SPARD

Spatial Analysis of Rural Development Measures
Contract No. 244944

Work Package No. 5

June 2012

D5.2-France

Calibration of model and estimation - FRANCE -

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Document status

Public use	
Confidential use	X
Draft No.3	05/10/2012
Final	Date
Submitted for internal review	Date

COOPERATION

Table of content

1. Introduction

SPARD 5.2 activities are highly data driven, and rely on Case-Study (CS) data availability and progress.

The aim of the study is twofold. Firstly, the uptake of Rural Development measures is statistically and econometrically analysed, by using data at a fine geographical level. Secondly, the additional effects of these policy measures are estimated on a range of available impact indicators. The studied period is 2007-2010 (or 2011 depending on the impact indicators considered).

Observations are 'revisited NUTS4 regions', some NUTS4 regions being split to account for the limits of less favoured areas. On average, ten French municipalities constitute one of these observed regions.

At this fine geographical level, the uptake is frequently nil. The first step of our analysis models the probability of a positive uptake, with and without taking into account any spatial spillover effect. In these preliminary results, the spatial lag model uses a spatial weight matrix that identifies the immediate neighbours of each observation.

The second step estimates diverse participation density indicators according to measures. The Heckman specification of the Tobit model uses Inverse Mills Ratio calculated with the results of the first step. For each measure, the first indicator used is the proportion of measure beneficiaries. For 121 investment measure, we also calculated the investment aid per agricultural area unit. For 214 agrienvironmental measures, we used the proportion of engaged area. For each measure, the estimated uptake probabilities of the other measures are included in the set of explanatory variables, to test how the participation in each measure impacts the participation in the others. Estimated uptake probabilities are preferred to observed participation to avoid endogeneity biases.

To examine additional effects of the measures on agricultural and environmental characteristics, the changes in these characteristics between 2007 and 2010 are used as the dependent variables and the estimated uptake probabilities are included into the regressors. To be sure to isolate the additional effect of measures, we include the level of studied agricultural and environmental characteristics in 2007 in the explanatory variables of all regressions. In the uptake regressions, their effect gives indirect information about the geographical targeting of the measures. Indeed, given the available data, the eligibility of farmers in the different measures is unknown. Then the observed uptake reflects both the supply of measure payments by the authorities and the farmers' participation behaviour. This is particularly true

for the measures with designated eligible areas like the 214I measures. We do not know these eligible areas. For other measures, the dedicated budget varies from place to place. Again, this information is missing here.

Following what was agreed in the document "Evolving Protocol_task 5.2" and additional discussions (internally or with other SPARD partners), this document provides an overview of the progress achieved so far (late June 2012) by the French team as regards:

- Data availability and processing;
- Modelling approach;
- Econometric analysis and first results;
- Draft conclusions and discussion.

2. Background information and specificities of the case study

We sum-up here what has been already put forward in the Deliverable 5.1. The programming level for RDR2 in France is NUTS2-based, with measures nationally designed and applicable over all of the 21 NUTS2 levels (France mainland; Corsica is not included as a specific RDP applies) on the one hand, and regional components, locally designed, aiming at meeting local environmental issues on the other hand.

The 2007-2013 Rural Development Plan is, in France, oriented towards three main issues:

- increasing the competitiveness of agricultural, forestry and agrifood sectors, considering that it is also crucial to improve the energy performance of agricultural holdings;
- preserving and maintaining the diversity of rural areas, while sustaining an appropriate balance between human activities and the management of natural resources;
- preserving and enhancing the attractiveness of rural areas through the promotion of the diversity of their resources, their activities and actors.

Although it was initially agreed that the French CS would rely on a focus on Midi-Pyrénées NUTS2 region, the whole France mainland (ie Corsica excluded) is concerned by the analyses presented hereafter. Indeed, given a data availability at the national level, in cross-region relevant way, it has been decided to proceed with analyses at that level, with focuses to Midi-Pyrénées when-/where-ever relevant.

3. Cross-measure issues in setting up the analysis

Based on data availability, the following measures are considered in the analyses:

- Measure 121: Farm modernisation
- Sub-Measure 214-A: Grassland premium
- Sub-Measure 214-D: Conversion to organic farming
- Sub-Measure 214-I: Regional AES, locally design, targeted and implemented
- Measures 311 & 313, aggregated into a single measure

3.1. Indicator variables issue

Nine indicators related to the uptake of the above measures, as well as eleven impact indicators, have been built so far, and are meant to be used as dependent variables in the modelling steps.

All of these indicators, calculated from data aggregated at municipality (NUTS5) level, are computed at a 'revisited' (to account for local conditions) NUTS4 level (see definition above).

As such, the case study area (ie France mainland) is made of 3,700 'revisited' NUTS4 regions.

3.1.1. Uptake and participation indicators

- **Measure 121**

$$\boldsymbol{Indic\_121\_payment} = \frac{\sum_{2007}^{\mathbf{2011}} Measure121\_subsidies\ (€)}{UAA\ (ha) in\ 2007}$$

$$\boldsymbol{Indic\_121\_benef} = \frac{\sum_{2007}^{\mathbf{2011}} Nb\ of\ 121\ beneficiaries}{Nb\ of\ farms\ in\ 2007}$$

- **Measure 214 A**

$$\boldsymbol{Indic\_214A\_area} = \frac{\sum_{2007}^{\mathbf{2009}} Area\ (ha) covered\ by\ 214A\ measure}{Permanent\ and\ Temporary\ Grassland\ areas\ (ha) in\ 2007}$$

$$\boldsymbol{Indic\_214A\_benef} = \frac{\sum_{2007}^{\mathbf{2011}} Nb\ of\ 214A\ beneficiaries}{Nb\ of\ farms\ in\ 2007}$$

- **Measure 214 D**

$$\boldsymbol{Indic\_214D\_area} = \frac{\sum_{2007}^{\mathbf{2009}} Area\ (ha) covered\ by\ 214A\ measure}{UAA\ (ha)\ in\ 2007}$$

$$\boldsymbol{Indic\_214D\_benef} = \frac{\sum_{2007}^{\mathbf{2011}} Nb\ of\ 214D\ beneficiaries}{Nb\ of\ farms\ in\ 2007}$$

- **Measure 214 I**

$$\boldsymbol{Indic\_214I\_area} = \frac{\sum_{2007}^{\mathbf{2011}} Area\ (ha) covered\ by\ 214I\ measure}{UAA\ (ha) in\ 2007}$$

NB: This indicator is computed only for NUTS4 levels being 214I recipient at least once over the period (2007-2011), to account for targeting restrictions in the calculation

$$\boldsymbol{Indic\_214I\_benef} = \frac{\sum_{2007}^{\mathbf{2011}} Nb\ of\ 214I\ beneficiaries}{Nb\ of\ farms\ in\ 2007}$$

NB: This indicator is computed only for NUTS4 levels having at least one 214I beneficiary over the period (2007-2011), to account for targeting restrictions in the calculation.

- **Measures 311 & 313**

$$\boldsymbol{Indic\_Axis3\_benef} = \frac{\sum_{2007}^{\mathbf{2011}} (Nb\ of\ 311\ beneficiaries + Nb\ of\ 313\ beneficiaries)}{Nb\ of\ farms\ in\ 2007}$$

3.1.2. Impact indicators

- **Impact on farmsize**

$$\boldsymbol{Indic\_evol\_farmsize} = \frac{Average\ farmsize\ in\ 2009}{Average\ farmsize\ in\ 2007}$$

- **Impact on labour**

$$\boldsymbol{Indic\_evol\_Labour} = \frac{Labour\ on\ farm\ in\ 2010 - Labour\ on\ farm\ in\ 2006}{Labour\ on\ farm\ in\ 2006}$$

Labour on farm is given in AWU, calculated as the weighted sum of AWU from farmers, the members of their family and hired labour.

- **Impact on plot size of annual crops**

$$\boldsymbol{Indic\_evol\_plotsize\_Ann.Crops} = \frac{average\ plot\ size\ of\ annual\ crops\ in\ 2010}{average\ plot\ size\ of\ annual\ crops\ in\ 2007}$$

- **Impact on plot size of grassland (voluntary set-aside + temporary & permanent grassland)**

$$\boldsymbol{Indic\_evol\_plotsize\_Grassland} = \frac{average\ plot\ size\ of\ grassland\ in\ 2010}{average\ plot\ size\ of\ grassland\ in\ 2007}$$

- **Impact on plot size of permanent crops**

$$\boldsymbol{Indic\_evol\_plotsize\_Per.Crops} = \frac{average\ plot\ size\ of\ permanent\ crops\ in\ 2010}{average\ plot\ size\ of\ permanent\ crops\ in\ 2007}$$

- **Impact on plot size of 'other' plots (mainly afforested farm land)**

$$\boldsymbol{Indic\_evol\_plotsize\_Other} = \frac{average\ size\ of\ other\ plots\ in\ 2010}{average\ size\ of\ other\ plots\ in\ 2007}$$

- **Impact on average size of all plots (mainly afforested farm land)**

These four plot size indicators defined above are then computed into an overall plot size indicator (no distinction is made on what the plots are covered by):

$$\boldsymbol{Indic\_evol\_plotsize\_Total} = \frac{Average\ plotsize\ in\ 2010}{Average\ plotsize\ in\ 2007}$$

- **Impact on Farm Nature Value**

This indicator (FNVI, for Farmland Nature Value Index) is a modification of HNV indicator as it is only based on farmland information.

FNVI is indeed made of three different sub-indicators, each of them reflecting specific features of the farmland composition:

- Crop Diversity Index (CDI), adapted from Pointereau et al. (2010)[1];
- Grassland Index (GI);
- Forest Index (FI).

$$\boldsymbol{FNVI} = CDI + GI + FI$$

- **Crop Diversity Index**

CDI (which lies between 1 and 15) is first computed for each farm (i) of 'revisited NUTS4' (j), as:

[1] Pointereau P., Doxa A., Coulon F., Jiguet F., Paracchini M.L., 2010. Analysis of spatial and temporal variations of High Nature Value farmland and links with changes in bird populations: a study on France. *JRC Scientific and Technical Reports EUR 24299 EN*.

$$\mathbf{CDI(i,j)} = 10 + \sum_{i,C(i)\geq\frac{UAA(i,j)}{20}} \left[1 - \frac{C(i) \times 10}{UAA(i,j)}\right]$$

Where:

C(i) : Cultivated area (in ha) of each crop present on the farm, considering only crop areas covering at least 5% of the farm UAA. 15 groups of crops are considered

UAA(i,j) : Sum of cropping areas (in ha) of farm (i) within 'revisited NUTS4' (j), excluding areas under permanent grass and afforested farmlands since they are addressed by GI and FI respectively.

CDI(i,j) is then computed at 'revisited NUTS4 level' (j):

$$\mathbf{CDI(j)} = \frac{\sum_i [CDI(i,j) \times UAA(i,j)]}{UAA(j)}$$

UAA(j): Sum of total farmland areas (in ha) within 'revisited NUTS4 level' (j), excluding areas (in ha) under permanent grass and afforested farmlands.

- **Grassland Index**

GI reflects the share of grasslands within the UAA, and lies between 0 and 10:

$$\mathbf{GI(j)} = \frac{10 \times GA(j)}{UAA(j)}$$

With:

GA(j): Permanent Grassland area (in ha) within 'revisited NUTS4' (j).

UAA(j) : Total farmland area (in ha) of 'revisited NUTS4' (j). Afforested farmland areas are excluded.

- **Forest Index**

FI reflects the share of afforested farmland areas within the UAA, and lies between 0 and 10:

$$\mathbf{FI(j)} = \frac{10 \times AA(j)}{UAA(j)}$$

With:

AA(j): Afforested farmland Area (in ha) within 'revisited NUTS4' (j).

UAA(j) : Total farmland area (in ha) of 'revisited NUTS4' (j).

Based on these four indicators (CDI, GI, FI and FNVI), calculated from 2007 and 2010 data, four impact measures are computed:

$$\textbf{Indic\_evol\_CDI} = \frac{CDI_{2010}}{CDI_{2007}}$$

$$\textbf{Indic\_evol\_GI} = \frac{GI_{2010}}{GI_{2007}}$$

$$\textbf{Indic\_evol\_FI} = \frac{FI_{2010}}{FI_{2007}}$$

$$\textbf{Indic\_evol\_FNVI} = \frac{FNVI_{2010}}{FNVI_{2007}}$$

3.1.3. Outliers detection

Specific attention has been paid to the presence of outliers in the data produced, acknowledging their influence in their analysis.

Various methods have been tested, and we finally retained the following method based on contribution to variance.

We calculated an indicator measuring the contribution to variance. For each observation *i* and for the variable *X*, the indicator is defined as follows:

$$I(i) = \frac{Var(X) - \left(1 - \frac{1}{n}\right) Var(X_{-i})}{Var(X)}$$

This indicator has an inflection point for the values of *X* satisfying the following:

$$(x_i - \bar{x})^2 \geq \frac{1}{4} \sum_k (x_k - \bar{x})^2$$

that is to say

$$x_i = \bar{x} \pm \sqrt{\frac{1}{4} \sum_k (x_k - \bar{x})^2}\ .$$

This means that we would exclude values for which:

$$x_i \leq m + \frac{s\sqrt{n}}{2} \qquad \text{or} \qquad x_i \leq m - \frac{s\sqrt{n}}{2}$$

The advantage of this method is that the choice of excluding outliers depends on the number of observations in the sample (*n*). For a small sample, the method allows a larger contribution to variance. Thus, the method excludes abnormal values, but not extreme values.

3.1.4. Descriptive statistics

Basic statistics on the indicators are presented in Table 1.

A very rough idea on impact indicators is that, during the period, the average farm size at NUTS4 level had increased, along with the average size of plots. In the meantime, on-farm labour demand had decreased, as well as the FNVI (proxying the biodiversity).

Table 1: Descriptive statistics on indicators to be used as dependant variables

	NA's	Zeros	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
Indic_121_payment	8	209	0.0000	11.0200	25.4400	42.3000	49.3900	3733.8000
Indic_121_benef	12	367	0.0000	0.0400	0.0756	0.0963	0.1200	3.0000
Indic_214A_area	58	1027	0.0000	0.0000	0.0589	0.1541	0.2383	1.2407
Indic_214A_benef	12	1149	0.0000	0.0000	0.0377	0.1751	0.2455	1.7143
Indic_214D_area	8	1915	0.0000	0.0000	0.0000	0.0054	0.0039	0.5982
Indic_214D_benef	13	1523	0.0000	0.0000	0.0081	0.0261	0.0256	1.5000
Indic_214I_area	1498	28	0.0000	0.0187	0.0444	0.0835	0.0949	2.4530
Indic_214I_benef	1613	0	0.0052	0.0886	0.1592	0.2292	0.2857	3.0000
Indic_Axis3_benef	13	2837	0.0000	0.0000	0.0000	0.0063	0.0000	0.8750
Indic_evol_farmsize	18	0	0.0662	0.9954	1.0430	1.0524	1.0927	3.2475
Indic_evol_Labour	0	0	-0.6297	-0.1145	-0.0708	-0.0645	-0.0232	1.3900
Indic_evol_plotsize_Ann.Crops	34	9	0.0000	0.8605	0.9476	0.9485	1.0218	8.0000
Indic_evol_plotsize_Grassland	13	22	0.0000	1.0250	1.0910	1.1810	1.2590	5.6140
Indic_evol_plotsize_Per.Crops	190	83	0.0000	0.8705	1.0000	1.3994	1.1739	120.0920
Indic_evol_plotsize_Other	14	4	0.0000	0.8231	0.9708	1.1031	1.1338	67.3232
Indic_evol_plotsize_Total	8	0	0.0690	1.0108	1.0360	1.0351	1.0622	2.6947
Indic_evol_CDI	16	0	0.2614	0.8829	0.9240	0.9314	0.9721	1.8136
Indic_evol_GI	29	8	0.0000	0.9220	0.9822	1.0249	1.0209	27.0574
Indic_evol_FI	14	4	0.0000	0.7184	0.8942	1.0730	1.0835	31.4543
Indic_evol_FNVI	7	0	0.0932	0.9009	0.9367	0.9357	0.9772	2.5758

3.2. Correlations

The correlation matrix of indicators is presented in Table 2.

Many correlations are statistically significant for measure uptakes between each other and between measure uptakes and impact indicators. However, correlations seldom exceed 0.3 and 0.2 respectively. Of course, correlations between the two participation indicators of the same measure are higher, but sometimes far from one, as in the 214I case (measures with designated eligible areas).

