to equating land shadow prices in all farm models.

Allowing the models to exchange land and entitlements with and without land (Table 2, scenarios *l+le*, *l+le+e*, *l+e*), equilibrium land shadow price becomes slightly higher than under scenario *l* (Table 2). Land moves from small to medium size farms, while entitlements with land flow from large to small farms. This latter flow reduces entitlements shadow prices in small farms because those farms become subject to modulation (Table 4). Land shadow price increases, since the entitlement perceived value decreases (see equation (5)).

When only entitlements can be exchanged land shadow price, in medium and large farms, do not vary (Table 2, scenario *e*). However, it increases in small farms, since entitlements move towards these farms (Table 3). This latter farms, at the margin, move land from non-eligible to eligible crops, in order to use obtained entitlements. However, in the considered farms, such distortion is very limited and affects the total economic results very marginally (Table 5).

Table 2. Land shadow price under different exchange scenarios (Euros/ha).

| | Simulation scenarios: | | | |
	No-Trade	land only (l)	l+le l+le+e l+e	entitlements only (e)
Small farms	178.6	225.5	230.7	198.5
Medium farms	264.2	225.5	230.7	264.2
Large farms	220.7	225.5	230.7	220.7

Indeed, small farms have a land opportunity cost (shadow price) lower than medium and large farms. Therefore, entitlements move towards land with lower productivity with negative efficiency effects. Furthermore, this flow of entitlements may generate an increase of land shadow price in those farms with lower land shadow price (and vice-versa).

The exchange of land is influenced by how entitlements are allocated among farms. In the case of heterogeneous distribution among identical farms (Table 3), land flows from small to medium farms, but also from those with few entitlements (type A) toward those with abundant entitlements (type B). Under no trade conditions (Table 1) type B small farms show a higher land shadow price because, having used all available land, they hold some unused entitlements (see last column of Table 1). As long as the skewness of distribution of entitlements increases, this also happens in type B medium and large farms.

It is interesting to notice that such skewness leads, under the exchange of only land scenario, to a land shadow price higher than in the case of a homogenous distribution of entitlements. In this case, the transfer of entitlements could affect land market equilibriums.

Table 3. Land shadow prices under different scenarios with skewed distribution of entitlements. Scenario *AB 50* (Euros/ha).

| Skewed distribution (*AB* 50) | | | | |
| | Simulation scenarios: | | | |
	No-Trade	land only (l)	l+le l+le+e l+e	entitlements only (e)
Small farms				
A	178.6	238.8	230.7	198.5
B	624.3	238.8	230.7	199
Medium farms				
A	264.7	238.8	230.7	264.2
B	264.2	238.8	230.7	264.2
Large farms				
A	220.7	238.8	230.7	220.7
B	220.7	238.8	230.7	220.7

Under the assumption that entitlements cannot be exchanged, more allocation of entitlements among farms is skewed, more exchange of land occurs (Graph 1). However, under the considered farm conditions, the increase of land exchange occurs only when the distribution is particularly skewed. If

