



## Comparative Analysis of Factor Markets for Agriculture across the Member States

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# Farm/Household-Level Simulation Results of Testing Policy and Other Scenarios

### ABSTRACT

Among the different production factors, land is the one that most often limits farm development and one of the most studied. The connection between policy and other context variables and land markets is at the core of the policy debate, including the present reform of the Common Agricultural Policy. The proposal of the latter has been published in October 2011 and in Italy it will include the switch of the payment regime from an historical to a regional basis. The authors' objective is to simulate the impact of the proposed policy reform on the land market, particularly on land values and propensity to transaction. They combine insights and data from a farm household investment model revised and extended in order to simulate the demand curve for land in different policy scenarios and a survey of farmers stated intention carried out in the province of Bologna (Italy) in 2012. Based on these results, the authors calibrate a mathematical programming model of land market exchanges for the province of Bologna and use this model for simulation. The results of the model largely corroborate the results from the survey and both hint at a relevant reaction of the land demand and supply to the shift from the historical to the regionalised payments. As effect, the regionalisation would result in increased rental prices and in a tendency to the re-allocation of land.

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

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# **Farm/Household-Level Simulation Results of Testing Policy and Other Scenarios**

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Marco Puddu and Meri Raggi\***

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## **1. Introduction and objectives**

The connection between policy and other context variables and land markets is at the core of the policy debate, including the present reform of the Common Agricultural Policy. In a previous paper (Puddu et al., 2012) a farm household investment model has been revised and extended in order to simulate the demand curve for land in different policy scenarios. In a parallel activity, a survey has been carried out in the province of Bologna (Italy) in order to understand the effect of the reform through stated intentions by the farmers (Raggi et al., 2013).

In this paper we join insights and data from these two exercises in order to simulate the impact of the new CAP policy instruments on the land market in the Province of Bologna. Attention is particularly focused on the regionalization of payments and considers both potential reactions by individual farms and their interaction on the market.

From the practical side, the paper aims to contribute an estimation of the potential effects of the reform and prices scenarios on the land values and propensity to transaction. From the methodological point of view, the paper aims to explore different ways to integrate very detailed farm level investment model output and survey information in more simplified farm models suitable to provide regional insights. The paper is organized as follows. In section 2 we look at the background literature, in section 3 we describe the main features of the new direct payment introduced by 2013-Cap reform proposal. In section 4 we illustrate the methodology, the data and the calibration strategy. In section 5 we illustrate the results. A discussion is provided in section 6, followed by conclusions in section 7.

## **2. Background and literature**

Factor markets are a central issue in the analyses of the farm development and of the agricultural sector vitality. Among the different production factors, land is one of the most studied. Land market is an imperfect market, due to the low substitutability, the poor transparency and high transactions costs. It is characterized by a low number of transactions and a local dimension and is, also, influenced by the economic, policy and institutional framework. In particular, the agricultural economic literature has highlighted the effects of the CAP (Common Agricultural Policy) on factor markets (Floyd, 1965; Parsch et al. 1998; Latruffe et al., 2006; Ciaian et al. 2006; Bartolini et al., 2011) and, specifically, it has studied the way in which the CAP reforms have changed such effects over time. In this section, we briefly analyze the literature on farmland price or rental price formation, and their determinants, as a background to the core issue of this paper. The first works that analyze the

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direct effect of policy on land demand and, in particular, the effect of agricultural price supports on the factor returns and on the personal distribution of income, is the paper by Floyd (1965). Many Authors, in later papers, show a close relationship between the effects of policy on the supply of production factors and their elasticity, as well as with their factor substitution possibilities (Parsch et al. 1998; Goodwin et al. 2005; Latruffe et al., 2006). Several works aim to estimate the effect of policy payments in terms of their capitalization into land value or land rental prices, and to calculate a share of capitalization depending on type of policy support (Ciaian et al. 2006; Dziemianowicz et al. 2008; Courleux, 2008; Latruffe et al. 2009). The studies mostly agree that government payments and other types of policy support are significant in explaining land prices and account for a large share of it. Studies estimate a share around 15-30%, although it could be up to 70% depending on specific regions and time periods (Latruffe et al., 2006).

The literature also underlines the effect of policy change on the reallocation of productive factors over time (Bartolini et al., 2011). Several papers in particular analyze the effects of decoupling, introduced in 2003 by the Fischler reform, on the dynamics of exchange of land. These works identify the determinants of capitalisation of payments into land prices, including the distribution of payments between beneficiaries, in connection to the possibility of exchange of entitlements and in relation with the ratio between eligible area and number of entitlements own (Le Mouel, 2004; Kilian et al., 2008; Courleux et al., 2008; Zier et al., 2010; Viaggi et al., 2010).