Table 2: Correlation matrix ('Pearson') of indicators calculated in Section 3.1

	Indic_121_payment	Indic_121_benef	Indic_214A_area	Indic_214A_benef	Indic_214D_area	Indic_214D_benef	Indic_214I_area	Indic_214I_benef	Indic_Axis3_benef	Indic_evol_farmsize	Indic_evol_Labour	Indic_evol_plotsize_Ann.Crops	Indic_evol_plotsize_Grassland	Indic_evol_plotsize_Per.Crops	Indic_evol_plotsize_Other	Indic_evol_plotsize_Total	Indic_evol_CDI	Indic_evol_GI	Indic_evol_FI	Indic_evol_FNVI
Indic_121_payment	1	0,64 ***	0,2 ***	0,1 ***	0,24 ***	0,25 ***	0,07 ***	0,04 .	0,11 ***	0,08 ***	0,03 .	0,16 ***	-0,11 ***	-0,01	0	-0,01	0,05 **	-0,02	0,02	-0,08 ***
Indic_121_benef	0,64 ***	1	0,08 ***	0,1 ***	0,21 ***	0,36 ***	0,13 ***	0,22 ***	0,14 ***	-0,06 ***	0,01	0,06 ***	-0,09 ***	0	0,02	-0,16 ***	-0,03 .	-0,04 **	0,03 .	-0,2 ***
Indic_214A_area	0,2 ***	0,08 ***	1	0,83 ***	0,02	-0,01	-0,01	0,04 .	0,06 ***	0,02	-0,03	0,2 ***	-0,22 ***	0	0,05 **	0,04 *	0,22 ***	-0,04 *	0,07 ***	0,29 ***
Indic_214A_benef	0,1 ***	0,1 ***	0,83 ***	1	-0,01	0	0,03	0,12 ***	0,12 ***	0	0,01	0,25 ***	-0,29 ***	0	0,07 ***	0,08 ***	0,23 ***	-0,03 .	0,1 ***	0,28 ***
Indic_214D_area	0,24 ***	0,21 ***	0,02	-0,01	1	0,51 ***	0,18 ***	0,1 ***	0,08 ***	0,05 **	0	0	-0,07 ***	-0,02	0,01	-0,1 ***	0,12 ***	0,06 ***	-0,01	-0,14 ***
Indic_214D_benef	0,25 ***	0,36 ***	-0,01	0	0,51 ***	1	0,15 ***	0,25 ***	0,18 ***	0	0	-0,02	-0,06 ***	-0,02	-0,01	-0,19 ***	0,13 ***	0,02	0,02	-0,15 ***
Indic_214I_area	0,07 ***	0,13 ***	-0,01	0,03	0,18 ***	0,15 ***	1	0,39 ***	0,11 ***	0	0,05 *	0,03	-0,07 **	0	0,03	-0,09 ***	0,06 **	0,1 ***	0,03	-0,01
Indic_214I_benef	0,04 .	0,22 ***	0,04 .	0,12 ***	0,1 ***	0,25 ***	0,39 ***	1	0,13 ***	-0,02	0,02	0,03	-0,02	0,02	0,03	0,04 .	0	0,02	0,04 *	-0,01
Indic_Axis3_benef	0,11 ***	0,14 ***	0,06 ***	0,12 ***	0,08 ***	0,18 ***	0,11 ***	0,13 ***	1	0	0,05 **	-0,02	-0,01	0	0,01	-0,07 ***	0,06 ***	0	0,04 *	-0,01
Indic_evol_farmsize	0,08 ***	-0,06 ***	0,02	0	0,05 **	0	0	-0,02	0	1	-0,01	0,01	0	0,02	0,06 ***	0,24 ***	-0,01	0,01	0	0,1 ***
Indic_evol_Labour	0,03 .	0,01	-0,03	0,01	0	0	0,05 *	0,02	0,05 **	-0,01	1	-0,03 *	0,03	0	0,03 .	-0,01	0,03	0,03 *	0,03 .	0,03 .
Indic_evol_plotsize_Ann.Crops	0,16 ***	0,06 ***	0,2 ***	0,25 ***	0	-0,02	0,03	0,03	-0,02	0,01	-0,03 *	1	-0,2 ***	0,01	0,29 ***	0,07 ***	-0,03 .	-0,03 *	0,14 ***	0,02
Indic_evol_plotsize_Grassland	-0,11 ***	-0,09 ***	-0,22 ***	-0,29 ***	-0,07 ***	-0,06 ***	-0,07 **	-0,02	-0,01	0	0,03	-0,2 ***	1	-0,01	0	0	-0,08 ***	0,05 **	-0,07 ***	-0,09 ***
Indic_evol_plotsize_Per.Crops	-0,01	0	0	0	-0,02	-0,02	0	0,02	0	0,02	0	0,01	-0,01	1	-0,01	0,04 *	-0,04 *	0	-0,02	-0,01
Indic_evol_plotsize_Other	0	0,02	0,05 **	0,07 ***	0,01	-0,01	0,03	0,03	0,01	0,06 ***	0,03 .	0,29 ***	0	-0,01	1	0,1 ***	0,06 ***	-0,01	0,55 ***	0,12 ***
Indic_evol_plotsize_Total	-0,01	-0,16 ***	0,04 *	0,08 ***	-0,1 ***	-0,19 ***	-0,09 ***	0,04 .	-0,07 ***	0,24 ***	-0,01	0,07 ***	0	0,04 *	0,1 ***	1	-0,08 ***	-0,02	0,01	0,23 ***
Indic_evol_CDI	0,05 **	-0,03 .	0,22 ***	0,23 ***	0,12 ***	0,13 ***	0,06 **	0	0,06 ***	-0,01	0,03	-0,03 .	-0,08 ***	-0,04 *	0,06 ***	-0,08 ***	1	0,04 *	0	0,4 ***
Indic_evol_GI	-0,02	-0,04 **	-0,04 *	-0,03 .	0,06 ***	0,02	0,1 ***	0,02	0	0,01	0,03 *	-0,03 *	0,05 **	0	-0,01	-0,02	0,04 *	1	-0,01	0,16 ***
Indic_evol_FI	0,02	0,03 .	0,07 ***	0,1 ***	-0,01	0,02	0,03	0,04 *	0,04 *	0	0,03 .	0,14 ***	-0,07 ***	-0,02	0,55 ***	0,01	0	-0,01	1	0,18 ***
Indic_evol_FNVI	-0,08 ***	-0,2 ***	0,29 ***	0,28 ***	-0,14 ***	-0,15 ***	-0,01	-0,01	-0,01	0,1 ***	0,03 .	0,02	-0,09 ***	-0,01	0,12 ***	0,23 ***	0,4 ***	0,16 ***	0,18 ***	1

Significance levels : "." = 0.1 ; "*" = 0.05 ; "**" = 0.01 ; "***" = 0.001

3.3. Spatial issues

3.3.1. Spatial weight matrix

The spatial weight matrix we chose to use in our analyses is produced with R from a polygon file of 'revisited NUTS4' unit at France level.

The weight matrix is built from a neighbours' list based on regions with contiguous boundaries, sharing one or more boundary points, in which regions are either listed as neighbours or are absent. The final matrix is a *n* (in our case, *n*=3700 'revisited NUTS4') by *n* weights matrix row standardised. Matrix rows are set as zero for any regions with zero neighbours.

3.3.2. Moran statistics

Similarly to all the analyses that we have conducted, Moran's I as well as Moran plots have been computed with R.

Moran plots, and Moran's indices have been systematically produced prior to any further analysis on each indicator presented in Section 3.1.

As regards Moran statistics, for each indicator, the value of the observed Moran's I, its expectation and its variance under the assumption of randomisation, have been computed (Table 3).

Table 3: Moran statistics

	Moran I statistic	Expectation	Variance
Indic_121_payment	**0.073**	-2.706e-04	7.623e-05
Indic_121_benef	**0.120**	-2.706e-04	9.229e-05
Indic_214A_area	**0.606**	-2.706e-04	9.601e-05
Indic_214A_benef	**0.636**	-2.706e-04	9.600e-05
Indic_214D_area	**0.104**	-2.706e-04	8.875e-05
Indic_214D_benef	**0.174**	-2.706e-04	9.303e-05
Indic_214I_area	**0.038**	-2.706e-04	9.308e-05
Indic_214I_benef	**0.037**	-2.706e-04	9.456e-05
Indic_Axis3_benef	**0.049**	-2.706e-04	8.646e-05
Indic_evol_farmsize	**0.017**	-2.706e-04	9.494e-05
Indic_evol_Labour	**0.041**	-2.706e-04	9.535e-05
Indic_evol_plotsize_Ann.Crops	**0.125**	-2.706e-04	8.734e-05
Indic_evol_plotsize_Grassland	**0.248**	-2.706e-04	9.554e-05
Indic_evol_plotsize_Per.Crops	**0.000**	-2.706e-04	8.223e-05
Indic_evol_plotsize_Other	**0.206**	-2.706e-04	6.360e-05
Indic_evol_plotsize_Total	**0.162**	-2.706e-04	9.487e-05
Indic_evol_CDI	**0.191**	-2.706e-04	9.576e-05
Indic_evol_GI	**0.025**	-2.706e-04	8.130e-05
Indic_evol_FI	**0.139**	-2.706e-04	9.046e-05
Indic_evol_FNVI	**0.166**	-2.706e-04	9.474e-05

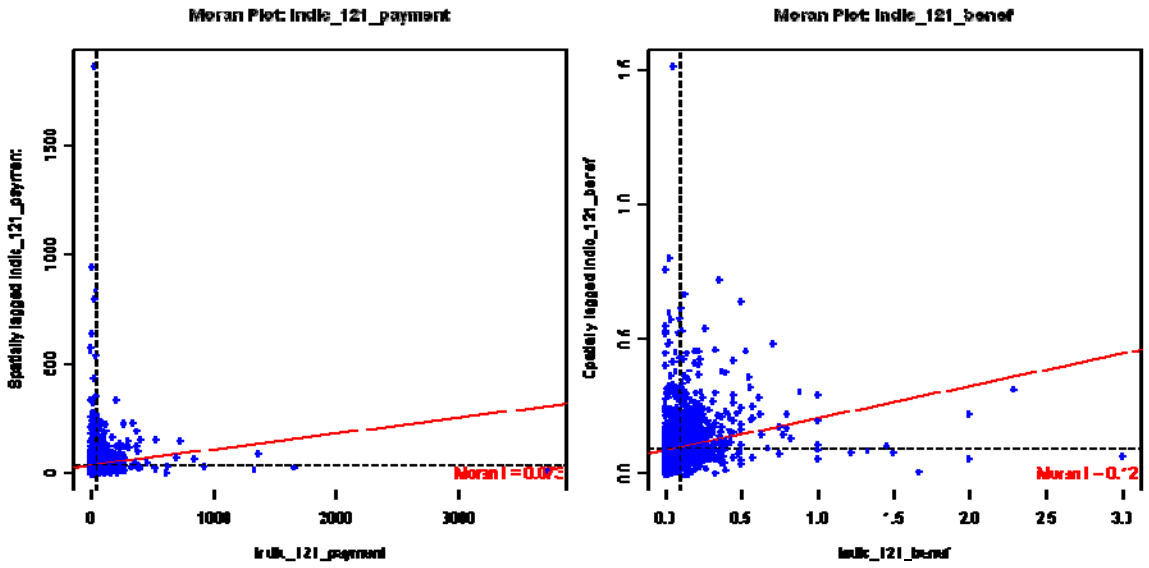
From a general viewpoint, Moran's I are quite low for measure-indicators, except for the indicators related to measures 214A (grassland premium) and 214D (conversion to organic farming). The high Moran's I of measure 214A indicators reflect the spatial importance of grassland areas, while Moran's I related to measure 214D provide information on spatial clusters of both beneficiaries and areas concerned by the measure.

As regards impact indicators, higher Moran I's values are for example observed for Indic_evol_plotsize_Grassland, Indic_evol_plotsize_Other, Indic_evol_CDI reflecting that these indicators are also spatially clustered, while the zero value (associated to Indic_evol_plotsize_Per.Crops) or other low values indicate that concern indicators are randomly scattered over the territory.

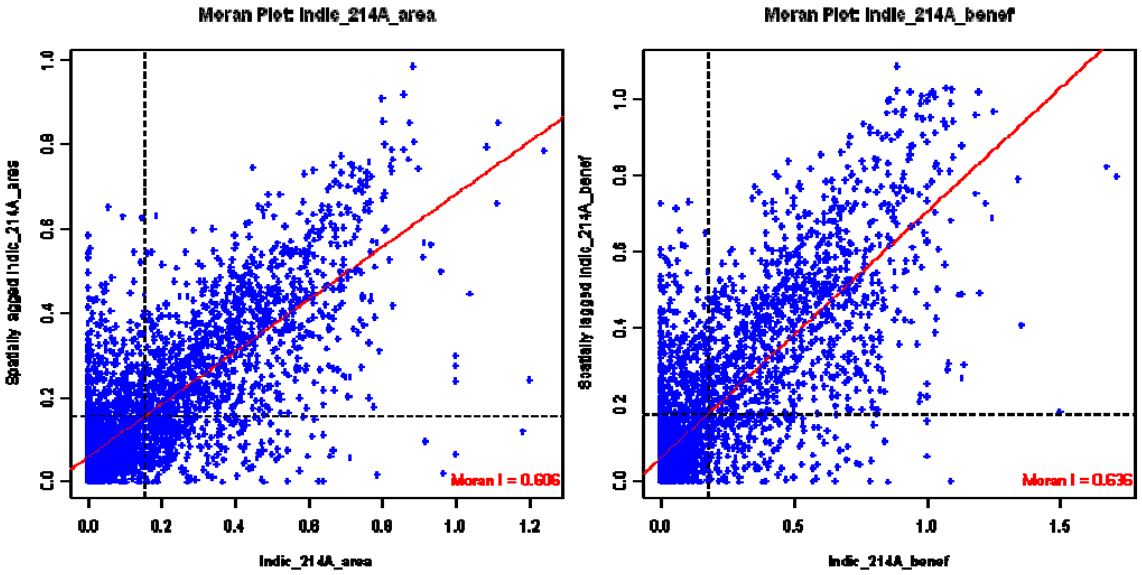
For visual exploration of spatial autocorrelation, Moran plots (spatial data against its spatially lagged values) have been produced (see panels below).

It is interesting to notice that in most cases of low Moran's I, the relative low slope coefficient may be explained by very few observations with high influence. That is particularly obvious for 121 and 214I measures.