entitlements can be exchanged only with land, the amount of exchanged land is even greater than in the previous case. Nonetheless, when entitlements can be transferred even without land, the amount of land exchanged is strongly reduced and almost not affected by how they are distributed among farms (Graph 1). In these two last cases, the exchange of entitlements, with or without land, always occurs from large to small farms (i.e. from farms subject to modulation, toward farms exempted from it) reducing the amount of financial resources drained by modulation (Table 5).
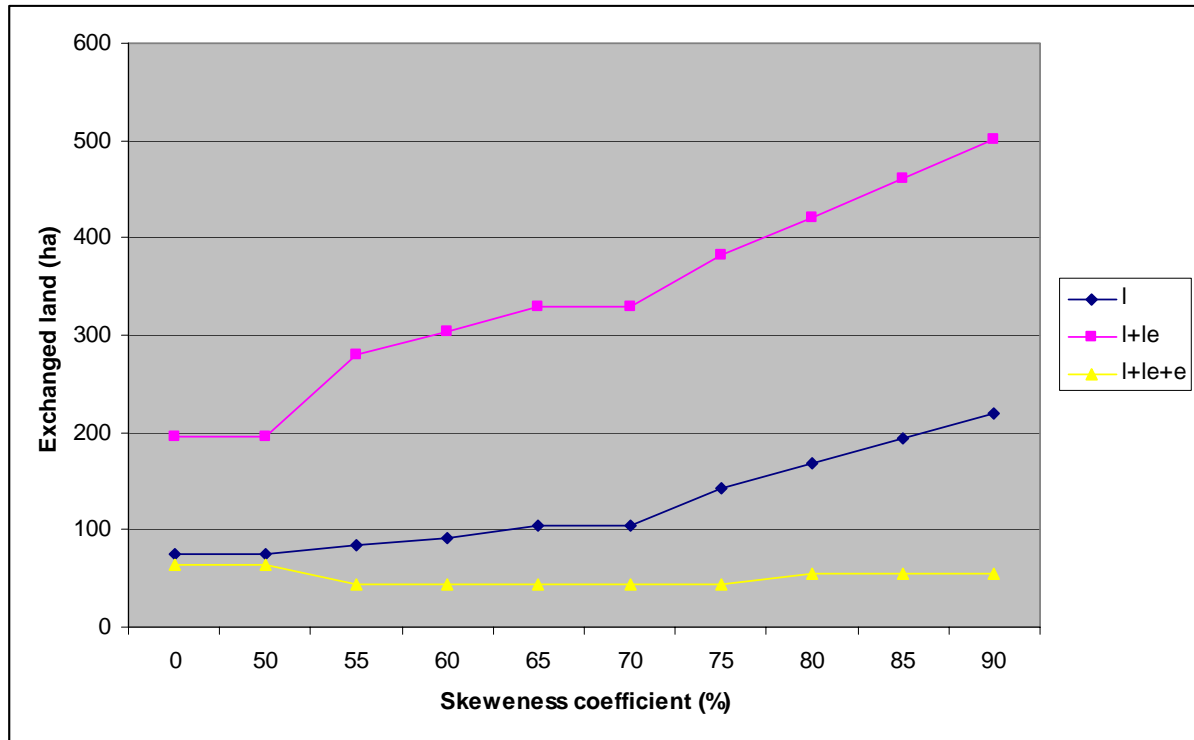
Graph 1. Exchange of land under different assumptions regarding the skeweness of the distribution of entitlements. Different exchange scenarios.

4.3. Shadow price and exchange of entitlements

The factors affecting the relative level of entitlement shadow prices (see paragraph 4.1) can also affect farmers' willingness to exchange entitlements. In facts, these factors are the main causes of entitlement transfers. At the contrary than for land, entitlements flow from medium or large farms to small farms to circumvent modulation. Here we refer to a single farm behavior. Because EC regulations set a limit to the whole refunds, exempted farms are eligible at the national level, such behavior cannot allow Member states to reduce their own contribution to modulated funds below a given level. The increasing availability of entitlements forces small farms to increase the amount of eligible crops (renting land) even if this generates a decrease in market driven profit and in entitlement shadow price. This occurs up to when direct payments reach the modulation exemption level (5000 Euros). At this point, the farm becomes subject to modulation and the entitlement shadow price decreases below its nominal value (Table 4).

As explained in the qualitative analysis, differences in eligibility costs between farms tend to affect the exchange of resources. In facts, land, entitlements and land with entitlements flow toward those farms (from A to B) with relatively lower eligibility costs.

Table 4. Entitlement nominal value and entitlement shadow prices (Euros/ha).

	Entitlement			Entitlement shadow price	
	Nominal value			Exchange of	
				Land only	Land and entitlements
	Small	Medium	Large	Small	Small
Small farms	448.55	388.69	410.34	448.55	428.52
Medium farms	448.55	388.69	410.34	426.12	426.12
Large farms	448.55	388.69	410.34	426.12	426.12

A final set of simulation has been performed to explore the impact of taxing the exchange of entitlements and entitlements with land. The taxation can induce a strong reduction of entitlements exchange. With taxation rates of 7.5% for entitlement only and of 2.5% for entitlements with land, farmers exchange entitlements, only with land, and this increases the whole amount of land exchanged in the market (Graph 1 and Table 6). However, when taxation rates reach 50% the of maximum level, exchange of entitlements, even with land, is inhibited. In this sense, the tax rate choice appears very important to push farmers toward exchanging entitlements alone or entitlements with land, or to prevent the development of any entitlements market.