Both ex-ante and ex-post analysis have some relevance in the literature. Ex-ante approaches are found in the evaluation of the effects of policy as a result of different scenario. Ex-post approaches are developed through the evaluation of policy effects after the policy is implemented and are based on analysis of surveys or secondary data. Most frequently, econometric models are used mainly for ex-post analysis, while mathematical programming models are used for ex-ante analysis.

Studies focusing on the effect of different policy scenarios on the changes of land demand or land rented/sold are often derived or are expressed by changes in the marginal value of land.

Mathematical programming models have been used to simulate the impact of policy reforms also considering changes in farm size under different price, policy, and cost scenarios (see Zimmerman et al., 2009 for a review of relevant models applied to structural change). This typology of models have also an important use to analyze competition for land allocation between different farms, measuring the effects of drivers of changes through the marginal value of land (Galko et al. 2011). Gocht et al., (2013) found that introduction of flat-rate payments (such as regionalised payments) determines a reduction of land use about 0.6% in EU-15. Authors observed also a decrease of rental prices in the old MS and small changes in the new MS due to the introduction of a more harmonised SPS scheme.

Some studies aims to investigate farmers' investment behaviour (including land), and evaluate the impact of different CAP scenarios, with special focus on the Single Payment Scheme, in order to contributing to the understanding of the relation between policy objectives and farmers' behaviour (Gallerani et al., 2008; Viaggi et al., 2011).

Several papers also show the use of econometric models based on the application of statistical and mathematical methods to address the effects of changes in policy mechanisms or property rights system on the amount of land markets transactions (Parsch et al. 1998; Latruffe et al. 2006; Gallerani et al. 2007; Ciaian et al. 2008; Jin et al. 2011). In other cases the analysis rests on surveys of intentions (Bougherara and Latruffe, 2010; Bartolini and Viaggi 2013).

A subject of a large branch of recent literature is the analysis of policy effects in Central and Eastern European Countries (CEECs). In those countries a major land reform process occurred during the post-communist period and the procedure for accession to the European Union. Transaction cost in land exchange and imperfection of the land markets, such as imperfect competition, can be very significant in CEECs and the combination of imperfect

competition and transaction costs has a strong impact on land prices (Swinnen, 1999; Ciaian et al., 2007).

### **3. The direct payment in the post 2013 CAP reform**

#### **3.1 Background**

The CAP follows a development characterized by an evolution from agricultural price support, to area payments, and to the present decoupled payments. The latest scheme, introduced with the 2003 reform, and active since 2005, is called Single Farm Payment (SFP). Farmers receiving the SFP have the flexibility to grow any crop on their eligible area except fruit, vegetables and table potatoes. In addition, they are obliged to keep their land in good agricultural and environmental condition (cross-compliance). The decoupling of payments, over the years has been extended to almost all agricultural sectors. The Health Check of the CAP (2008) has added a number of measures to assist the farmers in better responding to changes on the market as the introduction of the possibility of Member State to elaborate a national strategy on sustainable operative programs on fruit and vegetable market. Several measures were abolished, such as arable set-aside, others were developed, like milk quotas, which gradually go towards their abolition in 2015, and modulation, with the reduction of direct payments to farmers in order to transfer resources to the Rural Development share of the CAP. Today the CAP is in front of a new reform process; in fact, in October 2011 the official proposal of post-2013 reforms has been published. In Italy, this will include the switch of the payment regime from an historical to a regional basis. The new payment will then lose the connection with the per-hectare payment in reference three-year period (2000-2002) and the entitlements owned by the farmers. In addition, the farmers can obtain payments on all of their operated land area.

#### **3.2 General provisions**

In October 2011, the EU Commission published the new policy proposal for the CAP towards the period 2013-2020 (COM(2011)625/3). The mechanism of payment will be based on disentangling of the single farm payment into four different components: basic payments; greening component; payments to the less favoured areas and payments to young and small farms. The first two components are expected to be the most relevant because they cover almost the total of the payment that the farmers can receive. The basic payments can arrive at a maximum of 70% of the amount of payment assigned to the farm (regional ceiling divided by the number of entitlements fixed at regional level). The basic payments will be assigned to active farmers. An active farmer is a farmer who has an annual amount of direct payments greater than 5% of the total receipts they obtained from non-agricultural activities in the most recent fiscal year and that carry out on his land the minimum activity established by member states in accordance with the definition of “agricultural activity”. These limitations do not apply to farmers that receive less than 5000 euro of direct payment. The Member State shall decide not to grant direct payments to a farmer if the total amount of direct payments claimed or due to be granted in a given calendar year is less than 100 euro or if the eligible area of the farm is less than one hectare.