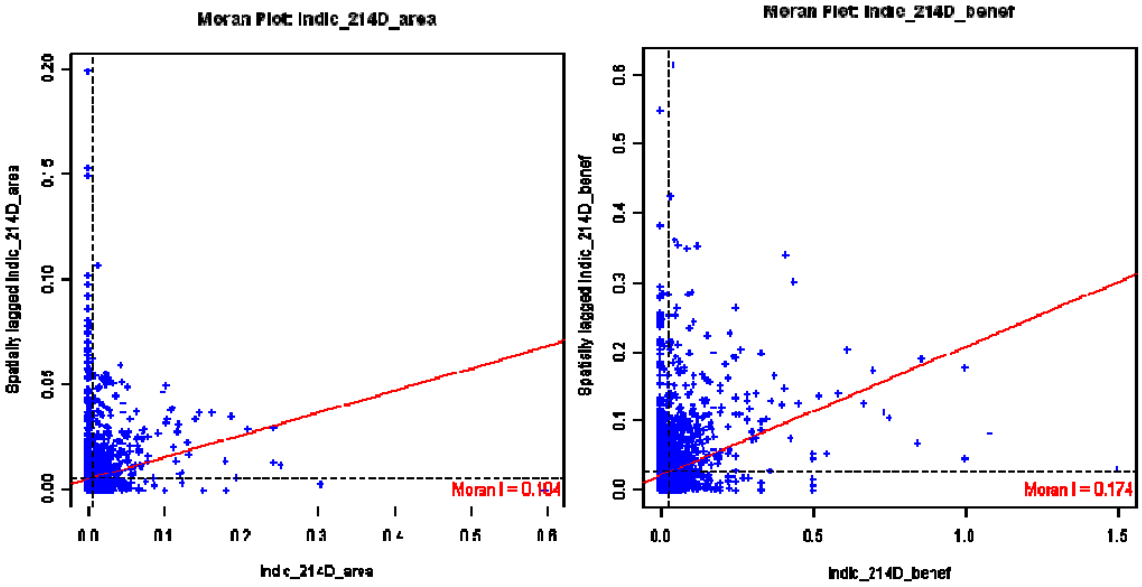
- ***Measure 121***



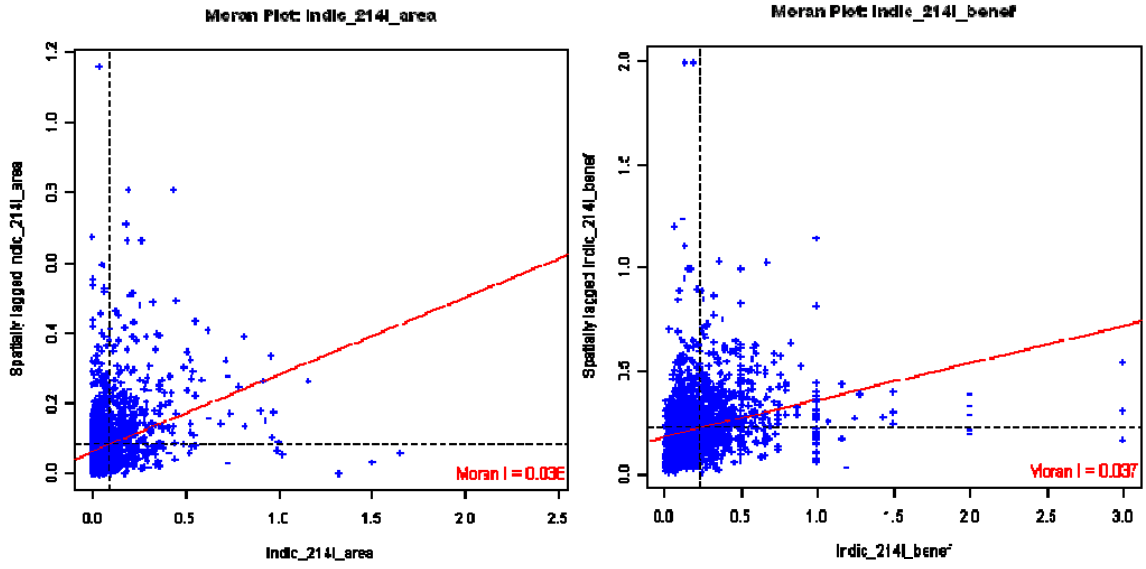
- ***Measure 214A***



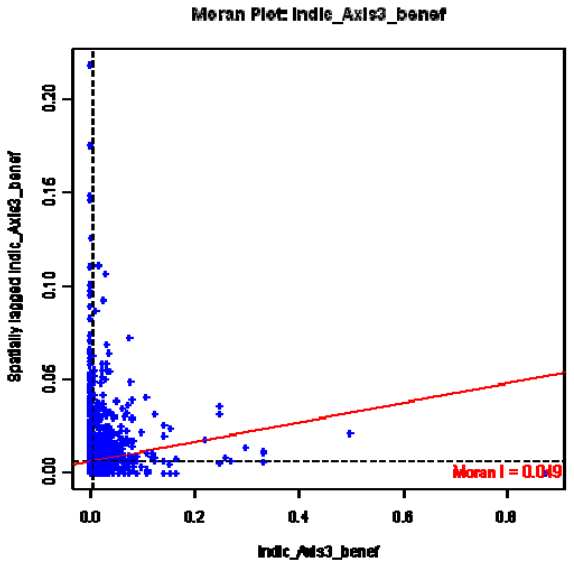
- ***Measure 214D***



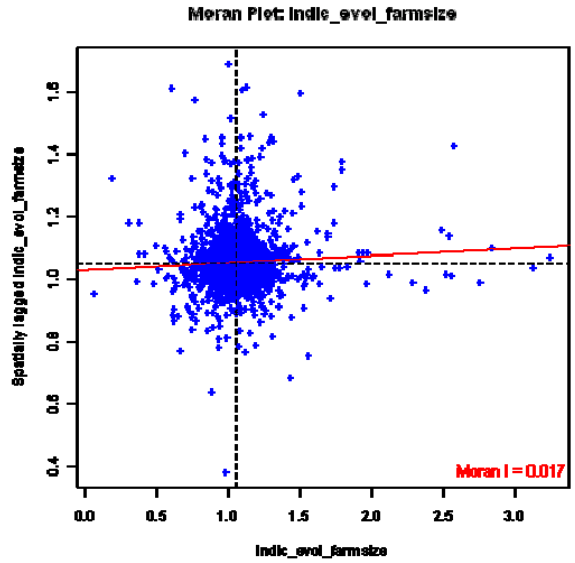
- ***Measure 214I***



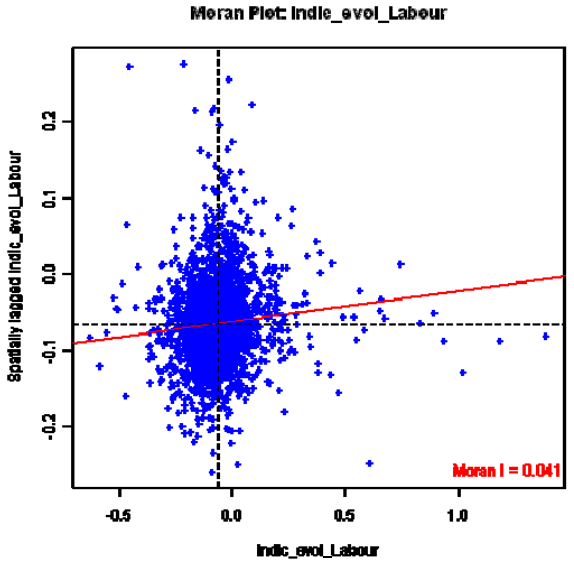
- ***Measures 311 and 313***



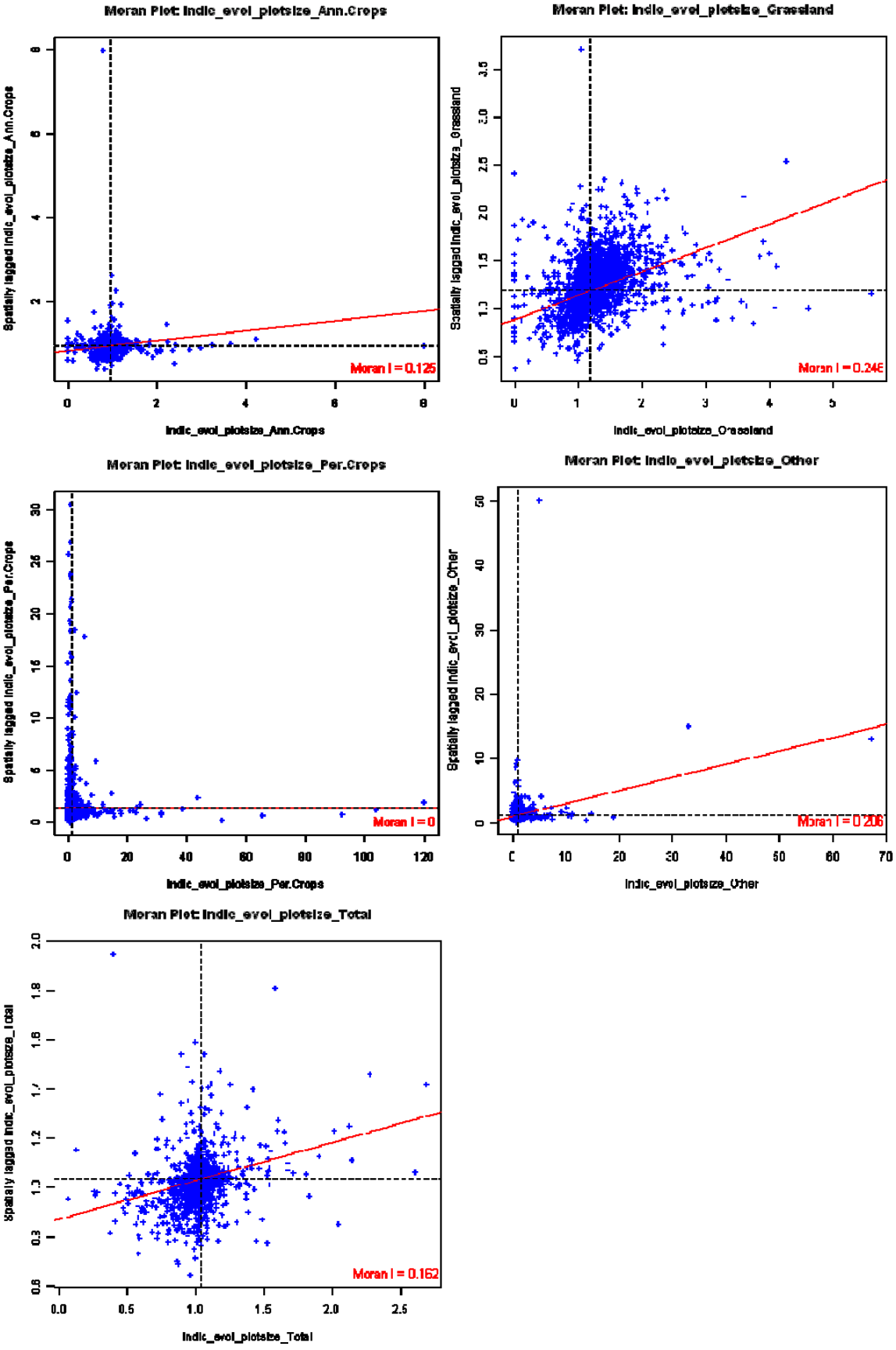
- ***Evolution of farmsize***



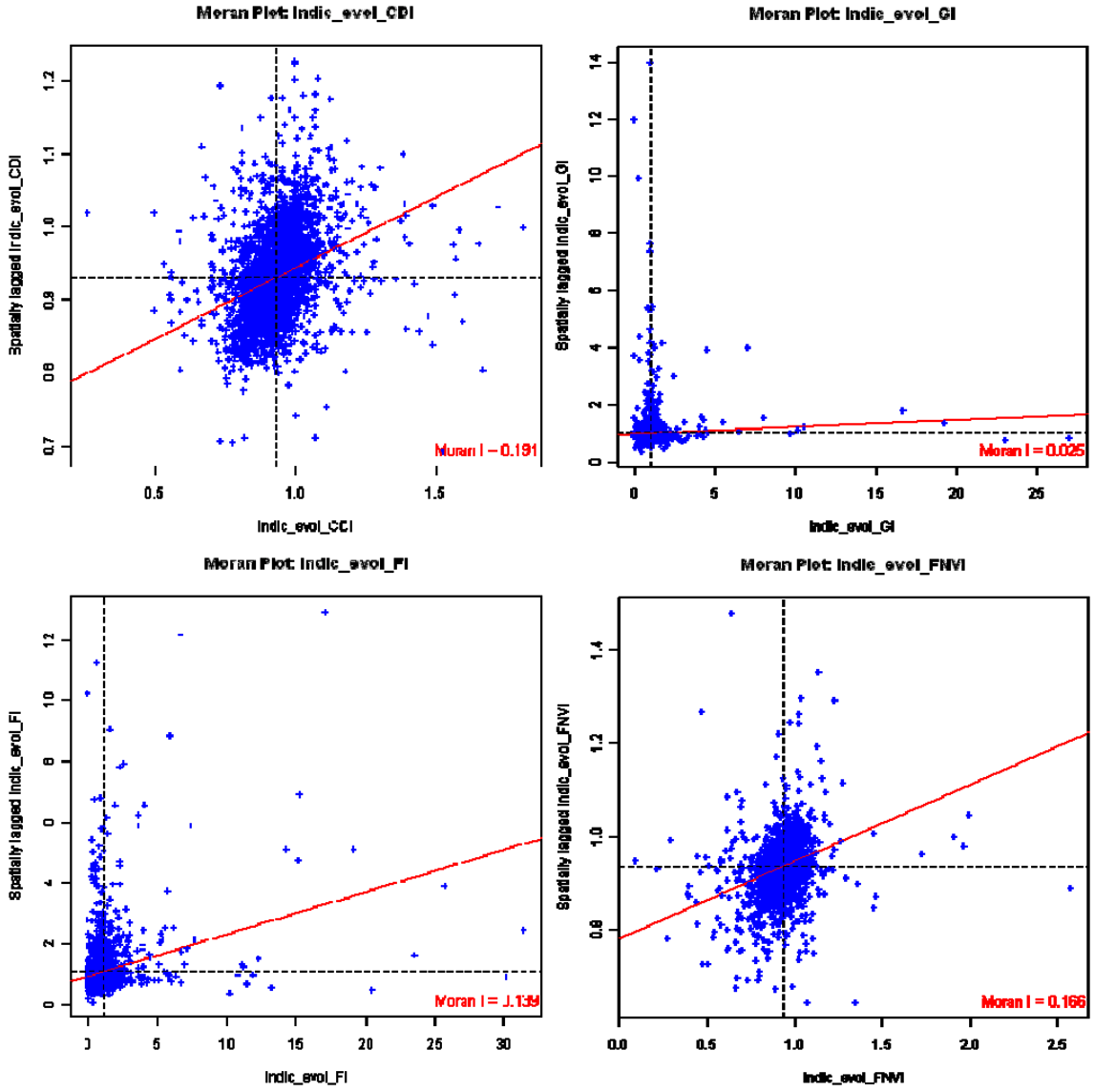
- ***Evolution of labour demand***



- ***Evolution of plot sizes***



- ***Evolution of FNV Index and its components***



3.4. Explanatory variables issue

Explanatory variables were selected among a list of available variables at the scale of interest (or that could be aggregated at the scale of interest, i.e. 'revisited NUTS4 level').

Different sources have been explored, which dependent variables were extracted from.

As such, the dependent variables we used mainly target:

- Farm or farmers' characteristics
- Agricultural structures
- Socio-economic conditions
- Bio-physical or geographical conditions and targetting
- Farmers' situation towards previous RDP programming measures
- Pillar I (cattle) payments

In addition, predicted variables and inverse Mills ratios (derived from models described in Section 4.1), calculated variables as well as initial values (as of 2000, 2006 or 2007) of indicators are also included.

Table 4 presents the various explanatory variables used in the models, while Table 5 presents descriptive statistics for some of them.

Table 4: Details on explanatory variables aggregated at 'revisited NUTS4' level

Variable names	Units	Year	Description
alt_moy	m	-	Average altitude
sth_sau_2000	-	2000	Share of grassland within the UAA
log_mo2006	-	2006	Log value of labour present on farm (farm heads, family labour and hired labour in AWU)
SUPMOYexpl.2006	ha	2006	Average farmsize
MONO1	-		Dummy variable indicating the presence a dominant (more than 50% of the farms and more than 60% of the area) crop in the NUTS4
AGE_MOY.2006	year	2006	Average farmers' age
ASB06_RNET	-	2006	Share of agricultural incomes within household incomes
log_denspop06p1	-	2006	Log of population density
txchom06	%	2006	Unemployment rate
log_montanttotp1	-		Log value of cattle direct payments (1,000 €)
pct_ste.2006	-	2006	Share of partnership farms within all farms
pct_comp.2006	-	2006	Share of company farms within all farms
Indic_Ann.Crop.2007	ha	2007	Average size of plots with annual crops
Indic_Grassland.2007	ha	2007	Average size of grassland plots
Indic_Per.Crops.2007	ha	2007	Average size of plots with permanent crops
Indic_Other.2007	ha	2007	Average size of other plots
Indic_Total.2007	ha	2007	Average size of all plots
Indic_CDI_2007	-	2007	Crop diversity index
Indic_FI_2007	-	2007	Forest index
INDIC_AOC1	-		Dummy indicating the presence of areas supporting Protected Designation of Origin (PDO) products
zauer4561	-		Dummy indicating the presence of rural areas
ZVul1	-		Dummy indicating the presence of nitrate vulnerable zones
natura20001	-		Dummy indicating the presence of Natura 2000 areas
CSP_max2	-		Dummy indicating that 'craft and related trades workers' socio-professional group is the most represented
CSP_max3	-		Dummy indicating that 'manual worker' socio-professional group is the most represented
CSP_max4	-		Dummy indicating that 'intermediate non manual workers' socio-professional group is the most represented
CSP_max5	-		Dummy indicating that 'executives & intellectual persons' socio-professional group is the most represented
CSP_max6	-		Dummy indicating that 'employees' socio-professional group is the most represented
OTE11	-		Dummy indicating that 'field-crop' type of farming is dominant
OTE231	-		Dummy indicating that 'wine, fruits and vegetables' type of farming is dominant
OTE431	-		Dummy indicating that 'mixed cattle' type of farming is dominant
OTE4ab51	-		Dummy indicating that 'beef and dairy' type of farming is dominant
OTE61	-		Dummy indicating that 'mixed crop and livestock' type of farming is dominant
indic_meca1	-	-	Dummy for previous existence of 'mechanisation' payments from RDP1
indic_ctecad1	-	-	Dummy for previous existence of 'AES payment' (other than grassland or crop diversification) payment from RDP1

indic_maerot1	-	-	Dummy for previous existence of 'AES crop diversification payment' from RDP1
indic_phaepmsee1	-	-	Dummy for previous existence of AES grassland premium from RDP1
indic_dja1	-	-	Dummy for previous existence of payment for setting up of young farmers from RDP1
indic_foret1	-	-	Dummy for previous existence of afforestation payments from RDP1
indic_forma1	-	-	Dummy for previous existence of training payments from RDP1
indic_ichn1	-	-	Dummy for previous existence of LFA payments from RDP1
indic_poa1	-	-	Dummy for previous existence of Agricultural Orientation Premium
indic_preret1	-	-	Dummy for previous existence early retirement payments from RDP1
PRED_121_payment	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 121_payment
PRED_121_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 121_benef
PRED_214A_area	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214A_area
PRED_214D_area	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214D_area
PRED_214I_area	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214I_area
PRED_214A_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214A_benef
PRED_214D_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214D_benef
PRED_214I_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214I_benef
PRED_Axis3_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator Axis3_benef
IMRSTEP1	-	-	Inverse Mills ratio from the Probit model
IMRSTEP1_spatial	-	-	Inverse Mills ratio from the spatial Probit model

Other variables presented in the regression

rho	-	-	Parameter of the spatial dependence of the lagged dependent variable
BPT	-	-	Correctly classified rate by the Probit model
BP1	-	-	Correctly classified rate by the Probit model for the NUTS4 having adopted the measure
N	-	-	Number of observations

Table 5: Descriptive statistics of some continuous explanatory variables

	NA's	Zeros	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
alt_moy	0	1	0,00	98,03	189,53	287,35	361,48	2409,20
sth_sau_2000	0	26	0,00	0,08	0,24	0,32	0,53	1,00
mo2006	0	0	6,04	89,09	173,33	223,11	290,15	2338,17
AGE_MOY.2006	0	0	37,21	41,90	43,05	43,20	44,25	52,63
ASB06_RNET	0	0	-0,29	0,00	0,01	0,02	0,03	0,37
denspop06p1	0	1	0,00	16,24	33,37	120,90	82,07	5901,73
txchom06	0	0	0,02	0,07	0,09	0,10	0,11	0,27
montanttotp1	0	184	0,00	34,00	133,00	307,71	365,00	3848,00
pct_ste.2006	0	285	0,00	0,04	0,07	0,09	0,12	0,43
pct_comp.2006	0	51	0,00	0,10	0,19	0,21	0,28	0,79
Indic_Ann.Crop.2007	7	40	0,00	2,06	3,37	3,91	5,08	63,54
Indic_Grassland.2007	7	29	0,00	1,54	2,22	2,60	3,23	34,26
Indic_Per.Crops.2007	7	458	0,00	0,34	1,09	3,30	2,51	217,21
Indic_Other.2007	7	14	0,00	0,34	0,48	1,04	0,74	150,38
Indic_Total.2007	7	0	0,21	2,13	3,01	3,45	4,13	39,54
Indic_CDI_2007	13	0	1,00	2,88	3,85	3,61	4,41	5,70
Indic_FI_2007	5	15	0,00	0,08	0,14	0,28	0,29	10,00

4. Econometric analysis

4.1. Methodology

4.1.1. On uptake indicators

Step1: Probit (Column P1S1 in the tables presenting the results, Section 4.2)

Step2: Tobit, with IMR derived from Step1 as explicative variable (Column P1S2 in the tables presenting the results, Section 4.2)

Step2 bis: Tobit, including IMR and predictions derived from Step1 as explicative variable (Column P1S2PR in the tables presenting the results, Section 4.2)

Step3: Spatial Probit (Column P2S1 in the tables presenting the results, Section 4.2)

Step4: Tobit, including IMR derived from Step3 as explicative variable (Column P3S2 in the tables presenting the results, Section 4.2)

Step4 bis: Tobit, including IMR and predictions derived from Step3 as explicative variables (Column P3S2PR in the tables presenting the results, Section 4.2)

4.1.2. On impact indicators

Two regressions have been conducted on each impact indicator:

- Tobit, including predictions derived from the Probit conducted on uptake indicators (Step1 Section 4.1.1): Column P1S2_*variable* in the tables presenting the results (Section 4.3);
- Tobit, including predictions derived from the spatial Probit conducted (Step3 Section 4.1.1) on uptake indicators: Column P3S2_*variable* in the tables presenting the results (Section 4.3).

4.2. Uptake and participation indicators

- ***Spatial spillover effect***

Result tables presented in this Section 4.2 deal with the analysis of measure uptake. In each table, in the first three columns spatial effects are ignored while the third columns show the results of the spatial lag specification in the first step that estimates the probability of positive uptake.

In the fourth column, the estimate of rho corresponds to this spatial lag effect. It is particularly strong (and significant in all cases), higher than 0.5, for the agrienvironment and axis3 measures, and very high (0.7) for those with designated eligible areas (214I).

Second and third columns show the Tobit model results for participation density indicators. Fifth and sixth column do the same for the result using Inverse Mills Ratios (IMR) based on the Probit estimates taking into account the spatial lag. Comparing the results across measures show that taking into account the spatial lag decreases the IMR effect. This regularity suggests that the IMR catches a part of the spatial effect when it is not specified.

The third column only differs from the second according to the inclusion of other measure uptake probabilities (PRED_*variable*) as explanatory variables. The sixth column differs from the fifth for the same reason.

Again, taking into account the spatial lag highly affects the estimates of these particular explanatory variables. For instance, the very positive effect of organic farming conversion measure uptake on the grassland premium uptake only appears when the spatial lag is taken into account. In contrast, the effect of the grassland premium uptake on the 214I measure disappears with the spatial lag specification, while the 214I uptake effect on the area benefitting of the grassland premium becomes significantly negative.