4.4. Economic results and land use under different scenarios

Entitlements exchange, with or without land, has limited allocative and efficiency effects, however, these results deserve a brief description in order to complement the results of the qualitative analysis.

When land, entitlements and land with entitlements can be exchanged, a limited increase of farm gross margin occurs. This is only because moving entitlements toward small farms decreases the amount of payment drained by modulation (Table 5). In facts, notice that there is almost no change in the gross margin net of payments. This result confirms that entitlement exchange can be used as a way to circumvent the modulation policy if taxation rates are not high enough to prevent the exchange of entitlements.

Table 5. Main economic results with two different entitlement distributions (Million Euros).

	Unskewed distribution			Skewed distribution (*AB 50*)		
	Simulation scenarios:			Simulation scenarios:		
	land only (l)	l+le l+le+e l+e	entitlements only (e)	land only (l)	l+le l+le+e l+e	entitlements only (e)
Gross margin	5091.6	5097.2	5093.4	5082.9	5097.1	5093.3
Gross margin net of payments	3712.9	3712.4	3706.2	3706.5	3712.4	3706.2
Modulated payments	24.1	17.9	16.0	26.6	17.9	16.0

Changing the distribution of entitlements can affect economic results. When the distribution of entitlements is particularly skewened (e.g. A – 50%, B + 50% of the original distribution) it results in a lower total gross margin. This happens for two main reasons. On the one hand, more payments are

drained by modulation, because the exemption mechanism is less effective. On the other hand, gross margin net of payment is lower. This latter result suggests that the distribution of entitlements can have some efficiency implication that, however, should be very limited (Table 5).

The taxation of entitlement exchange can be used to prevent farmers to circumvent modulation (as well as conditionality). In the case of the scenario *TX 0.25*, all the entitlements are exchanged with the land, in virtue of the smaller taxation of the entitlements with land (Table 6).

Table 6. Main economic results under different taxation rates on the exchange of entitlements with and without land (Million Euros). Unskewed distribution of entitlements.

	Unskewed distr. (*TX 0.00*)			*TX 0.25*			*TX 0.50*		
				Simulation scenarios:					
	land only (l)	l+le l+le+e l+e	entitlements only (e)	land only (l) l+e	l+le l+le+e	entitlements only (e)	land only (l)	l+le l+le+e l+e	entitlements only (e)
Gross margin	5091.6	5097.2	5093.4	5091.6	5094.4	5085.6	5091.6	5091.6	5085.6
Gross margin net of payments	3712.9	3712.4	3706.2	3712.9	3712.7	3706.2	3712.9	3712.9	3706.2
Modulated payments	24.1	17.9	16.0	24.1	18.2	24.1	24.1	24.1	24.1

5. Conclusions

The analysis has shown that the SPS, even if representing a relevant move towards decoupling support from production, can still have some residual effects on farmer's behavior because of the nature of the conditions to fulfill to obtain payments. The policy can induce farmers to plant relatively more eligible than non-eligible crops but, more specifically, it can affect their position in the land market. In fact, the same farm can have a significantly different position on land market according just to entitlements availability: low entitlement availability, resulting in a low land shadow price, can, per-se, force this farm to lease out land and vice-versa. Modulation acts as an "ad valorem" tax on the payments exceeding exemption level. This can reduce land shadow price and, therefore, can increase farmer willingness to lease out his/her land. However, SPS offers a new option to farmers: to trade entitlements with or without land.

Entitlement shadow price can range from zero to the unitary value of payment net of unitary eligibility costs and modulation (if required). Entitlement shadow price level can be affected by several factors such as levels of marginal market profit for eligible crop, for modulation rate, for unitary eligibility cost and for land shadow price. It can be lower than unitary value of payment net of modulation and unitary eligibility costs whenever a farmer, in order to obtain the payments, is willing to plant more eligible crop than expected according to its (net of payments) profitability.

Exchange of entitlements between two farms can occur if the exchange price lies in between the levels of entitlement shadow prices of those farms, and this exchange can generate allocative effects. In facts, entitlements may move towards farms where marginal market profit from farming an extra unit of land with eligible crops is comparatively greater: therefore, this may increase efficiency. Furthermore, entitlements may move towards farms exempted from modulation or towards farm/land types where compliance conditions can be satisfied at a lower cost. In this sense, the exchange of entitlements can be used to circumvent both modulation and conditionality. Therefore, EU and national Authorities should monitor the exchange of entitlements to verify if this can reduce the effectiveness of those two policies.