Member states can assign a small part of regional payments ceiling (respectively 2% and 10%) to young and small farms. Member states may grant a payments to farmers entitled to a compensation under a basic payment scheme whose holdings are fully or partly situated in less favoured areas. The reform, also, introduces the “capping”, that is a reduction of the amount of payments for farmers that receive more than 150,000 euro of direct payments.

#### **3.3 From historical to regionalized payments**

The regulation proposals include the provisions to switch the direct payment regime from historical to regional or national bases in the countries in which the historical payment is still in place (COM(2011)625/3, Art.18-20). Member State shall divide the national ceiling

between the regions and they may decide, before 1 August 2013, to apply the basic payment scheme at national or regional level. In Italy the most likely strategy is to adopt the direct payments at regional level. In this case Member State shall define the regions in accordance with objective and non-discriminatory criteria such as their agronomic and economic characteristics and their regional agricultural potential, or their institutional or administrative structure. The regionalized payment is a homogenous payment per hectare for farms in the same region and will be distributed on the basis of the farm area on which some agricultural activity is carried out. This measure is prompted by the desire to have a more uniform distribution of payments per hectare across EU farms.

### 3.4 The greening component

The greening component of the payment is assigned to farmers entitled to a payment under the basic payment scheme and that comply, on their eligible hectares, with some ecological prescriptions (COM(2011)625/3, Art.29-32). These are a) to have at least three different crops on their arable land where the arable land of the farm covers more than three hectares; b) to maintain existing permanent grassland on their holding; c) to have ecological focused areas (7% of the total farm area) on their agricultural area, such as land left fallow, terraces, landscape features, buffer strips and woodlands.

A different regime of payments is applied to organic farmers. The proposal allows to organic farmers to receive without additional commitments the greening payment. Budget allocated for pay greening payments are obtained by the 30% of the national ceiling. Application of greening payments and relations between provision of environmental good in both first and second CAP pillar are central in the ongoing scientific debates (see for example Matthews 2012; 2013).

## 4. The model

Cian et al., (2012) and Puddu et al., (2012) developed a theoretical analysis of the impact of regionalisation on land price in a two-farm setting and a simulation of farm-level demand curves. Puddu et al., 2012 also develop a model to simulate the effects of regionalisation (intended as the move from historical payment to fully regionalised) in the province of Bologna (Italy), adapting a farm household model developed to simulate farms' investments behaviour under CAP and price scenario (see Viaggi et al., 2011).

The general structure of the model simulates the functioning of a land market among farms by maximizing the total farm profit assuming the possibility of land reallocation among a group of farms ( $i=1...n$ ):

$$\text{Max } \Pi = \sum_i \pi_i(l_i, x_i, p_i)$$

s.t.:

$$\sum_i l_i \leq L$$

Where:  $\Pi$  = total profit of the area;  $\pi$  = profit function of farm  $i$ ;  $l$  = land available in farm  $i$ ;  $x$  = other factors affecting land profitability in farm  $i$ ;  $p$  = policy parameters for farm  $i$ ;  $L$  = total land available in the area.

In order to operationalise the model, a better specification of the profit function is needed allowing to recover the above profit function from information about actual farms, local rents and the policy parameters in place. Initially assuming that farms decide about their land size through renting only, let us assume farms maximize the following objective function:

$$\text{Max } \pi_i = s_i f(l_i, x_i) - r l_i$$

Where:  $s$  = scaling factor for farm  $i$ ,  $f$  = general profit function of land,  $r$  = local land rent.



First order conditions (with respect to l) are:  $s_i f'(l_i, x_i) - r = 0$

$$\text{i.e. } s_i = \frac{r}{f'(l_i, x_i)}$$

i.e. assuming we know the normalised (marginal) profit function, actual land available (l), the rent r and assuming a well behaved (decreasing) demand curve, we can derive an individual scaling factor for each individual farm.