Taking into account the spatial lag never changes the sign of other explanatory variables and has little effect on mean estimates. For the area entered in organic conversion measures, for the area entered in 214I measures and for Axis3 measure beneficiaries, the significance of many regressors is improved and the explained variability (R2) slightly increases; but only with the inclusion of other measure uptake estimates as regressors (third and sixth columns).

To conclude, the introduction of the spatial lag is mainly relevant to clarify the effect of measure uptakes between each other.

- ***Impacts of other measure uptake on each measure participation rates***

Here we interpret only the sixth column of results presented in the following tables of Section 4.2.

First of all, uptake of Axis3 measures (ie measures 311 and 313) is not significantly affected by other measure uptakes. In contrast, these Axis3 measures strongly affect all the others except the grassland premium.

As already mentioned, the uptake of the organic conversion measure strongly favours both the proportion of grassland premium beneficiaries and the proportion of grassland premium

entered area. To a lesser extent, the reverse also holds. Therefore, grassland premium participation and organic conversion measure participation strengthen each other.

The following subsections provide, measure per measure, rough tabular view of the results obtained from our models.

4.2.1. Measure 121

- Indic_121_payment

	P1S1	P1S2	P1S2PR	P2S1	P3S2	P3S2PR
(Intercept)	-0.17	7.01 ***	6.15 ***	-0.64	7.02 ***	7.23 ***
alt_moy	0.00	0.00 *	0.00 ***	0.00 .	0.00 *	0.00 ***
sth_sau_2000	-0.02	0.68 ***	0.52 **	-0.03	0.68 ***	0.61 ***
log_mo2006	0.64 ***	0.13 ***	-0.25 *	0.70 ***	0.12 ***	0.10
SUPMOYexpl.2006	0.00	-0.01 ***	-0.01 ***	0.00	-0.01 ***	-0.01 ***
MONO1	-0.01	0.04	0.04	0.03	0.04	0.07
AGE_MOY.2006	-0.07 **	-0.08 ***	-0.05 **	-0.07 **	-0.08 ***	-0.08 ***
ASB06_RNET	2.18	-1.21 .	2.06	3.02	-1.20 .	-1.90 *
log_denspop06p1	-0.06	0.12 ***	0.23 ***	-0.08	0.11 ***	0.05
txchom06	0.48	-2.09 ***	-3.55 ***	1.11	-2.08 ***	-2.33 ***
log_montanttotp1	0.21 ***	0.08 ***	0.01	0.20 ***	0.08 ***	0.08 ***
pct_ste.2006	2.49 *	3.58 ***	3.06 ***	2.17 *	3.57 ***	4.05 ***
pct_comp.2006	0.66	0.52 **	0.94 **	0.49	0.52 **	0.87 ***
Indic_Ann.Crop.2007	0.03	0.03 **	0.04 ***	0.05 .	0.03 **	0.02 **
Indic_Grassland.2007	-0.03	-0.02	-0.05 **	-0.04	-0.02	-0.03 .
Indic_Per.Crops.2007	-0.01	0.00 *	0.00	-0.01	0.00 *	0.00
Indic_Other.2007	0.11 *	0.00	0.01	0.12 **	0.00	0.00
Indic_Total.2007	-0.05	-0.07 ***	-0.07 ***	-0.04	-0.07 ***	-0.07 ***
Indic_CDI_2007	0.01	-0.36 ***	-0.36 ***	0.01	-0.36 ***	-0.32 ***
Indic_FI_2007	-0.25 .	0.01	-0.03	-0.24 *	0.01	0.07
INDIC_AOC1	-0.07	-0.06 .	-0.18 **	-0.04	-0.06 .	-0.03
zauer4561	0.12	0.07 .	0.12 *	-0.02	0.06 .	0.04
ZVul1	0.28 *	0.03	-0.03	0.23 *	0.03	0.07
natura20001	-0.05	-0.23 ***	-0.53 ***	0.02	-0.23 ***	-0.22 **
CSP_max2	0.01	0.24	0.34	-0.01	0.24	0.33
CSP_max3	0.05	-0.01	-0.07	0.20	0.00	0.02
CSP_max4	0.04	-0.11	-0.23	0.15	-0.10	-0.10
CSP_max5	0.23	0.03	-0.13	0.35	0.03	0.10
CSP_max6	0.01	-0.07	-0.22	0.08	-0.07	-0.07
OTE11	0.25	-0.10	-0.11	0.14	-0.10	-0.17
OTE231	0.58	0.94 ***	1.11 ***	0.56	0.93 ***	0.84 ***
OTE431	0.67 *	0.32 **	0.58 ***	0.55 .	0.31 **	0.45 **
OTE4ab51	0.51	0.32 *	0.78 **	0.53	0.32 *	0.43 *
OTE61	0.14	0.36 **	0.49 ***	0.10	0.36 **	0.37 **
indic_meca1	0.43	0.30 ***	0.25 ***	0.42 *	0.30 ***	0.28 ***
indic_ctecad1	0.58 ***	0.02	-0.30 *	0.53 ***	0.02	-0.02
indic_maerot1	0.00	-0.01	-0.12 *	-0.06	-0.01	-0.04
indic_phaepmsee1	-0.21	-0.14 **	-0.43 ***	-0.27 .	-0.14 **	-0.22 *
indic_dja1	0.32 .	-0.27 *	-0.13	0.28	-0.28 *	-0.24 .
indic_foret1	0.00	-0.06	-0.11 *	0.00	-0.06	-0.04
indic_forma1	-0.01	-0.01	-0.10 .	0.00	-0.01	-0.05
indic_ichn1	-0.01	0.01	-0.04	-0.08	0.01	-0.05
indic_poa1	0.14	-0.01	-0.08 .	0.17	-0.01	-0.01
indic_preret1	0.26 *	0.05	0.02	0.25 *	0.05	0.03
PRED_121_payment						
PRED_121_benef						
PRED_214A_area						

PRED_214D_area						
PRED_214I_area			1.29 *			-0.13
PRED_214A_benef			0.63 **			0.31 .
PRED_214D_benef			0.65			-0.34
PRED_214I_benef						
PRED_Axis3_benef			1.13 **			0.84 ***
rho				0.17 **		
IMRSTEP1		0.24	0.16			
IMRSTEP1_spatial					0.22	0.21
AIC	960					
BPT	0.847			0.857		
BP1	0.843			0.855		
N	3684	3480	3480	3684	3480	3480
R2		0.45	0.46		0.45	0.46
Pv_mod		0	0		0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

- Indic_121_benef

	P1S1	P1S2	P1S2PR	P2S1	P3S2	P3S2PR
(Intercept)	1.52	0.11	0.20	1.49	0.12	0.08
alt_moy	0.00 .	0.00 **	0.00	0.00 .	0.00 **	0.00
sth_sau_2000	-0.49 .	0.14	0.13	-0.56 .	0.14	0.10
log_mo2006	0.61 ***	0.09 ***	0.04	0.64 ***	0.08 ***	-0.03
SUPMOYexpl.2006	0.00	0.00	0.00	0.00	0.00	0.00
MONO1	0.12	0.03	0.07	0.21	0.04	0.05
AGE_MOY.2006	-0.10 ***	-0.07 ***	-0.08 ***	-0.10 ***	-0.07 ***	-0.06 ***
ASB06_RNET	-1.65	-0.11	0.28	-2.01	-0.08	0.48
log_denspop06p1	-0.06	0.09 ***	0.10 *	-0.04	0.09 ***	0.11 ***
txchom06	0.23	-1.81 ***	-1.88 **	-0.04	-1.84 ***	-2.27 ***
log_montanttotp1	0.26 ***	0.03 *	0.02	0.25 ***	0.03 *	0.01
pct_ste.2006	0.77	2.27 ***	2.35 ***	0.93	2.29 ***	2.35 ***
pct_comp.2006	0.49	0.77 ***	0.97 ***	0.33	0.76 ***	0.98 ***
Indic_Ann.Crop.2007	0.03 .	0.02 **	0.02 *	0.03 *	0.02 **	0.02 **
Indic_Grassland.2007	0.00	0.02	0.01	-0.01	0.02	0.01
Indic_Per.Crops.2007	0.00	0.00	0.00	0.00	0.00	0.00
Indic_Other.2007	0.11 **	0.01 **	0.01 **	0.10 ***	0.01 **	0.01 **
Indic_Total.2007	-0.08 **	-0.01	-0.01	-0.07 **	-0.01	-0.01
Indic_CDI_2007	-0.04	-0.20 ***	-0.20 ***	-0.06	-0.20 ***	-0.20 ***
Indic_FI_2007	-0.30 *	-0.16 ***	-0.17 ***	-0.29 **	-0.16 ***	-0.17 ***
INDIC_AOC1	-0.08	-0.03	-0.04	-0.11	-0.03	-0.06 .
zauer4561	0.10	0.09 **	0.09 *	0.14	0.09 **	0.10 **
ZVul1	0.18 .	0.02	0.04	0.14	0.02	0.01
natura20001	-0.27 .	-0.11 *	-0.10	-0.28 .	-0.11 *	-0.17 **
CSP_max2	-0.47	0.43 *	0.42 *	-0.58	0.44 *	0.47 *
CSP_max3	-0.30	0.22 *	0.22 *	-0.41	0.22 *	0.19 .
CSP_max4	-0.36	0.18 .	0.17	-0.50	0.18 .	0.13
CSP_max5	-0.40	0.21	0.20	-0.52	0.21	0.16
CSP_max6	-0.30	0.23 *	0.23 *	-0.44	0.23 *	0.18 .
OTE11	0.12	-0.29 *	-0.32 *	0.03	-0.30 *	-0.33 **
OTE231	0.73 .	0.76 ***	0.70 ***	0.58	0.75 ***	0.75 ***
OTE431	0.92 **	-0.04	-0.05	0.86 **	-0.05	0.02
OTE4ab51	0.39	-0.04	-0.04	0.23	-0.04	0.06
OTE61	0.27	0.05	0.04	0.29	0.05	0.07
indic_meca1	0.56 *	0.12 *	0.13 *	0.69 **	0.12 *	0.10 *
indic_ctecad1	0.58 ***	0.03	0.00	0.57 ***	0.02	-0.04
indic_maerot1	0.17	-0.01	-0.02	0.21 .	-0.01	-0.04
indic_phaepmsee1	0.06	-0.08 *	-0.21 *	0.05	-0.08 *	-0.17 *
indic_dja1	0.14	-0.27 *	-0.23 .	0.13	-0.28 *	-0.21 .
indic_foret1	-0.01	-0.04	-0.04	0.00	-0.04	-0.05
indic_forma1	0.06	-0.02	-0.05	0.04	-0.02	-0.05
indic_ichn1	-0.16	-0.06 .	-0.10	-0.17 .	-0.06 .	-0.10 *
indic_poa1	0.06	0.01	0.00	0.05	0.01	-0.01
indic_preret1	0.23 **	0.01	0.01	0.23 **	0.01	0.00
PRED_121_payment						

PRED_121_benef						
PRED_214A_area						
PRED_214D_area						
PRED_214I_area			-0.05			0.19 .
PRED_214A_benef			0.27 .			0.20
PRED_214D_benef			0.15			0.17
PRED_214I_benef						
PRED_Axis3_benef			0.14			0.44 *
rho				0.11 .		
IMRSTEP1		0.55 ***	0.55 ***			
IMRSTEP1_spatial					0.50 ***	0.51 ***
AIC	1406					
BPT	0.838			0.843		
BP1	0.833			0.839		
N	3681	3318	3318	3681	3318	3318
R2		0.28	0.28		0.28	0.28
Pv_mod		0	0		0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

4.2.2. Measure 214A

- Indic_214A_area

	P1S1	P1S2	P1S2PR	P2S1	P3S2	P3S2PR
(Intercept)	-2.87 *	-3.38 **	-2.78 *	-2.62 *	-2.62 *	-2.04 .
alt_moy	0.00 ***	0.00	0.00 *	0.00 *	0.00	0.00
sth_sau_2000	1.48 ***	2.06 ***	2.16 ***	0.96 ***	1.94 ***	2.31 ***
log_mo2006	0.02	0.07	0.16	0.15 *	0.09 .	-0.22 .
SUPMOYexpl.2006	0.00	0.01 ***	0.01 ***	0.00	0.01 ***	0.01 ***
MONO1	-0.34 .	-0.39 *	-0.34 .	-0.17	-0.37 *	-0.16
AGE_MOY.2006	0.05 *	0.00	-0.03	0.02	-0.01	-0.01
ASB06_RNET	-0.65	1.42	1.58	-1.16	1.26	3.54 *
log_denspop06p1	-0.07	0.05	0.10	-0.06	0.05	0.14 *
txchom06	-3.53 **	-3.10 **	-2.30 .	-1.50	-2.76 **	-4.30 ***
log_montanttotp1	0.18 ***	-0.03	0.00	0.10 **	-0.05	-0.03
pct_ste.2006	-1.84 *	-1.94 ***	-2.11 *	-1.43 *	-1.94 ***	-1.71 **
pct_comp.2006	-0.80 *	-2.04 ***	-2.29 ***	-0.43	-1.90 ***	-1.27 **
Indic_Ann.Crop.2007	0.07 **	0.05 **	0.04 *	0.02	0.04 **	0.04 **
Indic_Grassland.2007	0.22 ***	0.07 **	0.08 **	0.13 ***	0.06 *	0.06 *
Indic_Per.Crops.2007	0.01	-0.01 **	-0.01 .	0.01	-0.01 **	0.00
Indic_Other.2007	0.17 **	-0.01 .	-0.02 *	0.09 ***	-0.01 .	-0.01
Indic_Total.2007	-0.24 ***	-0.08 ***	-0.07 ***	-0.11 ***	-0.07 ***	-0.07 ***
Indic_CDI_2007	0.04	-0.23 ***	-0.27 ***	0.06	-0.23 ***	-0.26 ***
Indic_FI_2007	-0.47 **	0.04	-0.03	-0.29 **	0.05	-0.01
INDIC_AOC1	0.20 **	0.00	0.00	0.04	-0.02	-0.07
zauer4561	0.04	0.04	0.04	-0.13	0.04	0.04
ZVul1	-0.39 ***	-0.44 ***	-0.41 ***	-0.21 **	-0.40 ***	-0.35 ***
natura20001	-0.03	-0.23 *	-0.05	-0.10	-0.23 *	-0.14
CSP_max2	-0.28	-0.09	-0.42	-0.36	-0.09	-0.26
CSP_max3	0.02	-0.13	-0.13	0.25	-0.16	-0.22
CSP_max4	-0.21	-0.15	-0.12	0.17	-0.15	-0.27
CSP_max5	0.19	0.05	-0.04	0.37	0.02	-0.16
CSP_max6	0.04	-0.07	-0.01	0.24	-0.10	-0.18
OTE11	-0.08	0.14	0.17	-0.07	0.20	-0.02
OTE231	0.01	0.82 **	0.65 .	-0.08	0.85 **	0.45
OTE431	-0.21	-0.26	-0.65 *	-0.14	-0.22	-0.47 *
OTE4ab51	-0.29	0.05	-0.40	-0.37	0.09	-0.24
OTE61	-0.40	-0.06	-0.17	-0.31	-0.02	-0.09
indic_meca1	-0.28	0.11	0.18 .	-0.11	0.12	0.13
indic_ctecad1	0.12	-0.16	-0.19	0.02	-0.19	-0.44 .
indic_maerot1	0.37 ***	0.06	0.13	0.21 **	0.01	0.05
indic_phaepmsee1	1.10 ***	0.98 ***	0.81 ***	1.00 ***	0.66 ***	0.53 **
indic_dja1	-0.02	-0.18	-0.32	0.02	-0.18	-0.16
indic_foret1	-0.18 .	0.19 *	0.19 *	-0.16 .	0.21 **	0.12

indic_forma1	0.23 *	0.10	0.14	0.15	0.07	0.01
indic_ichn1	0.17 .	0.85 ***	0.83 ***	0.18 *	0.81 ***	0.62 ***
indic_poa1	0.03	0.02	0.04	0.01	0.02	-0.05
indic_preret1	0.16 *	-0.08	-0.09	0.10	-0.10	-0.13 .
PRED_121_payment			0.65			0.83 *
PRED_121_benef						
PRED_214A_area						
PRED_214D_area						
PRED_214I_area			-0.77			-0.64 **
PRED_214A_benef						
PRED_214D_benef			0.57			1.55 **
PRED_214I_benef						
PRED_Axis3_benef			-1.53 *			0.28
rho				0.58 ***		
IMRSTEP1		0.72 ***	0.70 ***			
IMRSTEP1_spatial					0.34 **	0.31 *
AIC	2146					
BPT	0.857			0.878		
BP1	0.854			0.886		
N	3635	2610	2610	3635	2610	2610
R2		0.43	0.43		0.43	0.43
Pv_mod		0	0		0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