However, taxing such transactions can drastically reduce the exchange of entitlements. Simulation results show that taxation rates of the order of 25% and 50% of the maximum rates established by EC Regulation 795/2004 can strongly reduce and inhibit the exchange of entitlements. Furthermore, the taxation rates can be fixed at different levels for the exchange of entitlements with or without land. Increasing the taxation for this latter form of exchange can induce an increase of the amount of land exchanged in the market. However, because the lease of entitlement (with land) cannot

be taxed, increasing taxation rates, while reducing the definitive exchange of entitlements, can indirectly result in an incentive to non-definitive exchange of land with entitlements.

Finally, it is important to notice that, given the innovative nature of the exchanged good and the heterogeneity of entitlement nominal values, the entitlement market may become very fragmented and, therefore, affected by high transaction costs. This factor should reduce the amount of entitlements (with and without land) exchanged on the market.

Appendix:

The characteristics of the programming models are described in Severini (2003) and, basically, refer to the approach developed by Paris and Arfini (2000). This appendix briefly presents the main features of the new constraints developed to model land exchange, entitlements with and without land.

Land availability constraint for a single farm model has the following:

$$\sum_j xh_j + xhcam \leq TER + \sum_{azaa} tndin_{azaa} - \sum_{azaa} tndout_{azaa} + \sum_{azaa,tipd} xpuain_{azaa,tipd} - \sum_{azaa,tipd} xpuaout_{azaa,tipd}$$

(A1)

where:

    azaa is the index that identifies the farm size (small, medium, large);

    tipd is the index that identifies the kind of entitlements according to farm size;

    xh(j) is cultivated land (ha);

    xhcam is non cultivated land, in good agricultural and environmental conditions (GAEC);

    TER is Utilised Agricultural Area (UAA);

    tndin(azaa) and *tndout(azaa)* are exchanged land, rent in and rent out (ha);

    xpuain(azaaa,tipd) and *xpuaout(azaa,tipd)* are exchanged land with entitlements (according to kind of entitlement).

Each farm can lease out land up to the maximum amount of land he/she originally holds:

$$\sum_{azaa} tndout_{azaa} + \sum_{azaa,tipd} xpuaout_{azaa,tipd} \leq TER$$

(A2)

A similar condition holds for the exchange of entitlements (for every kind of entitlement):

$$\sum_{azaa} xpuaout_{azaa,tipd} + \sum_{azaa} xdout_{azaa,tipd} \leq ARIF\_AA(tipd)$$

(A3)

where:

    xdout(azaa,tipd) is given entitlements (according to farm of destination and kind of entitlement);

    ARIF_AA(tipd) is amount of available entitlements, according to kind of entitlement.

However, it is important to account that, in the studied case, three different types of entitlements exist: one for each farm model.

Furthermore, a specific constraint about entitlements availability has been introduced:

$$xpua(tipd) \leq ARIF\_AA(tipd) + \left(\sum_{azaa} xpuain_{azaa,tipd} * COTAGTD(tipd) \right) - \sum_{azaa} xpuaout_{azaa,tipd}$$

$$+ \left(\sum_{azaa} xdin_{azaa,tipd} * COTAGD(tipd) \right) - \sum_{azaa} xdout_{azaa,tipd}$$

(A4)

where:

$xpua(tipd)$ is elegible land (that receives single farm payment);

$xdin(azaa,tipd)$ and $xdout(azaa,tipd)$ is obtained and given entitlements (according to farm of provenience and destination, and kind of entitlement);

$COTAGTD(tipd)$ is taxation rates according to transfer of entitlements with land;

$COTAGTD(tipd)$ is taxation rates according to transfer of entitlements.

The combined regional model includes three main market clearance groups of constraints. The first refers to the exchange of land:

$$\sum_{azaa} tndin_{azaa} = \sum_{azaa} tndout_{azaa}$$

(A5)

The second one refers to the exchange of land with entitlements:

$$\sum_{azaa} xpuain_{azaa,tipd} = \sum_{azaa} xpuaout_{azaa,tipd}$$

(A6)

The third one refers to the exchange of entitlements:

$$\sum_{azaa} xdin_{azaa,tipd} = \sum_{azaa} xdout_{azaa,tipd}$$

(A7)

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