This general approach can include (and interact with) policy in different ways. In the case of the SFP, the formulation would become:

$$\text{Max } \pi_i = s_i f(l_i, x_i) + SFP e_i - r l_i$$

With

$$e_i \leq E_i \text{ and } e_i \leq l_i$$

Assuming the farm will activate all available entitlements, using the available land, then:

If  $E_i \leq l_i$  then the profit becomes:  $\pi_i = s_i f(l_i, x_i) + SFP E_i - r l_i$  with SFP independent from E and the marginal value calculated as before.

If  $E_i > l_i$  the profit function becomes  $\pi_i = s_i f(l_i, x_i) + SFP l_i - r l_i$  and the first order conditions of its derivative with respect to l become:

$$s_i f'(l_i, x_i) + SFP - r = 0$$

$$\text{i.e. } s_i = \frac{r - SFP}{f'(l_i, x_i)}$$

The formula is analogous for the basic payment in a regionalised model, in which, however, the SFP is substituted by a RP and there is no restriction to the connection with the land area.

However, as modelling shows that some SFP can be capitalised in marginal land rent even when the entitlements are lower than the land available (Latruffe and Le Mouël, 2009), we

can express this as a fraction c of the average SFP per ha SFP ha:  $SFP_{ha} = SFP \frac{E_i}{l_i}$

$$s_i = \frac{r - c SFP_{ha}}{f'(l_i, x_i)}$$

In the model we use this approach to identify the s factor. Once this is found, we can use the full model for simulation.

As a consequence the effect of the post 2013 CAP reform on the land market in the area can be calculated as the difference between the current situation and the new situation assuming a redistribution of the total amount of payments in the area based on a regionalised payment, by comparing the following situations:

$$\text{Max } \pi_i = s_i f(l_i, x_i) + SFP e_i - r l_i \quad \dots(\text{ma vedi equazione nel modello coerente con}$$

$$s_i = \frac{r - c SFP_{ha}}{f'(l_i, x_i)} \text{ (a)}$$

$$\text{Max } \pi_i = s_i f(l_i, x_i) + RPE_i - r l_i \text{ (b)}$$

Where RP is the regionalised payment.

Following the model developed above, and based on model developed by Deininger et al., (2008) and Bartolini and Viaggi (2013), when the transaction costs associated with renting-in or renting-out are positive, the optimisation problem can be rewritten as:

$$\max_A \pi = s_i f(A_i, x_i) + SFPE_i - I^{in} \left[ (A_i - \bar{A}_i) (r + tc^{in}) \right] + I^{out} \left[ (\bar{A}_i - A_i) (r - tc^{out}) \right] \quad (1)$$

$$\text{s.t. } A_i \geq 0 \quad (1a)$$

where  $\bar{A}_i$  is the land endowment by farm  $i$ ;  $f(A_i, x_i)$ , with  $f'(\cdot) > 0$  and  $f''(\cdot) < 0$  represents the general profit function of the land operated ( $A_i$ ), and the quantity of labour ( $L$ ) used on the farm (both household and external labour) and the optimal farmed area ( $A$ );  $I^{in}, I^{out}$  are two indicators for the rent-in or the rent-out activity. These two elements can have a value of zero when they are not activated or a value of one when the farm household is rented-in or rented-out, respectively;  $r$  is the net rental price that is assumed constant in the rental market;  $tc^{in}, tc^{out}$  represent the transaction costs associated with the renting-in or the renting-out. Following Deininger et al., (2008) and Deininger and Jin (2008) the first order condition (FOC) when the household rents-in ( $A_i^* > \bar{A}_i$ ) yields

$$s_i f'(A_i, x_i) = r - cSFPha + tc^{in} \quad \text{then } s_i = \frac{r - cSFPha + tc^{in}}{f'(A_i, x_i)}; \quad \text{otherwise, when the household}$$

rents-out a portion of the land ( $A_i^* < \bar{A}_i$ ) the FOC yields  $s_i f'(A_i, x_i) = r - tc^{out}$  and then

$$s_i = \frac{r - cSFPha - tc^{out}}{f'(A_i, x_i)}; \quad \text{finally, when the household land endowment is entirely used by the}$$

household itself, ( $A_i^* = \bar{A}_i$ ), the FOC yields  $r - cSFPha - tc^{out} < s_i f'(A_i, x_i) < r - cSFPha + tc^{in}$

$$\text{and then } \frac{r - cSFPha - tc^{out}}{f'(A_i, x_i)} < s_i < \frac{r - cSFPha + tc^{in}}{f'(A_i, x_i)}$$