- Indic_214A_benef

	P1S1	P1S2	P1S2PR	P2S1	P3S2	P3S2PR
(Intercept)	-4.14 **	-2.93 ***	-2.66 **	-3.35 **	-2.55 ***	-2.33 **
alt_moy	0.00 ***	0.00 ***	0.00 ***	0.00 **	0.00 ***	0.00 ***
sth_sau_2000	1.64 ***	2.31 ***	2.40 ***	1.39 ***	2.25 ***	2.47 ***
log_mo2006	0.23 ***	-0.13 ***	-0.17	0.29 ***	-0.14 ***	-0.42 ***
SUPMOYexpl.2006	0.00 .	0.01 ***	0.01 ***	0.00 *	0.01 ***	0.01 ***
MONO1	-0.09	-0.22 *	-0.18	0.00	-0.22 *	-0.10
AGE_MOY.2006	0.06 **	-0.01	-0.02	0.05 *	-0.02	-0.01
ASB06_RNET	-3.44 *	1.51 .	2.16 .	-3.04 *	1.64 *	3.83 ***
log_denspop06p1	-0.09 .	0.12 ***	0.16 **	-0.08 *	0.13 ***	0.21 ***
txchom06	-1.97	1.31 *	1.32	-0.97	1.42 *	0.21
log_montanttotp1	0.16 ***	0.06 **	0.07 *	0.10 *	0.05 **	0.05 *
pct_ste.2006	-1.28 .	0.01	-0.11	-1.17	-0.02	-0.06
pct_comp.2006	-1.61 ***	-1.00 ***	-1.01 **	-1.22 ***	-0.90 ***	-0.50 .
Indic_Ann.Crop.2007	0.02	0.00	0.01	0.01	0.00	0.01
Indic_Grassland.2007	0.11 **	0.12 ***	0.12 ***	0.06 .	0.11 ***	0.11 ***
Indic_Per.Crops.2007	-0.01 .	0.00 **	0.00	-0.01	0.00 **	0.00
Indic_Other.2007	0.02	-0.01 .	-0.01 .	0.00	-0.01 .	0.00
Indic_Total.2007	-0.06 .	-0.03 **	-0.03 **	-0.03	-0.03 **	-0.03 **
Indic_CDI_2007	-0.10 *	-0.16 ***	-0.18 ***	-0.07 .	-0.16 ***	-0.19 ***
Indic_FI_2007	0.02	0.05	0.01	0.00	0.04	-0.03
INDIC_AOC1	0.05	0.10 *	0.07	-0.03	0.09 *	0.02
zauer4561	0.10	0.07 .	0.08 .	0.03	0.07 .	0.09 *
ZVul1	-0.21 *	-0.38 ***	-0.37 ***	-0.12 .	-0.36 ***	-0.37 ***
natura20001	-0.05	0.06	0.09	-0.02	0.07	0.03
CSP_max2	-0.22	0.38	0.30	-0.60	0.34	0.31
CSP_max3	-0.85 .	-0.11	-0.13	-1.10 *	-0.11	-0.18
CSP_max4	-0.75	0.05	0.04	-0.93 *	0.06	-0.06
CSP_max5	-0.71	0.13	0.06	-0.95 *	0.13	-0.06
CSP_max6	-0.70	0.01	0.00	-0.97 *	0.01	-0.10
OTE11	0.00	-0.45 **	-0.45 *	-0.03	-0.44 **	-0.54 **
OTE231	0.16	0.30 .	0.26	0.01	0.29 .	0.18
OTE431	0.21	-0.29 *	-0.42 **	0.20	-0.29 *	-0.40 **
OTE4ab51	-0.12	-0.16	-0.29	-0.21	-0.15	-0.24
OTE61	0.00	-0.37 **	-0.39 **	0.01	-0.37 **	-0.36 **
indic_meca1	-0.15	0.18 **	0.20 **	0.20	0.19 **	0.17 **
indic_ctecad1	0.34	0.02	0.04	0.27	-0.01	-0.13
indic_maerot1	0.17 .	-0.14 **	-0.13 *	0.08	-0.15 **	-0.16 **
indic_phaepmsee1	1.30 ***	0.14	0.07	1.20 ***	-0.04	-0.12

indic_dja1	-0.31	-0.18	-0.16	-0.37 *	-0.17	-0.07
indic_foret1	0.01	0.04	0.02	0.05	0.04	-0.03
indic_forma1	0.28 **	0.06	0.06	0.26 *	0.05	0.00
indic_ichn1	0.28 **	0.78 ***	0.76 ***	0.27 ***	0.76 ***	0.66 ***
indic_poa1	0.05	0.00	-0.01	0.04	-0.01	-0.06
indic_preret1	0.04	-0.12 **	-0.12 **	0.04	-0.12 **	-0.14 **
PRED_121_payment			-0.02			0.20
PRED_121_benef						
PRED_214A_area						
PRED_214D_area						
PRED_214I_area			-0.16			0.01
PRED_214A_benef						
PRED_214D_benef			0.47			1.21 **
PRED_214I_benef						
PRED_Axis3_benef			-0.42			0.25
rho				0.35 ***		
IMRSTEP1		0.23 .	0.23 .			
IMRSTEP1_spatial					0.05	0.06
AIC	2255					
BPT	0.852			0.859		
BP1	0.859			0.867		
N	3681	2534	2534	3681	2534	2534
R2		0.76	0.76		0.76	0.76
Pv_mod		0	0		0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

4.2.3. Measure 214D

- ***Indic_214D_area***

	P1S1	P1S2	P1S2PR	P2S1	P3S2	P3S2PR
(Intercept)	-1.04	-9.32 ***	-7.65 **	-1.48 .	-7.17 ***	-6.21 **
alt_moy	0.00	0.00	0.00	0.00	0.00	0.00
sth_sau_2000	-0.23	-0.79 *	-0.67	-0.03	-0.60 *	-0.69 *
log_mo2006	0.49 ***	0.17	-0.19	0.48 ***	-0.26 *	-0.34 *
SUPMOYexpl.2006	0.00 .	-0.01 ***	-0.01 **	0.00	-0.01 **	-0.01 ***
MONO1	0.04	0.01	0.15	0.02	-0.03	0.05
AGE_MOY.2006	-0.03 .	0.05	0.07	-0.03	0.08 *	0.08 *
ASB06_RNET	-3.51 **	-0.83	0.46	-3.27 **	2.36	1.78
log_denspop06p1	-0.24 ***	-0.16	-0.16	-0.16 ***	0.06	-0.03
txchom06	1.68 .	2.79	1.27	1.49 .	1.36	1.18
log_montanttotp1	-0.04 .	-0.14 **	-0.14 .	-0.03	-0.11 **	-0.14 **
pct_ste.2006	0.23	3.21 ***	4.04 **	0.04	3.02 **	3.59 ***
pct_comp.2006	-0.35	0.32	1.58	-0.26	0.65	1.44 *
Indic_Ann.Crop.2007	-0.01	-0.01	0.00	0.00	0.00	0.01
Indic_Grassland.2007	0.09 ***	0.16 **	0.12 *	0.05 .	0.10 **	0.09 *
Indic_Per.Crops.2007	-0.01 .	-0.01 *	-0.01	0.00 .	-0.01 .	-0.01
Indic_Other.2007	-0.02 *	-0.05	-0.04	-0.01	-0.03	-0.02
Indic_Total.2007	-0.02	-0.02	-0.02	-0.01	-0.02	-0.02
Indic_CDI_2007	0.07 *	-0.17 *	-0.14 .	0.06 .	-0.24 ***	-0.20 **
Indic_FI_2007	0.17 *	0.39 *	0.42 *	0.10	0.23	0.29 .
INDIC_AOC1	0.24 ***	0.16	0.09	0.14 **	-0.06	-0.03
zauer4561	-0.16 **	0.03	0.03	-0.19 **	0.16	0.11
ZVul1	0.01	-0.12	-0.06	0.02	-0.13	-0.08
natura20001	-0.02	-0.03	-0.05	-0.01	0.00	-0.04
CSP_max2	0.25	0.84	0.90	0.25	0.52	0.63
CSP_max3	-0.11	0.56	0.64 .	-0.07	0.67 .	0.66 .
CSP_max4	-0.07	0.49	0.51	0.01	0.54	0.49
CSP_max5	-0.10	1.10 *	1.18 *	-0.15	1.18 *	1.12 *
CSP_max6	-0.06	0.63 .	0.62 .	-0.03	0.70 *	0.64 .
OTE11	0.02	0.17	-0.10	0.14	0.16	0.03
OTE231	0.23	0.88 *	0.55	0.24	0.72 .	0.62
OTE431	0.30 .	0.56 .	0.75 .	0.30	0.30	0.51
OTE4ab51	-0.12	0.22	0.44	-0.02	0.30	0.47

OTE61	0.04	0.38	0.40	0.13	0.33	0.35
indic_meca1	-0.20 *	0.25	0.28	-0.17 .	0.42 *	0.40 *
indic_ctecad1	0.31 .	0.27	0.16	0.27 .	-0.06	0.08
indic_maerot1	-0.05	-0.17	-0.23	0.01	-0.14	-0.22 .
indic_phaepmsee1	0.30 ***	0.58 **	0.33	0.21 **	0.32 *	-0.01
indic_dja1	-0.09	0.01	0.64	-0.18	0.05	0.68
indic_foret1	-0.04	-0.20 .	-0.24 *	0.01	-0.18	-0.22 .
indic_forma1	0.02	-0.20	-0.31 *	-0.04	-0.20	-0.28 *
indic_ichn1	0.18 **	0.07	-0.17	0.16 **	-0.09	-0.22 .
indic_poa1	0.22 ***	0.10	-0.01	0.20 **	-0.07	-0.08
indic_preret1	0.04	-0.12	-0.13	-0.01	-0.16	-0.13
PRED_121_payment			-1.49 .			-1.57 *
PRED_121_benef						
PRED_214A_area						
PRED_214D_area						
PRED_214I_area			-0.09			0.02
PRED_214A_benef			0.50			0.80 .
PRED_214D_benef						
PRED_214I_benef						
PRED_Axis3_benef			2.10 .			1.23 *
rho				0.52 ***		
IMRSTEP1		0.81	0.21			
IMRSTEP1_spatial					-0.59 *	-0.46
AIC	4381					
BPT	0.693			0.695		
BP1	0.73			0.716		
N	3684	1777	1777	3684	1777	1777
R2		0.19	0.19		0.19	0.2
Pv_mod		0	0		0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

- ***Indic_214D_benef***

	P1S1	P1S2	P1S2PR	P2S1	P3S2	P3S2PR
(Intercept)	-1.78 *	-3.96 ***	-5.15 ***	-2.33 **	-1.94 *	-2.59 **
alt_moy	0.00	0.00	0.00 *	0.00	0.00	0.00 **
sth_sau_2000	-0.58 **	-0.37 *	-0.57 **	-0.34 *	-0.09	-0.34 *
log_mo2006	0.62 ***	0.24 **	0.01	0.61 ***	-0.09	-0.20 **
SUPMOYexpl.2006	0.00	0.00 .	0.00 *	0.00	0.00	0.00 *
MONO1	-0.25 .	-0.07	-0.06	-0.25 .	0.08	0.08
AGE_MOY.2006	-0.01	-0.02 .	0.01	-0.01	-0.02	-0.01
ASB06_RNET	-7.25 ***	-4.08 ***	-2.84 *	-6.64 ***	-0.88	-1.28
log_denspop06p1	-0.28 ***	-0.09 *	-0.09	-0.22 ***	0.06	-0.01
txchom06	2.04 *	4.32 ***	3.18 **	1.97 *	3.16 ***	2.70 **
log_montanttotp1	-0.03	-0.21 ***	-0.28 ***	-0.02	-0.20 ***	-0.25 ***
pct_ste.2006	0.36	1.02 *	1.08 .	0.34	0.79 .	1.27 **
pct_comp.2006	-0.64 *	0.39	0.92 *	-0.60 *	0.79 **	1.43 ***
Indic_Ann.Crop.2007	-0.02	0.00	0.00	-0.01	0.01	0.00
Indic_Grassland.2007	0.03	0.10 ***	0.09 ***	0.01	0.09 ***	0.07 ***
Indic_Per.Crops.2007	-0.01 ***	-0.01 **	-0.01 *	-0.01 ***	0.00	0.00
Indic_Other.2007	-0.01	-0.01	-0.01	0.00	-0.01	-0.01
Indic_Total.2007	0.00	-0.01	-0.02	0.00	-0.02	-0.02
Indic_CDI_2007	0.06	-0.07 *	-0.05	0.07 .	-0.11 ***	-0.07 *
Indic_FI_2007	0.20 **	0.25 ***	0.31 ***	0.18 **	0.16 **	0.24 ***
INDIC_AOC1	0.18 **	0.22 ***	0.20 **	0.13 **	0.12 *	0.15 **
zauer4561	-0.07	-0.02	-0.02	-0.09	0.02	0.00
ZVul1	0.02	-0.09 *	-0.12 .	0.01	-0.10 *	-0.08 .
natura20001	0.07	-0.08	-0.27 .	0.06	-0.11 .	-0.19 **
CSP_max2	0.07	0.61 .	0.77 *	0.11	0.47	0.62 .
CSP_max3	0.05	0.32 .	0.31 .	0.15	0.27	0.27
CSP_max4	0.10	0.56 **	0.49 **	0.23	0.46 **	0.41 *
CSP_max5	0.37	1.06 ***	1.07 ***	0.47 .	0.80 ***	0.85 ***
CSP_max6	0.11	0.49 **	0.40 *	0.21	0.40 *	0.35 *
OTE11	0.19	-0.69 ***	-0.78 ***	0.25	-0.82 ***	-0.89 ***
OTE231	0.25	0.31	0.32	0.23	0.16	0.09

OTE431	0.36 .	-0.19	0.12	0.32 .	-0.37 **	-0.11
OTE4ab51	0.28	-0.60 **	-0.21	0.28	-0.77 ***	-0.46 *
OTE61	0.00	-0.35 **	-0.27 .	0.05	-0.36 **	-0.32 *
indic_meca1	-0.03	-0.03	-0.09	0.00	-0.01	-0.05
indic_ctecad1	0.27 .	0.11	-0.22	0.22	-0.10	-0.28
indic_maerot1	0.04	0.03	-0.06	0.03	0.01	-0.07
indic_phaepmsee1	0.28 ***	0.38 ***	0.23	0.23 **	0.23 **	-0.07
indic_dja1	-0.30 .	-0.41 *	-0.47 *	-0.30 *	-0.31 .	-0.27
indic_foret1	0.15 *	-0.01	-0.04	0.16 *	-0.08	-0.08
indic_forma1	0.14 .	0.06	-0.03	0.11	0.00	-0.09
indic_ichn1	0.22 **	0.33 ***	0.27 **	0.19 **	0.22 ***	0.11 .
indic_poa1	0.16 **	0.05	0.01	0.15 *	-0.02	-0.03
indic_preret1	0.01	-0.01	-0.05	-0.01	-0.03	-0.06
PRED_121_payment			0.70 *			0.41
PRED_121_benef						
PRED_214A_area						
PRED_214D_area						
PRED_214I_area			0.78			0.22
PRED_214A_benef			0.57 *			0.83 ***
PRED_214D_benef						
PRED_214I_benef						
PRED_Axis3_benef			1.43 *			1.25 ***
rho				0.31 ***		
IMRSTEP1		1.29 ***	1.39 ***			
IMRSTEP1_spatial					0.27	0.58 **
AIC	4077					
BPT	0.729			0.729		
BP1	0.75			0.748		
N	3680	2164	2164	3680	2164	2164
R2		0.45	0.46		0.45	0.46
Pv_mod		0	0		0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

4.2.4. Measure 214I

- ***Indic_214I_area***

	P1S1	P1S2	P1S2PR	P2S1	P3S2	P3S2PR
(Intercept)	1.07	-2.17 *	-2.12 .	0.40	-2.44 *	-2.42 *
alt_moy	0.00 .	0.00	0.00	0.00	0.00	0.00
sth_sau_2000	0.43 *	1.17 ***	1.04 ***	0.50 **	1.35 ***	1.39 ***
log_mo2006	0.22 ***	-0.03	-0.13	0.31 ***	0.06	-0.01
SUPMOYexpl.2006	0.00 *	0.00	0.00 *	0.00 .	0.00 *	-0.01 **
MONO1	0.34 *	-0.02	0.02	0.24	0.09	0.11
AGE_MOY.2006	-0.07 ***	-0.01	0.00	-0.06 ***	-0.04 .	-0.03
ASB06_RNET	-3.77 **	-2.15	-2.75	-3.65 **	-3.54 *	-5.10 **
log_denspop06p1	-0.19 ***	0.06	-0.02	-0.14 ***	-0.02	-0.13 .
txchom06	0.97	1.92 .	1.20	0.68	2.38 *	1.41
log_montanttotp1	0.13 ***	-0.20 ***	-0.23 ***	0.08 ***	-0.15 ***	-0.15 ***
pct_ste.2006	2.09 ***	-0.09	0.51	1.30 **	0.59	1.35 *
pct_comp.2006	0.90 **	0.65	1.36 *	0.26	0.98 **	1.49 ***
Indic_Ann.Crop.2007	-0.02 .	0.01	0.01	-0.01	0.00	0.00
Indic_Grassland.2007	0.01	0.00	-0.01	0.00	0.01	0.01
Indic_Per.Crops.2007	0.01 *	0.00	0.00	0.01 *	0.00	0.00
Indic_Other.2007	-0.01	-0.01	0.00	-0.01	-0.01	-0.01
Indic_Total.2007	0.02	0.00	0.00	0.01	0.00	0.01
Indic_CDI_2007	0.05	-0.02	0.03	0.04	0.00	0.05
Indic_FI_2007	0.09	0.17 *	0.27 *	0.09	0.21 *	0.31 **
INDIC_AOC1	0.19 ***	0.06	0.09	0.09 .	0.12 *	0.18 *
zauer4561	-0.13 *	0.02	-0.01	-0.18 **	-0.03	-0.06
ZVul1	0.23 ***	0.19 *	0.23 *	0.13 *	0.28 ***	0.32 ***
natura20001	0.74 ***	0.16	0.11	0.72 ***	0.38 ***	0.37 ***
CSP_max2	-0.42	-0.12	0.06	-0.46	-0.30	-0.21
CSP_max3	0.14	0.14	0.16	0.18	0.19	0.21

CSP_max4	0.15	0.33	0.30	0.30	0.39	0.37
CSP_max5	0.27	-0.43	-0.31	0.34	-0.33	-0.20
CSP_max6	0.20	0.23	0.20	0.29	0.31	0.29
OTE11	-0.48 .	-0.61 *	-0.75 **	-0.20	-0.74 **	-0.86 **
OTE231	-0.98 ***	0.52	0.44	-0.67 **	0.18	0.08
OTE431	-0.50 **	-0.55 *	-0.24	-0.47 **	-0.71 ***	-0.46 *
OTE4ab51	-1.01 ***	-0.56 .	-0.28	-0.81 ***	-0.88 ***	-0.67 *
OTE61	-0.32 .	-0.37 .	-0.33 .	-0.27 .	-0.46 *	-0.43 *
indic_meca1	0.05	-0.19 .	-0.24 *	0.07	-0.15	-0.22 *
indic_ctecad1	0.35 *	0.37	0.35	0.28 .	0.56 *	0.61 *
indic_maerot1	0.13 .	0.10	0.03	0.11 .	0.14 .	0.09
indic_phaepmsee1	-0.02	0.11	0.00	-0.03	0.11	0.26
indic_dja1	0.07	-0.06	0.09	0.04	-0.01	0.10
indic_foret1	0.01	0.04	0.04	0.01	0.05	0.06
indic_forma1	-0.03	-0.05	-0.13	-0.04	-0.05	-0.10
indic_ichn1	-0.25 ***	0.17 .	0.09	-0.11 .	0.08	0.01
indic_poa1	0.04	-0.13 *	-0.15 .	-0.01	-0.13 .	-0.13 .
indic_preret1	-0.01	-0.10	-0.12 .	-0.01	-0.10	-0.12 .
PRED_121_payment			-0.31			-0.03
PRED_121_benef						
PRED_214A_area						
PRED_214D_area						
PRED_214I_area						
PRED_214A_benef			0.52			-0.03
PRED_214D_benef			-0.52			-0.46
PRED_214I_benef						
PRED_Axis3_benef			1.65 *			1.49 ***
rho				0.70 ***		
IMRSTEP1		-0.57	-0.69			
IMRSTEP1_spatial					0.11	0.20
AIC	4292					
BPT	0.692			0.692		
BP1	0.724			0.729		
N	3686	2171	2171	3686	2171	2171
R2		0.17	0.17		0.17	0.18
Pv_mod		0	0		0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