## 5. Data and calibration

The empirical data used comes from a survey conducted in the early summer 2012 on a random sample of 350 farm household out of 7379 beneficiaries of Cap payments located in Bologna province. The questionnaire has been realized through a telephone interview which was focuses on farmers' intentions about land size expansion/reduction conditional on the introduction of some specific measures of the post 2013-CAP reform proposal. More specifically they were asked to state intentions about rent-in/out more/less land and buy/sell more/less land assuming the introduction of the regionalized payments, the greening and the capping measures respect to what their would have done in baseline scenario (current CAP system). The sample has been proportionally stratified by altimetry location (mountain, hill, Bologna hill, plain) and by the amount of CAP payments received in 2011 (below and above the mean). The questionnaire has been divided in different sections: first, information about farm characteristics, labour features and market strategy have been asked, afterwards CAP payments and generic planned future activities were requested, then questions concerning expansion/reduction intentions under current CAP and under post 2013-CAP proposal have been performed, and finally personal and household characteristics were request. The stated intentions regarding changes in farmland owned or rented in response to CAP change, were collected only for those who stated intention to do not exit from farming activity in the next 5 years (about 85% of the whole sample). Also information related motivations (cause) of leaving the sector and future intentions regard own land use were collected. The farm



characteristics are related to farm size, location, legal form, main farm specialization, typology of crops and animals breeding, intensity of livestock production, surface at agro-environmental or ecological measure, hectares involved in photovoltaic or biogas systems. In the same section have been asked information on lands rent-in and rent-out, on the increase/decrease of land in ownership or rented in the previous years (from 2002), and on the presence of relatives between owners or tenants of the farm. About labour characteristic were asked the number of household members working full-time or part-time in the farm and the number of external workers full and part-time working in the farm. Market strategies are investigated through questions about sales channel which the farms sell the products derived from the main farm specialization, about presence of sales contracts, internet use to buy inputs or sell output of farm production. Regard CAP payments, information on amount of payments, number of entitlements owned and the amount of others payments received in 2011, was collected. Moreover, was asked to quantify how the farm revenue is affected by those payments. About generic intentions question on adoption of new technology and on intention to stay in activity in the next years was asked. Also the percentage of total gross family income comes from farming was investigated in this section. The expansion/reduction intentions under current CAP has been collected for the land in property, rented out and rented in and for each of those the interviewed could choose between the follows categories: increase, no change, decrease. Stated intentions about rent-in/out more/less land and buy/sell more/less land assuming the introduction of the regionalized payments, the greening and the capping measures respect to what their would have done in baseline scenario, were asked. Household information's are collected through questions concerning gender of family components, number of minors, of over 65 years old and number of unemployed. Personal characteristics have been asked related to farmer age and education level, the latter divided in 8 categories ranging from no title or primary school to PHD.

Sample is composed by 63% of farms located in the plain area, 16% in hill, 10% in the hills of Bologna and the last 10% in the mountains. The location referred to the centre of farm and many farmers who lives in hills actually have part of the land in plain, this is relevant especially in hill of Bologna case that have 6% of farms with land in plain area. The greater part of surveyed farms are specialised in cereals (47% of the sample), 27% are specialised in mixed crops, 14% in livestock (which includes the categories livestock, mixed livestock/arable, milk/meat cattle farms), and 8% of fruits farms. Moreover, specialisation is heterogeneous among altitude: cereals, in plains and hills of Bologna and mixed crops in the mountains and hills. The majority of farms have is individual firm (82%), while company are only 14%. Rental market shows low amount of transactions: where only 5% of farms rented-out land to other farms with an average dimension of plots rented out of 11 hectares. On the contrary, quite high number of farms rented-in land. They are about the 34% and the average land rented-in is 19 hectares per farm. The majority of farmers sell the greater part of products through cooperative (63%), 32% to wholesaler or retailer, and 19% direct to consumers. It is worth noting that only 24% of the sample know details of post-2013 CAP reform.

The second part of the survey collects information about stated intention in operated land in next five years. Firstly questions about stated intention in the coming years are asked assuming current CAP maintenance (baseline). Then question was repeated assuming introduction of the new policy mechanisms included into the proposal of post-2013 CAP reform (regionalised, greening and capping). It is worth noting that in these questions changes with respect stated current CAP scenario are asked. Then for each of new policy mechanism changes with respect baseline are asked. Table 1 shows stated intention about land operated results.

Under new policy scenarios farmers could state three alternative strategies. First option is to maintain same intention stated assuming current CAP scenario, second strategy is to increase land operated and, third strategy is to reduce land operated.

*Table 1. Pattern responses*

<b>CAP measure</b>	<b>Direction of change</b>	<b>Typology</b>	<b>Farmers (#)</b>	<b>Percentage</b>
Regionalization	Expansion	buy	36	12.04
		rent	38	12.71
	Reduction	sell	10	3.34
		rent	23	7.69
Greening	Expansion	buy	30	10.03
		rent	30	10.03
	Reduction	sell	4	1.34
		rent	7	2.34
Capping	Expansion	buy	40	13.38
		rent	29	9.7
	Reduction	sell	11	3.68
		rent	11	3.68

Compared to the current SFP mechanism, these new instruments show a similar trend in the three options. In fact, greater part of farmers stated to maintain the same strategy that would be likely to maintain under current SFP policy. Few farmers, (10%) stated intention to increase land operated under new policy mechanisms. Overall in all new scenarios (regionalization, greening and capping) intention to increase land operated is higher than intention to reduce land operated.

During the survey information about stated intention about changes in land rented-in, land rented-out and land owned was collected. The following tables show some elaborations on intention of expand or reduce farm size whit the regionalization.

*Table 2. Regionalization: Comparison between expansion and reduction in rented area*

Regionalization		Decrease land operated (Rent in less land and/or Rent out more land)		
		NO	YES	Total
Increase land operated (rent in more land and/or rent out less land)	NO	243	18	261
	YES	33	5	38
	Total	276	23	299

The previous table shows that the farmers with intentions to expand rented area are more than those who want to reduce it and the major of the sample show no intention to change.

*Table 3. Regionalization: Comparison between reduction in terms of rented area and in terms of land in property*

Regionalization		Reduction owned land (Sell more land)		
		NO	YES	Total
Reduction operated land (Rent in less land and/or Rent out more land)	NO	258	5	263
	YES	31	5	36
	Total	289	10	299

From the table above its evident that there are more farmers with intention to reduce rented area than those which intention is to reduce the land owned. That supports the literature that assigns to the rental market more mobility than the sales market and hence more reactivity to changes in policy. Annex 1 presents descriptive statistics of farm survey.

In order to calibrate the model illustrated in the previous section, we rely on the following 5 assumptions:

- The demand function can be recovered based on information about demand slope (function) and the amount of land available.
- Land can only be traded within each area (mountain, hill, Bologna hill, plain).
- The decoupled SFP is actually partially coupled due to rotations, contracts etc.
- The regionalised payment will be uniform across the whole area and calculated based on the total SFP/UAA of the area (this is also, necessary in order to the different models to be comparable); a different hypothesis made is that the regionalised payment is uniform within each sub area of the whole study area (mountain, hill, Bologna hill and plain).
- In the model we use the individual farms in the Bologna province assuming altogether they are representative of the dynamics of the area.

An inspection of survey information available shows that information about the amount of entitlements is largely missing (only 43 out of 349 interviewed farmers reported this information). In the large majority of cases in which it is available, the farm UAA (largely) exceeds the number of entitlements. Only 2 cases report a number of entitlements higher than the UAA and 5 report a number of entitlements equal to that of the UAA.

Based on the rationale of the policy instrument, it would be reasonable to assume that entitlements (on the historical basis) do not affect the marginal value of land for most the farmers in the area (see also Bartolini and Viaggi 2013).

However, past evidence and evidence shows that there is some degree of capitalisation due to various reasons, including rotations etc. Based on the data from the metamodelling (Bartolini et al., 2011) the % of SFP value (per ha average) coupled to the marginal value of land is 58%. This value is also assumed in this paper for the calibration process.

Numerically  $c$  is obtained by “metamodelling”, through interpolating the marginal data reported in Bartolini et al., 2011. The demand function is calculated by interpolation of the points generated through simulation in Puddu et al. (2012)

Land areas and SFP per farm, are those collected in the factor markets farm survey described above, while information about land rental prices have been collected through expert interview.

## 6. Results

The results of the model are illustrated in table 4. The regionalisation of payments causes an increase of total income: from 5.119 million euro to 5.698, as a result of the fact that with the regionalised payments land allocation is not driven by entitlements and hence land is allocation reflects the private optimum without any policy-driven distortion.