- ***Indic_214I_benef***

	P1S1	P1S2	P1S2PR	P2S1	P3S2	P3S2PR
(Intercept)	-0.25	0.05	0.82	-0.85	0.47	1.03
alt_moy	0.00 *	0.00 .	0.00	0.00	0.00	0.00
sth_sau_2000	0.41 *	1.68 ***	1.66 ***	0.42 *	1.60 ***	1.50 ***
log_mo2006	0.21 ***	0.00	-0.19	0.29 ***	-0.04	0.02
SUPMOYexpl.2006	0.00 *	0.00 **	0.00 **	0.00	0.00 ***	0.00 **
MONO1	0.46 **	0.07	0.14	0.36 *	0.00	-0.02
AGE_MOY.2006	-0.04 *	-0.08 ***	-0.08 ***	-0.03 *	-0.07 ***	-0.07 ***
ASB06_RNET	-3.07 **	-2.30 *	-0.18	-3.09 **	-1.61 .	-2.74 *
log_denspop06p1	-0.20 ***	0.01	0.09	-0.15 ***	0.05	-0.01
txchom06	2.09 *	1.77 *	1.20	1.90 *	1.36 *	1.59 *
log_montanttotp1	0.11 ***	-0.14 ***	-0.15 ***	0.07 **	-0.16 ***	-0.16 ***
pct_ste.2006	1.89 ***	1.40 **	1.27 *	1.30 **	1.03 **	1.26 **
pct_comp.2006	0.99 ***	0.85 **	1.32 **	0.33	0.64 **	0.80 **
Indic_Ann.Crop.2007	-0.04 **	0.00	0.01	-0.01	0.01	0.01
Indic_Grassland.2007	0.02	-0.01	-0.04 *	0.01	-0.02	-0.03
Indic_Per.Crops.2007	0.01 **	0.00	0.01 .	0.01 *	0.00	0.00
Indic_Other.2007	-0.01	0.01 *	0.02 **	-0.01	0.01 **	0.01 **
Indic_Total.2007	0.02	0.00	0.00	0.01	0.00	0.00
Indic_CDI_2007	0.05	0.05	0.04	0.04	0.04	0.07 *
Indic_FI_2007	0.06	-0.20 ***	-0.23 **	0.05	-0.21 ***	-0.17 **
INDIC_AOC1	0.15 **	-0.02	-0.08	0.07	-0.04	-0.02
zauer4561	-0.19 **	-0.06	-0.04	-0.23 ***	-0.02	-0.04
ZVul1	0.22 ***	0.16 *	0.17 **	0.12 *	0.12 *	0.14 **
natura20001	0.66 ***	0.41 ***	0.34 **	0.63 ***	0.31 ***	0.30 ***

CSP_max2	0.00	0.17	0.13	-0.01	0.20	0.27
CSP_max3	0.03	0.43 **	0.41 **	0.03	0.42 **	0.44 **
CSP_max4	0.03	0.56 ***	0.51 **	0.11	0.56 ***	0.57 ***
CSP_max5	0.29	0.08	-0.04	0.40	0.03	0.10
CSP_max6	0.05	0.43 **	0.38 *	0.09	0.42 **	0.43 **
OTE11	-0.56 *	-0.43 *	-0.47 *	-0.31	-0.35 *	-0.34 *
OTE231	-1.15 ***	0.11	0.11	-0.82 **	0.32 .	0.37 .
OTE431	-0.48 **	-0.73 ***	-0.68 ***	-0.42 *	-0.64 ***	-0.50 **
OTE4ab51	-1.03 ***	-0.89 ***	-0.80 **	-0.83 **	-0.71 ***	-0.58 **
OTE61	-0.26	-0.35 **	-0.32 *	-0.21	-0.31 *	-0.28 *
indic_meca1	0.02	-0.15 .	-0.13 .	0.05	-0.15 *	-0.15 *
indic_ctecad1	0.47 **	0.85 ***	0.81 **	0.46 *	0.69 ***	0.84 ***
indic_maerot1	0.08	0.15 **	0.11 *	0.06	0.14 **	0.12 *
indic_phaepmsee1	-0.04	0.02	-0.32 *	-0.04	0.03	-0.05
indic_dja1	0.13	-0.63 **	-0.48 *	0.19	-0.68 ***	-0.63 **
indic_foret1	0.04	0.16 **	0.12 *	0.05	0.15 **	0.18 **
indic_forma1	0.10	-0.08	-0.16 *	0.11	-0.10 .	-0.12 *
indic_ichn1	-0.25 ***	-0.12 .	-0.21 *	-0.10	-0.07	-0.07
indic_poa1	0.05	-0.08 .	-0.13 *	0.02	-0.09 *	-0.08 .
indic_preret1	0.03	-0.02	-0.03	0.03	-0.02	-0.02
PRED_121_payment			-0.60 .			-0.80 *
PRED_121_benef						
PRED_214A_area						
PRED_214D_area						
PRED_214I_area						
PRED_214A_benef			0.62 **			0.27
PRED_214D_benef			0.68			-0.48
PRED_214I_benef						
PRED_Axis3_benef			0.38			0.40
rho				0.70 ***		
IMRSTEP1		0.47	0.29			
IMRSTEP1_spatial					0.10	0.07
AIC	4406					
BPT	0.677			0.684		
BP1	0.716			0.724		
N	3686	2085	2085	3686	2085	2085
R2		0.32	0.32		0.32	0.32
Pv_mod		0	0		0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

4.2.5. Indic_Axis3_benef

	P1S1	P1S2	P1S2PR	P2S1	P3S2	P3S2PR
(Intercept)	-1.90 *	-5.95 *	-6.54 *	-2.40 *	-2.19 *	-2.11 *
alt_moy	0.00 ***	0.00	0.00	0.00 ***	0.00	0.00
sth_sau_2000	-0.19	0.30	0.49	-0.03	0.50 **	0.72 **
log_mo2006	0.43 ***	0.03	-0.15	0.38 ***	-0.48 ***	-0.62 ***
SUPMOYexpl.2006	0.00 **	0.00	0.00	0.00 *	0.00	0.00
MONO1	-0.18	0.00	0.05	-0.11	0.19	0.29
AGE_MOY.2006	-0.04 *	-0.01	0.00	-0.03	0.04 *	0.04 *
ASB06_RNET	-0.38	1.52	4.04 .	-0.14	1.91	3.66 *
log_denspop06p1	0.12 **	0.33 **	0.45 **	0.13 **	0.18 ***	0.25 ***
txchom06	2.78 **	4.12 .	3.50	2.71 **	0.79	0.32
log_montanttotp1	0.01	-0.17 ***	-0.16 ***	0.03	-0.19 ***	-0.17 ***
pct_ste.2006	-1.52 **	-0.17	-0.56	-0.93	1.69 **	1.66 **
pct_comp.2006	-1.51 ***	-0.87	-1.01	-0.94 **	0.87 *	0.97 *
Indic_Ann.Crop.2007	-0.01	0.02	0.03	-0.01	0.03 .	0.04 *
Indic_Grassland.2007	0.00	0.07 **	0.07 **	0.00	0.07 **	0.08 **
Indic_Per.Crops.2007	-0.01 **	-0.02 .	-0.01	-0.01 *	0.00	0.00
Indic_Other.2007	0.00	-0.02 **	-0.01 *	0.00	-0.01 **	-0.01 *
Indic_Total.2007	0.00	0.02	0.01	0.01	0.01	0.01
Indic_CDI_2007	-0.08 .	-0.19 *	-0.22 **	-0.06	-0.09 *	-0.11 *
Indic_FI_2007	-0.19 *	-0.15	-0.22	-0.16 .	0.06	0.01
INDIC_AOC1	-0.05	0.06	-0.01	-0.02	0.11 *	0.07

zauer4561	0.05	0.11	0.15 .	0.03	0.06	0.07
ZVul1	-0.05	-0.07	-0.11	-0.03	-0.02	-0.01
natura20001	0.09	0.01	-0.05	0.11	-0.10	-0.06
CSP_max2	-0.34	-0.37	-0.43	-0.19	0.05	0.01
CSP_max3	0.00	0.02	-0.01	0.25	0.01	-0.02
CSP_max4	0.10	0.15	0.10	0.33	0.02	-0.02
CSP_max5	-0.16	-0.08	-0.23	0.19	0.04	-0.06
CSP_max6	0.11	0.18	0.14	0.33	0.03	0.00
OTE11	0.44 .	-0.23	-0.25	0.30	-0.71 **	-0.81 **
OTE231	0.34	0.37	0.38	0.19	0.00	-0.14
OTE431	-0.50 **	-0.72	-0.86 .	-0.43 *	-0.14	-0.32
OTE4ab51	-0.38	-0.96 *	-1.05 *	-0.36	-0.50 *	-0.71 **
OTE61	-0.05	-0.16	-0.16	-0.06	-0.10	-0.15
indic_meca1	0.13	0.09	0.10	0.15	-0.06	-0.06
indic_ctecad1	0.64 **	0.09	0.05	0.48 **	-0.66 *	-0.70 *
indic_maerot1	0.10	-0.08	-0.08	0.10	-0.22 **	-0.20 **
indic_phaepmsee1	-0.22 **	-0.26	-0.19	-0.16 .	0.01	0.07
indic_dja1	-0.18	-0.08	-0.11	-0.25	0.10	0.09
indic_foret1	0.09	0.10	0.07	0.07	0.01	-0.02
indic_forma1	0.13 .	0.07	0.08	0.16 .	-0.08	-0.09
indic_ichn1	0.23 **	0.33	0.33	0.20 **	0.04	0.00
indic_poa1	0.05	-0.09	-0.13 .	0.03	-0.16 **	-0.19 **
indic_preret1	0.05	-0.21 **	-0.22 **	0.08	-0.28 ***	-0.28 ***
PRED_121_payment			0.29			0.22
PRED_121_benef						
PRED_214A_area						
PRED_214D_area						
PRED_214I_area			0.22			-0.21
PRED_214A_benef			-0.36			-0.26
PRED_214D_benef			0.99			0.85
PRED_214I_benef						
PRED_Axis3_benef						
rho				0.59 ***		
IMRSTEP1		1.12	1.26			
IMRSTEP1_spatial					-0.42 **	-0.37 *
AIC	3653					
BPT	0.633			0.687		
BP1	0.683			0.607		
N	3680	849	849	3680	849	849
R2		0.62	0.62		0.62	0.63
Pv_mod		0	0		0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

4.3. Impact indicators

In the following tables, and as described in Section 4.1.2, Column P1S2_*variable* reports the results of Tobit with predictions of uptake indicators derived from the Probit conducted in Step1 (Section 4.1.1), while Column P3S2_ *variable* reports the results of Tobit with predictions of uptake indicators derived from the spatial Probit conducted in Step3 (Section 4.1.1).

Although results tables are presented hereafter, their main interpretation and conclusions from a cross-measure perspective are presented in Section 5.

Some light interpretation is nevertheless presented on chosen variables below each table. It concerns variables that are significant in both specification cases (with and without spatial effects).

R2 are in general not satisfying as they range (depending on the indicator considered) between 0.04 and 0.28, indicating that improvements in the estimations are possible.

4.3.1. Indic_evol_farmsize

	P1S2_evol_farmsize	P3S2_evol_farmsize
(Intercept)	0.83 ***	0.73 ***
alt_moy	0.00 .	0.00
sth_sau_2000	0.01	0.00
log_mo2006	0.03 ***	0.01 *
SUPMOYexpl.2006	0.00	0.00
MONO1	-0.01	-0.01
AGE_MOY.2006	0.00 **	0.00
ASB06_RNET	-0.28 **	-0.08
log_denspop06p1	-0.01 **	0.00
txchom06	0.20 **	0.12 *
log_montanttotp1	0.00 *	0.00
pct_ste.2006	0.09 *	0.02
pct_comp.2006	0.00	-0.02
Indic_Ann.Crop.2007	0.00	0.00 .
Indic_Grassland.2007	0.00 *	0.00 **
Indic_Per.Crops.2007	0.00	0.00 *
Indic_Other.2007	0.00 ***	0.00 ***
Indic_Total.2007	0.00 **	0.00 **
Indic_CDI_2007	0.00	0.00
Indic_FI_2007	0.01 .	0.00
INDIC_AOC1	0.02 ***	0.01 *
zauer4561	-0.01 *	0.00
ZVul1	0.01 .	0.00
natura20001	0.03 **	0.00
CSP_max2	-0.06 **	-0.05 **
CSP_max3	0.01	0.00
CSP_max4	0.01	0.00
CSP_max5	0.05 ***	0.04 **
CSP_max6	0.01	0.00
OTE11	0.00	0.01
OTE231	-0.03	0.00
OTE431	0.00	0.01
OTE4ab51	-0.01	0.02
OTE61	-0.01	0.00
indic_meca1	-0.01	-0.01 *
indic_ctecad1	0.04 ***	0.02 *
indic_maerot1	0.00	0.00
indic_phaepmsee1	0.00	0.00
indic_dja1	-0.03 **	-0.03 **
indic_foret1	0.01 *	0.01
indic_forma1	0.00	0.00
indic_ichn1	0.00	0.00
indic_poa1	0.00	0.00
indic_preret1	0.00	0.00

PRED_121_payment	-0.04 *	-0.02
PRED_214I_area	-0.10 *	0.01
PRED_214A_benef	0.01	0.00
PRED_214D_benef	-0.07 *	-0.03
PRED_Axis3_benef	-0.03	-0.02
N	3677	3677
R2	0.05	0.05
Pv_mod	0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

According to the above table, the higher the labour used on farm in 2006, the stronger the growth of average farm size.

4.3.2. Indic_evol_Labour

	P1S2_evol_Labour	P3S2_evol_Labour
(Intercept)	0.10	0.11 .
alt_moy	0.00 **	0.00 **
sth_sau_2000	0.02	0.02
log_mo2006	-0.01	-0.01
SUPMOYexpl.2006	0.00	0.00
MONO1	0.00	0.00
AGE_MOY.2006	-0.01 ***	-0.01 ***
ASB06_RNET	0.23	0.13
log_denspop06p1	0.02 **	0.01 **
txchom06	0.00	0.00
log_montanttotp1	0.00	0.00
pct_ste.2006	-0.06	-0.02
pct_comp.2006	0.05	0.07 **
Indic_Ann.Crop.2007	0.00 *	0.00 *
Indic_Grassland.2007	-0.01 ***	-0.01 ***
Indic_Per.Crops.2007	0.00	0.00
Indic_Other.2007	0.00	0.00
Indic_Total.2007	0.01 ***	0.01 ***
Indic_CDI_2007	0.00	0.00
Indic_FI_2007	0.00	0.00
INDIC_AOC1	0.00	0.00
zauer4561	0.01 *	0.01 .
ZVul1	-0.01	0.00
natura20001	0.00	0.00
CSP_max2	-0.05 .	-0.04
CSP_max3	0.01	0.01
CSP_max4	0.02	0.02
CSP_max5	-0.05 *	-0.04 .
CSP_max6	0.01	0.02
OTE11	0.05 *	0.04 *
OTE231	0.03	0.02
OTE431	0.00	0.00
OTE4ab51	0.00	0.00
OTE61	0.03 *	0.03 *
indic_meca1	0.01	0.01
indic_ctecad1	0.03 *	0.03 **
indic_maerot1	0.01	0.01
indic_phaepmsee1	-0.02	-0.01
indic_dja1	0.03 *	0.03 *
indic_foret1	0.00	0.00

indic_forma1	0.02 **	0.02 **
indic_ichn1	0.00	-0.01
indic_poa1	0.00	0.00
indic_preret1	-0.01 *	-0.01 *
PRED_121_payment	-0.03	-0.03
PRED_214I_area	0.04	0.01
PRED_214A_benef	0.00	0.01
PRED_214D_benef	0.11 *	0.07 .
PRED_Axis3_benef	-0.11 *	-0.05 .
N	3686	3686
R2	0.06	0.06
Pv_mod	0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

The table shows that the higher the average altitude and the population density of 'revisited NUTS4' in 2006, the greater the increase in the demand of labour on farm over time. This is observed whether accounting for spatial effects or not.

'Revisited NUTS4 regions' where 'field crop' or 'mixed-crop and livestock' types of farming are dominant, saw their farm labour use increase over the period.