*Table 4. Main results of the model*

	Baseline (Historical SFP)	Regionalised payment	Regionalised payment per zone
Total gross margin (Meuro)	5.119	5.698	5.698
Marginal land value			
mountain	200	372	251
hill	350	509	542
Bologna hill	350	506	404
plain	600	744	789
N. farms	349	160	160
N. farm Transaction costs model			
TC=0		122	117
TC=0.1		223	152
TC=0.2		292	211
TC=0.3		320	265
TC=0.4		324	294

The total income does not differ among the two regionalisation options, due to the fact that land allocation is the same and also the total amount of payments distributed.

There is an increase of marginal land values as revealed by the land constraints in the model (which could hint at an increase in land prices); this may be due to two main effects:

- as the regionalised payment directly affects the marginal value, differently from the historical payments, constrained by the mechanism of entitlements;
- there is an increase in the marginal productivity of land due to better re-allocation.

The marginal value of land (and supposedly the income) per zone changes among the two regionalised options, as they imply a different re-distribution of payments across areas. In particular, the uniform regionalised payments would yield relevant increases of marginal value of land in mountain areas.

The results also indicate a major tendency to the re-allocation of land, which concentrates in only 160 farms (less than half). This does not differ among the two regionalisation options, due to the fact that land is constrained to be re-allocated within the same zone and the optimal allocation does not change with changing the level of regionalised payments.

The model with inclusion of transaction costs corroborates the same ideas, but also emphasise that the actual land re-allocation would depend on the actual transaction costs. The effect of assumptions about transaction costs is twofold. First, by affecting model calibration. Assuming transaction costs the differential of marginal value of land across farms is emphasised and this yields different results (more intense re-allocation) in the option with zero transaction cost (less farms remaining). Increasing transaction costs causes a reduction of land exchanges and hence a higher number of farms remaining. It is expected that there is no difference between the two regionalisation hypotheses.

## 7. Discussion

This work is affected by several limitations. A key limit of this work is the current uncertainty about the Cap reform (now still in phase of negotiation). This does not allow making realistic hypotheses about the actual details of the allocation mechanisms.

Another set of limitations derives from the characteristics of the model, which uses a very simplified approach not including specific technical constraints, land uses and technologies. Though they are incorporated in the initial model from which the demand function is derived, the interplay with change in the payment system cannot be deemed to be fully accounted for. The results are particularly affected by the assumption about the homogeneity of the slope of the demand curve, due to data limitations.

In addition, in spite of the use of transaction costs, the model cannot be deemed to fully incorporate obstacles to land transaction, including distance effects, life cycle of the farms, etc., as well as other factors affecting land values and transactions. As a result, the changes due to the reform and the related economic effects are certainly overestimated compared to reality. This is also showed explicitly considering the effect of transaction costs and by comparing the results of the survey with the results of modelling. On the other hand the results of the model may indicate the tendency of adaptation over time in case a regionalisation reform is approved in the area.

Several other limitations apply, in relation of the specificity of the area. The Province of Bologna is rather heterogeneous, which may increase reactivity to changes in policy and over-emphasise the tendency through adaptation through land exchanges. Due to such heterogeneity, also the way the calculation of the new regionalised payment would be performed is unclear and hence its comparison with other areas may require a re-thing of the potential differences in the regionalisation rationale.

For the same reasons, it is difficult to compare these results with those of other studies.

Altogether the results of the model corroborate and are consistent with the results from the survey. In particular, both hint at the fact that there are farms interested in selling/buying land in opposite directions in the area in case of regionalisation. However, the high level of no changes in the survey, which is normal when comparing modelling results with actual intentions, reveal that any change would occur at least much more gradually than indicated by the model.

## **8. Conclusion**

Modelling and survey information show a reaction of the land demand to the shift from the historical to the regionalised payments. Results are supported by previous literature findings on implementation of regionalised payments (see for example Kilian et al., 2012). The regionalized payment seems to be more capitalized into the land value, at the margin, as long as it is less connected to entitlement. As a result, the regionalisation would result in increase rental prices. From an economic point of view, overall agricultural income would benefit from regionalisation due to a more efficient allocation of land.

The reaction is strongly influenced by the previous historical system of distribution of payments. In fact, the quantity of entitlements owned before the reform and the link of these with the farm area is the key factor in affecting the change in land demand due to the upcoming reform and how each farm would interact with the market. The difference in historical payment and the hypotheses about how the regionalised payment will be calculated also affect strongly the outcome of the modelling exercise.