4.3.3. Indic_evol_plotsize_Ann.Crops

	P1S2_evol_plotsize_Ann.Crops	P3S2_evol_plotsize_Ann.Crops
(Intercept)	0.86 ***	0.66 ***
alt_moy	0.00	0.00
sth_sau_2000	0.10 ***	0.07 ***
log_mo2006	0.02 .	0.01
SUPMOYexpl.2006	0.00 ***	0.00
MONO1	0.04 ***	0.02
AGE_MOY.2006	-0.01 ***	0.00 *
ASB06_RNET	-0.13	0.11
log_denspop06p1	-0.01 *	0.00
txchom06	0.15 *	0.09
log_montanttotp1	0.01 ***	0.00 .
pct_ste.2006	0.25 ***	0.08 *
pct_comp.2006	0.12 ***	0.03
Indic_Ann.Crop.2007	-0.01 ***	-0.01 ***
Indic_Grassland.2007	0.00	0.00 .
Indic_Per.Crops.2007	0.00 *	0.00
Indic_Other.2007	0.00 ***	0.00 ***
Indic_Total.2007	0.01 ***	0.01 ***
Indic_CDI_2007	0.01 ***	0.01 ***
Indic_FI_2007	0.01	0.00
INDIC_AOC1	0.02 **	0.00
zauer4561	-0.01 **	0.00
ZVul1	0.02 **	0.00
natura20001	0.03 **	-0.01 *
CSP_max2	-0.02	-0.01
CSP_max3	0.03 *	0.01
CSP_max4	0.02 .	0.01
CSP_max5	0.02	0.00
CSP_max6	0.02 .	0.01
OTE11	-0.05 **	-0.02

OTE231	-0.09 ***	-0.02
OTE431	-0.01	0.02
OTE4ab51	-0.05 **	0.01
OTE61	-0.02 *	0.00
indic_meca1	0.01	0.01
indic_ctecad1	-0.02	-0.04 ***
indic_maerot1	0.00	-0.01 *
indic_phaepmsee1	-0.03 **	-0.02 *
indic_dja1	0.00	-0.01
indic_foret1	0.00	0.00
indic_forma1	0.00	0.01 *
indic_ichn1	-0.03 ***	-0.01
indic_poa1	0.00	-0.01
indic_preret1	0.00	0.00
PRED_121_payment	0.00	0.02
PRED_214I_area	-0.24 ***	-0.02 .
PRED_214A_benef	0.06 **	0.04 **
PRED_214D_benef	-0.01	-0.01
PRED_Axis3_benef	0.03	-0.01
N	3663	3663
R2	0.24	0.24
Pv_mod	0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

4.3.4. Indic_evol_plotsize_Grassland

	P1S2_evol_plotsize_Grassland	P3S2_evol_plotsize_Grassland
(Intercept)	0.41 ***	0.39 ***
alt_moy	0.00 **	0.00 ***
sth_sau_2000	-0.01	-0.03
log_mo2006	0.02	0.01
SUPMOYexpl.2006	0.00	0.00
MONO1	-0.02	-0.03 .
AGE_MOY.2006	0.01 **	0.01 ***
ASB06_RNET	0.08	0.17
log_denspop06p1	-0.02 *	-0.01 *
txchom06	-0.04	-0.06
log_montanttotp1	0.00	0.00
pct_ste.2006	-0.01	-0.05
pct_comp.2006	-0.02	-0.02
Indic_Ann.Crop.2007	0.00 .	0.00 .
Indic_Grassland.2007	0.00	0.00
Indic_Per.Crops.2007	0.00 .	0.00 *
Indic_Other.2007	0.00	0.00
Indic_Total.2007	-0.01 **	-0.01 ***
Indic_CDI_2007	0.03 ***	0.03 ***
Indic_FI_2007	0.03 ***	0.03 ***
INDIC_AOC1	0.02 **	0.02 **
zauer4561	-0.01	-0.01
ZVul1	0.00	0.00
natura20001	0.03 .	0.02 *
CSP_max2	0.07 *	0.07 *
CSP_max3	-0.01	-0.02
CSP_max4	-0.01	-0.02
CSP_max5	0.05 *	0.05 .
CSP_max6	0.00	-0.01
OTE11	0.03	0.05 *
OTE231	-0.08 *	-0.06 *
OTE431	-0.03	-0.01

OTE4ab51	-0.02	0.01
OTE61	-0.03	-0.02
indic_meca1	0.00	0.00
indic_ctecad1	-0.02	-0.02 .
indic_maerot1	0.03 ***	0.02 ***
indic_phaepmsee1	0.11 ***	0.09 ***
indic_dja1	0.01	0.01
indic_foret1	0.01	0.01
indic_forma1	0.01	0.01
indic_ichn1	0.00	0.00
indic_poa1	0.01 *	0.01 *
indic_preret1	-0.01 *	-0.01 *
PRED_121_payment	0.19 ***	0.19 ***
PRED_214I_area	-0.14 .	-0.07 **
PRED_214A_benef	-0.20 ***	-0.15 ***
PRED_214D_benef	-0.08	-0.10 *
PRED_Axis3_benef	0.11 .	0.13 ***
N	3680	3680
R2	0.27	0.28
Pv_mod	0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

4.3.5. Indic_evol_plotsize_Per.Crops

	P1S2_evol_plotsize_Per.Crops	P3S2_evol_plotsize_Per.Crops
(Intercept)	1.08 ***	0.85 ***
alt_moy	0.00	0.00 .
sth_sau_2000	0.09	0.03
log_mo2006	-0.02	0.01
SUPMOYexpl.2006	0.00	0.00
MONO1	0.09 .	0.06
AGE_MOY.2006	-0.01	-0.01
ASB06_RNET	-0.44	-0.46
log_denspop06p1	0.01	0.01
txchom06	-0.16	-0.03
log_montanttotp1	0.02 *	0.01 .
pct_ste.2006	0.18	-0.01
pct_comp.2006	0.19	0.05
Indic_Ann.Crop.2007	0.00	0.00
Indic_Grassland.2007	0.00	0.00
Indic_Per.Crops.2007	0.00 ***	0.00 ***
Indic_Other.2007	0.01 ***	0.01 ***
Indic_Total.2007	0.00	-0.01
Indic_CDI_2007	-0.01	-0.01
Indic_FI_2007	0.02	0.01
INDIC_AOC1	-0.02	-0.02
zauer4561	0.00	0.01
ZVul1	0.04	0.02
natura20001	0.08 .	0.05 .
CSP_max2	0.00	0.01
CSP_max3	0.08	0.08
CSP_max4	0.06	0.06
CSP_max5	0.04	0.05
CSP_max6	0.09	0.09
OTE11	-0.08	-0.03
OTE231	-0.17 .	-0.09
OTE431	-0.09	-0.06
OTE4ab51	-0.17 .	-0.11
OTE61	-0.03	-0.01

indic_meca1	0.06 *	0.06 *
indic_ctecad1	0.00	-0.01
indic_maerot1	0.04 .	0.04 .
indic_phaepmsee1	-0.08	-0.07 .
indic_dja1	0.02	0.00
indic_foret1	0.02	0.03
indic_forma1	-0.04	-0.02
indic_ichn1	-0.06 .	-0.02
indic_poa1	-0.02	-0.02
indic_preret1	0.01	0.01
PRED_121_payment	-0.06	-0.03
PRED_214I_area	-0.24	-0.02
PRED_214A_benef	0.05	0.06
PRED_214D_benef	0.23	0.08
PRED_Axis3_benef	-0.07	-0.20 *
N	3503	3503
R2	0.04	0.04
Pv_mod	0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

4.3.6. Indic_evol_plotsize_Other

	P1S2_evol_plotsize_Other	P3S2_evol_plotsize_Other
(Intercept)	0.59 **	0.49 **
alt_moy	0.00 ***	0.00 ***
sth_sau_2000	-0.05	-0.08 *
log_mo2006	-0.03	-0.01
SUPMOYexpl.2006	0.00 *	0.00 **
MONO1	0.00	-0.01
AGE_MOY.2006	0.00	0.00
ASB06_RNET	0.15	0.05
log_denspop06p1	0.01	0.01
txchom06	-0.03	0.05
log_montanttotp1	0.00	-0.01
pct_ste.2006	-0.07	-0.11
pct_comp.2006	0.10	0.06
Indic_Ann.Crop.2007	-0.01 ***	-0.01 ***
Indic_Grassland.2007	0.00	0.00
Indic_Per.Crops.2007	0.00	0.00
Indic_Other.2007	-0.01 ***	-0.01 ***
Indic_Total.2007	0.02 ***	0.02 ***
Indic_CDI_2007	0.00	-0.01
Indic_FI_2007	-0.12 ***	-0.12 ***
INDIC_AOC1	0.02	0.02 .
zauer4561	0.00	0.00
ZVul1	-0.01	-0.01
natura20001	0.01	0.00
CSP_max2	-0.03	-0.03
CSP_max3	0.04	0.04
CSP_max4	0.02	0.02
CSP_max5	0.00	0.01
CSP_max6	0.03	0.04
OTE11	0.02	0.03
OTE231	0.03	0.06
OTE431	-0.03	-0.01
OTE4ab51	-0.02	0.01
OTE61	0.02	0.02
indic_meca1	0.00	0.00
indic_ctecad1	-0.05	-0.05 *

indic_maerot1	0.06 ***	0.06 ***
indic_phaepmsee1	-0.04	-0.03
indic_dja1	0.08 **	0.07 *
indic_foret1	0.00	0.00
indic_forma1	0.00	0.01
indic_ichn1	-0.02	0.00
indic_poa1	0.00	0.00
indic_preret1	-0.01	-0.01
PRED_121_payment	-0.05	-0.04
PRED_214I_area	0.01	0.08 *
PRED_214A_benef	0.05	0.05
PRED_214D_benef	0.10	0.01
PRED_Axis3_benef	-0.15	-0.18 **
N	3679	3679
R2	0.12	0.12
Pv_mod	0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

4.3.7. Indic_evol_plotsize_Total

	P1S2_evol_plotsize_Total	P3S2_evol_plotsize_Total
(Intercept)	0.67 ***	0.64 ***
alt_moy	0.00 ***	0.00 ***
sth_sau_2000	0.01	0.01
log_mo2006	0.00	0.00
SUPMOYexpl.2006	0.00 **	0.00 ***
MONO1	-0.01	-0.01
AGE_MOY.2006	0.00	0.00 **
ASB06_RNET	-0.08	-0.04
log_denspop06p1	0.00	0.00
txchom06	0.13 **	0.13 ***
log_montanttotp1	0.01 **	0.00 ***
pct_ste.2006	0.01	-0.01
pct_comp.2006	-0.02	-0.03 *
Indic_Ann.Crop.2007	0.00 **	0.00 ***
Indic_Grassland.2007	0.00	0.00
Indic_Per.Crops.2007	0.00	0.00
Indic_Other.2007	0.00 *	0.00 **
Indic_Total.2007	0.00 ***	0.00 ***
Indic_CDI_2007	0.00 **	0.00 *
Indic_FI_2007	0.00	0.00
INDIC_AOC1	0.00	-0.01 *
zauer4561	0.00	0.00
ZVul1	0.00	-0.01 *
natura20001	0.02 **	0.02 ***
CSP_max2	0.00	0.00
CSP_max3	0.00	0.00
CSP_max4	-0.01	-0.01
CSP_max5	-0.02	-0.02
CSP_max6	-0.01	-0.01
OTE11	0.00	0.01
OTE231	-0.05 ***	-0.04 ***
OTE431	-0.02 .	-0.01 *
OTE4ab51	-0.01	-0.01
OTE61	-0.01	-0.01
indic_meca1	-0.01 *	-0.01 *
indic_ctecad1	0.01	0.00
indic_maerot1	0.00	0.00 .
indic_phaepmsee1	-0.01 .	-0.01 .

indic_dja1	-0.01 .	-0.01 *
indic_foret1	0.00	0.00
indic_forma1	0.00	0.01 .
indic_ichn1	-0.01 .	0.00
indic_poa1	0.00	0.00
indic_preret1	0.01 *	0.01 **
PRED_121_payment	-0.05 ***	-0.04 ***
PRED_214I_area	-0.02	0.01
PRED_214A_benef	-0.01	-0.02 .
PRED_214D_benef	0.00	0.01
PRED_Axis3_benef	-0.06 **	-0.07 ***
N	3685	3685
R2	0.18	0.19
Pv_mod	0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

The results indicate that the higher the average farm size in 2006, the greater the growth of the average size of all plots over the period.

'Revisited NUTS4 regions' where 'wine, fruits and vegetables' types of farming are dominant, saw the average size of their plots decrease over the period.

4.3.8. Indic_evol_CDI

	P1S2_evol_CDI	P3S2_evol_CDI
(Intercept)	0.63 ***	0.67 ***
alt_moy	0.00	0.00
sth_sau_2000	-0.01	0.00
log_mo2006	0.00	0.00
SUPMOYexpl.2006	0.00 ***	0.00 ***
MONO1	0.00	0.00
AGE_MOY.2006	0.00 *	0.00 *
ASB06_RNET	0.03	0.09 .
log_denspop06p1	0.00	0.00
txchom06	0.01	-0.01
log_montanttotp1	0.00	0.00
pct_ste.2006	-0.03	-0.01
pct_comp.2006	-0.04 *	-0.02
Indic_Ann.Crop.2007	0.00 *	0.00 *
Indic_Grassland.2007	0.00 ***	0.00 ***
Indic_Per.Crops.2007	0.00 *	0.00
Indic_Other.2007	0.00 ***	0.00 ***
Indic_Total.2007	0.00	0.00
Indic_CDI_2007	-0.02 ***	-0.02 ***
Indic_FI_2007	0.01 *	0.00
INDIC_AOC1	0.00	0.00
zauer4561	0.00	0.00
ZVul1	0.00	0.00
natura20001	0.00	0.00
CSP_max2	0.00	-0.01
CSP_max3	-0.01	-0.01
CSP_max4	0.00	0.00
CSP_max5	0.00	-0.01
CSP_max6	-0.01	-0.01
OTE11	0.01	0.00

OTE231	-0.02	-0.03 ***
OTE431	0.00	-0.01
OTE4ab51	0.01	-0.01
OTE61	0.00	0.00
indic_meca1	0.00	0.00
indic_ctecad1	0.00	0.00
indic_maerot1	-0.01 **	-0.01 **
indic_phaepmsee1	0.02 **	0.01 *
indic_dja1	0.00	0.01
indic_foret1	0.00	0.00
indic_forma1	0.00	0.00
indic_ichn1	0.02 ***	0.02 ***
indic_poa1	0.00 *	-0.01 **
indic_preret1	0.00	0.00
PRED_121_payment	0.00	0.01
PRED_214I_area	0.03	0.00
PRED_214A_benef	-0.04 ***	-0.04 ***
PRED_214D_benef	0.00	0.05 **
PRED_Axis3_benef	-0.01	-0.01
N	3684	3684
R2	0.19	0.2
Pv_mod	0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

The higher the average farm size in 2006, the greater the increase in the Crop Diversity Index over the period. This suggests that large farms in 2006 have more opportunity to develop or adapt their cropping systems.

4.3.9. Indic_evol_GI

	P1S2_evol_GI	P3S2_evol_GI
(Intercept)	0.74 ***	0.71 ***
alt_moy	0.00	0.00
sth_sau_2000	0.07 *	0.07 **
log_mo2006	0.03 .	0.02
SUPMOYexpl.2006	0.00	0.00
MONO1	0.00	0.00
AGE_MOY.2006	0.00	0.00
ASB06_RNET	-0.33	-0.14
log_denspop06p1	-0.01	-0.01
txchom06	-0.10	-0.15
log_montanttotp1	-0.01 **	-0.02 ***
pct_ste.2006	0.03	-0.02
pct_comp.2006	-0.10 .	-0.10 *
Indic_Ann.Crop.2007	0.00	0.00
Indic_Grassland.2007	0.00	0.00
Indic_Per.Crops.2007	0.00	0.00
Indic_Other.2007	0.00	0.00
Indic_Total.2007	0.00	0.00
Indic_CDI_2007	0.01 **	0.01 **
Indic_FI_2007	0.05 ***	0.04 ***
INDIC_AOC1	0.00	-0.01
zauer4561	0.00	0.01
ZVul1	0.00	0.00
natura20001	0.04 .	0.03 *
CSP_max2	-0.09 *	-0.09 *

CSP_max3	-0.01	-0.02
CSP_max4	0.00	-0.01
CSP_max5	-0.03	-0.04
CSP_max6	-0.01	-0.02
OTE11	0.00	0.01
OTE231	-0.11 **	-0.10 **
OTE431	-0.01	0.00
OTE4ab51	-0.03	-0.01
OTE61	0.00	0.00
indic_meca1	0.01	0.01
indic_ctecad1	0.00	-0.01
indic_maerot1	0.01	0.01
indic_phaepmsee1	-0.01	-0.03 .
indic_dja1	-0.01	0.00
indic_foret1	0.00	-0.01
indic_forma1	0.02 *	0.02 *
indic_ichn1	0.00	0.00
indic_poa1	0.02 *	0.01
indic_preret1	0.01 .	0.01 .
PRED_121_payment	0.04	0.03
PRED_214I_area	-0.13	-0.06 **
PRED_214A_benef	-0.04	-0.01
PRED_214D_benef	-0.02	0.03
PRED_Axis3_benef	-0.02	-0.01
N	3664	3664
R2	0.06	0.06
Pv_mod	0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

Unsurprisingly, the higher the share of grassland in the UAA in 2000, the greater the increase of Grassland Index over the period, while 'revisited NUTS4' regions with a dominance of 'wine, fruits and vegetables' type of farming saw a decrease in their Grassland Index over the period.

4.3.10. Indic_evol_FI

	P1S2_evol_FI	P3S2_evol_FI
(Intercept)	0.41 *	0.35 *
alt_moy	0.00 ***	0.00 ***
sth_sau_2000	-0.08	-0.10 *
log_mo2006	0.00	0.00
SUPMOYexpl.2006	0.00	0.00
MONO1	-0.04	-0.04
AGE_MOY.2006	0.01	0.01 *
ASB06_RNET	-0.31	-0.25
log_denspop06p1	0.01	0.01
txchom06	0.03	0.08
log_montanttotp1	-0.01	-0.01 .
pct_ste.2006	-0.11	-0.14
pct_comp.2006	0.10	0.10
Indic_Ann.Crop.2007	-0.01 **	-0.01 ***
Indic_Grassland.2007	-0.01	-0.01 .
Indic_Per.Crops.2007	0.00	0.00
Indic_Other.2007	-0.01 ***	-0.01 ***
Indic_Total.2007	0.02 ***	0.02 ***

Indic_CDI_2007	-0.02 .	-0.02 *
Indic_FI_2007	-0.16 ***	-0.16 ***
INDIC_AOC1	0.03 .	0.02 .
zauer4561	-0.01	-0.01
ZVul1	0.00	-0.01
natura20001	-0.02	-0.03
CSP_max2	0.05	0.04
CSP_max3	0.03	0.03
CSP_max4	0.02	0.02
CSP_max5	0.02	0.02
CSP_max6	0.03	0.03
OTE11	-0.01	0.00
OTE231	0.09	0.10 .
OTE431	0.01	0.00
OTE4ab51	0.06	0.06
OTE61	0.00	0.00
indic_meca1	0.02	0.02
indic_ctecad1	-0.03	-0.03
indic_maerot1	0.05 **	0.05 **
indic_phaepmsee1	0.02	0.01
indic_dja1	0.01	0.02
indic_foret1	0.00	0.00
indic_forma1	0.00	0.00
indic_ichn1	-0.01	-0.01
indic_poa1	0.01	0.01
indic_preret1	0.00	0.00
PRED_121_payment	-0.09	-0.07
PRED_214I_area	0.10	0.13 **
PRED_214A_benef	0.02	0.05
PRED_214D_benef	-0.09	-0.08
PRED_Axis3_benef	-0.10	-0.15 *
N	3679	3679
R2	0.13	0.13
Pv_mod	0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

4.3.11. Indic_evol_FNVI

	P1S2_evol_FNVI	P3S2_evol_FNVI
(Intercept)	0.65 ***	0.65 ***
alt_moy	0.00 ***	0.00 ***
sth_sau_2000	0.02 **	0.03 ***
log_mo2006	0.01	-0.01
SUPMOYexpl.2006	0.00 .	0.00
MONO1	0.00	0.00
AGE_MOY.2006	0.00	0.00
ASB06_RNET	-0.02	0.07
log_denspop06p1	0.00	0.00 *
txchom06	0.08 *	0.02
log_montanttotp1	0.00	0.00
pct_ste.2006	-0.05 .	-0.03 .
pct_comp.2006	-0.03 *	0.00
Indic_Ann.Crop.2007	0.00	0.00
Indic_Grassland.2007	0.00	0.00 *
Indic_Per.Crops.2007	0.00	0.00
Indic_Other.2007	0.00 ***	0.00 ***
Indic_Total.2007	0.00	0.00
Indic_CDI_2007	0.00	0.00 .