A straightforward development of this work is hence to be found in the revision of the model once the reform is approved and the implementation process better clarified. In addition new instruments could be included in the analysis and/or better developed, such as the greening or the capping.

On the other hand, the model can be better specified in the direction of accounting for a wider range of farm features, such as financial constraints, interest rates, salaries and land markets, which are largely unexplored in the present paper. It could also be extended to an actual territorial model rather than just a model of land trade within the sample considered.

Another line of investigation rests in the use of a dynamic model, which could better account for the process of adaptation.

Finally, a more realistic specification of spatial interactions, allowing for distance and neighbouring effects.

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**Annex 1. Statistics Descriptive of farm survey**

Category	Variable (code)	Variable (description)	Obs	Mean	Std. Dev.	Min	Max
Geographical characteristics	d_hillBo	1 if farm located in Bologna area	350	0.102857	0.304207	0	1
	d_hill	1 if farm located in hill area	350	0.16	0.367131	0	1
	d_mountain	1 if farm located in mountain area	350	0.102857	0.304207	0	1
	d_plain	1 if farm located in plain area	350	0.634286	0.482319	0	1
	d_disadv	1 if the farm is in a disadvantaged area	350	0.331429	0.471401	0	1
Farm characteristics	d_rentOut	1 if the farmer have land rent out	348	0.051724	0.221788	0	1
	d_rentIn	1 if the farmer have land rent in	349	0.335244	0.472753	0	1
	d_saleCon	1 if have contracts to sell products	348	0.33046	0.471056	0	1
	d_livestock	1 if carries out livestock farming activities	349	0.106017	0.308302	0	1
	d_fruits	1 if main specialization is fruits	349	0.083095	0.276421	0	1
	d_mixedcrop	1 if main specialization is mixedcrop	349	0.272206	0.445735	0	1
	d_cereals	1 if main specialization is cereals	349	0.469914	0.499811	0	1
	HectLanProp	Farm total area in property	349	29.73066	107.5369	0	1870
	d_AATs	1 if is a small farm (AAT <=10 hectares)	349	0.492837	0.500667	0	1
	d_AATms	1 if is a medium small farm (AAT >10 <=50 hectares)	349	0.383954	0.487045	0	1
	d_AATml	1 if is a medium large farm (AAT >50 <=100 hectares)	349	0.083095	0.276421	0	1
	d_AATI	1 if is a large farm (AAT >100 hectares)	349	0.040115	0.19651	0	1
Household characteristics	d_ExPartT	1 if have external worker part time	349	0.091691	0.289003	0	1
	d_ExFullT	1 if have external worker full time	349	0.057307	0.232761	0	1
	d_HPartT	1 if have Household worker part time	349	0.183381	0.387534	0	1
	d_HFullt	1 if have Household worker full time	350	0.871429	0.335204	0	1
	d_Unemployed	1 if presence of unemployed in the household	346	0.054913	0.228141	0	1
Farmer characteristics	d_Over65	1 if presence of over 65 on household	350	0.537143	0.499332	0	1
	d_higheduc	farmer with high school, degree or PHD title	350	0.294286	0.456373	0	1
	d_LowEduc	farmer with no title, primary or middle school title	350	0.705714	0.456373	0	1
	Age	Age of respondent	347	63.29683	13.96263	25	92
	d_livOnFarm	1 if live on farm (alone or with family or only the family)	347	0.85879	0.348741	0	1
	d_Exit	1 if farmer intend to leave farm activity	350	0.145714	0.353325	0	1
	d_Sellpro	1 if sell products to processing firms	350	0.071429	0.257908	0	1
	d_selldea	1 if sell products to wholesale dealer	348	0.321839	0.467854	0	1
	d_sellcoo	1 if sell products to cooperative	347	0.636888	0.481591	0	1
	d_sellcon	1 if sell products to consumers	347	0.198847	0.399709	0	1
CAP payments	d_sellotfa	1 if sell products to another farm	347	0.083574	0.277147	0	1
	importSFP	Amount of Single Farm Payment received	257	7539.428	26404.53	36	350000
	ImpOthPaym	Amount of other CAP payments received	25	27418.4	66675.45	200	310000
	NEntitlem2011	Number of entitlements owned	44	55.29545	188.2768	1	1200
	ImpPayOnRevenue	Average influence of CAP payments on revenue	253	2.217391	1.437927	1	6



## Comparative Analysis of Factor Markets for Agriculture across the Member States

245123-FP7-KBBE-2009-3

### The Factor Markets project in a nutshell

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