Indic_FI_2007	-0.01 ***	-0.01 ***
INDIC_AOC1	0.00	0.00
zauer4561	0.00	0.00
ZVul1	0.00	0.00
natura20001	0.01	0.01 **
CSP_max2	-0.04 ***	-0.04 ***
CSP_max3	-0.01 *	-0.01 *
CSP_max4	-0.01	-0.01
CSP_max5	0.00	-0.01
CSP_max6	-0.01	-0.01 .
OTE11	0.01	0.00
OTE231	-0.04 ***	-0.05 ***
OTE431	-0.01	-0.01 *
OTE4ab51	-0.01	-0.02 *
OTE61	-0.01	-0.01
indic_meca1	0.01 .	0.00
indic_ctecad1	0.02 **	0.01 *
indic_maerot1	0.00	0.00
indic_phaepmsee1	0.00	0.00
indic_dja1	0.00	0.01
indic_foret1	0.00	-0.01 **
indic_forma1	0.00	0.00
indic_ichn1	0.01 ***	0.01 **
indic_poa1	0.00	0.00
indic_preret1	0.00	0.00
PRED_121_payment	-0.03 **	-0.02 *
PRED_214I_area	0.01	0.00
PRED_214A_benef	-0.02 *	-0.01 .
PRED_214D_benef	0.00	0.05 **
PRED_Axis3_benef	-0.07 ***	-0.03 **
N	3686	3686
R2	0.22	0.22
Pv_mod	0	0

Significance level: '.' = 0.1; '*' = 0.05; '**' = 0.01; '***' = 0.001

From a general viewpoint, intuitively HNV friendly 'revisited NUTS4' areas (ie higher share of grassland in the UAA in 2000 and higher average altitude) saw their Farmland Nature Value Index grow over the period.

5. Discussion

5.1. Cross-measures issues as regards impact indicators

- ***Influence of the probability to uptake measure 121 (Investments)***

According to the above tables, the probably to uptake measure 121 reduces the average farm size over time, but this cannot be considered as a strong result as the coefficient is not significant when accounting for spatial effects.

This probability has a negative influence on the growth of the average size of all plots, it has however a positive influence on the growth of average grassland plots, and this is confirmed in both specifications (with and without spatial effects).

In addition, the predicted probability influences negatively the Farmland Nature Value Index, in both specifications (with and without spatial effects).

- ***Influence of the probability to uptake measure 214A (Grassland premium)***

According to the above tables, the probability to uptake measure 214A has a positive influence on the growth of the average size of plots with annual crops and a negative influence on the growth of the average size of grassland plots, and this is valid both with and without accounting for spatial effects. A negative influence on the growth all plots' average size is revealed only when spatial effects are considered.

The probability to uptake measure 214A constrained the increase of Crop Diversity Index and the increase of Farmland Nature Value Index over the period. This is observed when accounting for spatial influence or not.

- ***Influence of the probability to uptake measure 214D (Conversion to organic farming)***

According to the above tables, the higher the probability to uptake measure 214D (conversion to organic farming), the stronger the reduction of farm size and the stronger the increase of labour on farm, within 'revisited NUTS4' areas. Although less pronounced, the effect on labour is still valid when accounting for spatial issues. That is not the case with the effect on farm size.

Meanwhile, accounting for spatial effect shows that the probability to uptake measure 214D contributes to the decrease in the average size of grassland plots over time, but to the increase in the Crop Diversity Index, and more generally in the Farmland Nature Value Index.

- ***Influence of the probability to uptake measures 311 and 313 (diversification)***

The probability to uptake measures 311 or 313 from Axis3 has a negative impact on the growth of labour demand on farm, and of the average size of all plots. This is confirmed with and without spatial effects.

This negative effect on plots' size increase is revealed for plots of perennial crops and for other plots, but only when considering spatial effects. By contrast, the opposite effect is found, with and without accounting for spatial effects, in the case of grassland plots.

Besides, the probability to uptake measures 311 or 313 negatively influences the increase in Forest Index (FI) and Farmland Nature Value Index, although this is shown only with spatial effects specification in the case of FI.

6. Axis 1 approach, France case study

2 dependant variables to explore the uptake: beneficiary density and payment per hectare of agricultural area in the beginning of the period (2007) for the farm investment aid of measure 121. This measure is available for every farm. It mainly targets investments to comply with environmental and animal welfare regulations. However it is expected that farm productivity and profitability increases are enhanced.

- **Measure 121**

$$\boldsymbol{Indic\_121\_payment} = \frac{\sum_{2007}^{\mathbf{2011}} Measure121\_subsidies\ (€)}{UAA\ (ha) in\ 2007}$$

$$\boldsymbol{Indic\_121\_benef} = \frac{\sum_{2007}^{\mathbf{2011}} Nb\ of\ 121\ beneficiaries}{Nb\ of\ farms\ in\ 2007}$$

	NA's	Zeros	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
Indic_121_payment	8	209	0.0000	11.0200	25.4400	42.3000	49.3900	3733.8000
Indic_121_benef	12	367	0.0000	0.0400	0.0756	0.0963	0.1200	3.0000

The participation indicator are nil or missing in about 10% of our revisited NUTS4 regions. The average participation is 9.6%. The surprising maximum of 300% comes from a rare region where much more farms were created than closed up an after 2007, with these new farms being beneficiaries. There are a little bit more regions with payments than regions with beneficiary farmers: only 217 zeros and missing against 379. This is explained by non farmer beneficiaries like training organisations, companies providing machinery services for the agricultural production and farmers' cooperatives for shared property of machineries (Coopérative d'Utilisation du Matériel Agricoles).

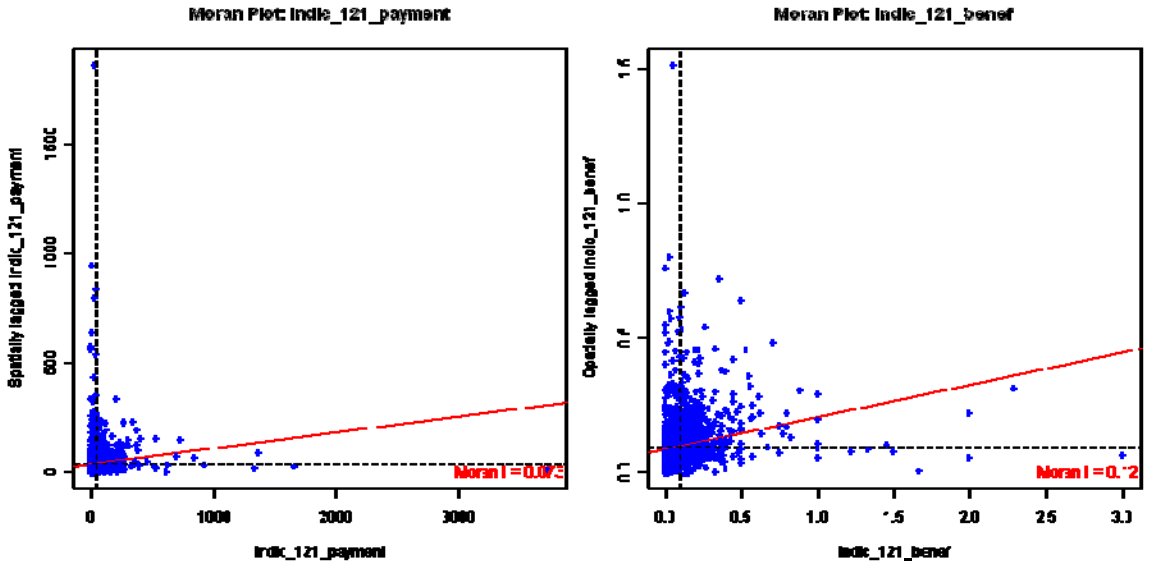
For each indicator, Inverse Mills Ratios (IMRs) were derived from Probit regressions to take into account the zeros, with missing values assimilated to zeros. IMR is significant in the beneficiary regressions but is not in the payment regressions.

6.1. Spatial correlations and spillovers

This measure is not highly spatially concentrated.

	Moran I statistic	Expectation	Variance
Indic_121_payment	**0.073**	-2.706e-04	7.623e-05
Indic_121_benef	**0.120**	-2.706e-04	9.229e-05

- ***Measure 121***



A spatial lag is specified in the probit regressions that explain the strictly positive uptake. It is significantly positive but weak (0.17) for the payments only. The introduction of this spatial lag does not significantly affect the other variable effects. The main consequences of the spatial lag are the change in the effects of pre-2007 rural development measures and the change of the predictions of others pillar two measures of the present period, when the IMRs are derived from the Probit regressions with spatial lag. Considering the payments, negative effects of several pre-2007 measures disappear as well as the positive effects of several current measures like the grassland premium and the geographically targeted measures (214I). Considering the beneficiary density, a positive effect of the axis3 measure appear significantly.

6.2. The effect of the local economic and environmental conditions

Table: The explanatory variables describing the local economic and environmental conditions aggregated at 'revisited NUTS4' level

Variable names	Units	Year	Description
alt_moy	m	-	Average altitude
log_denspop06p1	-	2006	Log of population density
txchom06	%	2006	Unemployment rate
Indic_FI_2007	-	2007	Forest index
INDIC_AOC1	-		Dummy indicating the presence of areas supporting Protected Designation of Origin (PDO) products
zauer4561	-		Dummy indicating the presence of rural areas according to the French classification.
ZVul1	-		Dummy indicating the presence of nitrate vulnerable zones
natura20001	-		Dummy indicating the presence of Natura 2000 areas
CSP_max2	-		Dummy indicating that 'craft and retailed trades workers' socio-professional group is the most represented
CSP_max3	-		Dummy indicating that 'manual worker' socio-professional group is the most represented
CSP_max4	-		Dummy indicating that 'intermediate non manual workers' socio-professional group is the most represented
CSP_max5	-		Dummy indicating that 'executives & intellectual persons' socio-professional group is the most represented
CSP_max6	-		Dummy indicating that 'employees' socio-professional group is the most represented

Regression results	Presence of farmer beneficiaries Probit	Density of beneficiaries Tobit	Presence of payment Probit with spatial lag	Payment per ha Tobit
(Intercept)	1.52	0.08	-0.64	7.23 ***
alt_moy	0.00 .	0.00	0.00 .	0.00 ***
log_denspop06p1	-0.06	0.11 ***	-0.08	0.05
txchom06	0.23	-2.27 ***	1.11	-2.33 ***
Indic_FI_2007	-0.30 *	-0.17 ***	-0.24 *	0.07
INDIC_AOC1	-0.08	-0.06 .	-0.04	-0.03
zauer4561	0.10	0.10 **	-0.02	0.04
ZVul1	0.18 .	0.01	0.23 *	0.07
natura20001	-0.27 .	-0.17 **	0.02	-0.22 **
CSP_max2	-0.47	0.47 *	-0.01	0.33
CSP_max3	-0.30	0.19 .	0.20	0.02
CSP_max4	-0.36	0.13	0.15	-0.10
CSP_max5	-0.40	0.16	0.35	0.10
CSP_max6	-0.30	0.18 .	0.08	-0.07

As regions without any beneficiaries are few, less than 10%, the Probit results are not very significant. Only the forest index has a negative effect on farmers' participation and the presence of payments, while it does not affect the payments par ha. In contrast, nitrate vulnerable zones favour the presence of payments without affecting significantly the presence of farmer beneficiaries. This suggests that collective equipment to manage the agricultural pollution are involved.

Tobit regressions bring additional information.

The unemployment rate and the presence of Natura 2000 designated zones decreases the beneficiary density and the payments per ha. The density of beneficiaries in the farm population increases with the general population density, the ruralness and the dominance of craft and trade in the active population. Payments per ha rise with altitude.

6.3. The effect of agricultural features of the region

Table: The explanatory variables describing agricultural characteristics aggregated at 'revisited NUTS4' level

Variable names	Units	Year	Description
sth_sau_2000	-	2000	Share of grassland within the UAA
log_mo2006	-	2006	Log value of labour present on farm (farm heads, family labour and hired labour in AWU)
SUPMOYexpl.2006	ha	2006	Average farmsize
MONO1	-		Dummy variable indicating the presence a dominant (more than 50% of the farms and more than 60% of the area) crop in the NUTS4
AGE_MOY.2006	year	2006	Average farmers' age
ASB06_RNET	-	2006	Share of agricultural incomes within household incomes
log_montanttotp1	-		Log value of cattle direct payments (1,000 €)
pct_ste.2006	-	2006	Share of partnership farms within all farms
pct_comp.2006	-	2006	Share of company farms within all farms
Indic_Ann.Crop.2007	ha	2007	Average size of plots with annual crops
Indic_Grassland.2007	ha	2007	Average size of grassland plots
Indic_Per.Crops.2007	ha	2007	Average size of plots with permanent crops
Indic_Other.2007	ha	2007	Average size of other plots
Indic_Total.2007	ha	2007	Average size of all plots
Indic_CDI_2007	-	2007	Crop diversity index
OTE11	-		Dummy indicating that 'field-crop' type of farming is dominant
OTE231	-		Dummy indicating that 'wine, fruits and vegetables' type of farming is dominant
OTE431	-		Dummy indicating that 'mixed cattle' type of farming is dominant
OTE4ab51	-		Dummy indicating that 'beef and dairy' type of farming is dominant
OTE61	-		Dummy indicating that 'mixed crop and livestock' type of farming is dominant

Regression results	Presence of farmer beneficiaries Probit	Density of beneficiaries Tobit	Presence of payment Probit with spatial lag	Payment per ha Tobit
sth_sau_2000	-0.49 .	0.10	-0.03	0.61 ***
log_mo2006	0.61 ***	-0.03	0.70 ***	0.10
SUPMOYexpl.2006	0.00	0.00	0.00	-0.01 ***
MONO1	0.12	0.05	0.03	0.07
AGE_MOY.2006	-0.10 ***	-0.06 ***	-0.07 **	-0.08 ***
ASB06_RNET	-1.65	0.48	3.02	-1.90 *
log_montanttotp1	0.26 ***	0.01	0.20 ***	0.08 ***
pct_ste.2006	0.77	2.35 ***	2.17 *	4.05 ***
pct_comp.2006	0.49	0.98 ***	0.49	0.87 ***
Indic_Ann.Crop.2007	0.03 .	0.02 **	0.05 .	0.02 **
Indic_Grassland.2007	0.00	0.01	-0.04	-0.03 .
Indic_Per.Crops.2007	0.00	0.00	-0.01	0.00
Indic_Other.2007	0.11 **	0.01 **	0.12 **	0.00
Indic_Total.2007	-0.08 **	-0.01	-0.04	-0.07 ***
Indic_CDI_2007	-0.04	-0.20 ***	0.01	-0.32 ***
OTE11	0.12	-0.33 **	0.14	-0.17
OTE231	0.73 .	0.75 ***	0.56	0.84 ***
OTE431	0.92 **	0.02	0.55 .	0.45 **
OTE4ab51	0.39	0.06	0.53	0.43 *
OTE61	0.27	0.07	0.10	0.37 **

Not surprisingly, regions with oldest farmers on average have a lower probability to have beneficiaries, have a lower beneficiary density and lower payment per ha. The active population in agriculture (log_mo2006) clearly enhance the presence of farmer beneficiaries and the presence of payment, but does not affect the density of farmer beneficiaries nor the payment per ha. Regions with largest farms and largest plot size on average get lower payments per ha.

First pillar payments for cattle encourages the presence of farmer beneficiaries and the presence of payment and slightly increases the payment per ha. This effect is reinforced by the fact that regions dominated by mixed cattle farms have a higher probability to have farmer beneficiaries. Accordingly regions dominated by farms with animals (OTE431, OTE4ab51 and OTE61) get higher payment per hectare, without having a higher density of farmer beneficiaries. Regions dominated by cereal and field crop farm have lower density of farmer beneficiaries, while regions dominated by permanent crops and/or vegetable farms conjugate high density of farmer beneficiaries and high payment per ha.

So it seems that investment aids target regions with high agricultural population and smallest farms, horticulture and animal farms rather than cereal farms.

6.4. The effect of other measures

Table: The explanatory variables describing the uptake of previous and other second pillar measures

indic_meca1	-	-	Dummy for previous existence of 'mechanisation' payments from RDP1
indic_ctecad1	-	-	Dummy for previous existence of 'AES payment' (other than grassland or crop diversification) payment from RDP1
indic_maerot1	-	-	Dummy for previous existence of 'AES crop diversification payment' from RDP1
indic_phaepmsee1	-	-	Dummy for previous existence of AES grassland premium from RDP1
indic_dja1	-	-	Dummy for previous existence of payment for setting up of young farmers from RDP1
indic_foret1	-	-	Dummy for previous existence of afforestation payments from RDP1
indic_forma1	-	-	Dummy for previous existence of training payments from RDP1
indic_ichn1	-	-	Dummy for previous existence of LFA payments from RDP1
indic_poa1	-	-	Dummy for previous existence of Agricultural Orientation Premium
indic_preret1	-	-	Dummy for previous existence early retirement payments from RDP1
PRED_121_payment	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 121_payment
PRED_121_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 121_benef
PRED_214A_area	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214A_area
PRED_214D_area	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214D_area
PRED_214I_area	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214I_area
PRED_214A_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214A_benef
PRED_214D_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214D_benef
PRED_214I_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214I_benef
PRED_Axis3_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator Axis3_benef

Regression results	Presence of farmer beneficiaries Probit	Density of beneficiaries Tobit	Presence of payment Probit with spatial lag	Payment per ha Tobit
indic_meca1	0.56 *	0.10 *	0.42 *	0.28 ***
indic_ctecad1	0.58 ***	-0.04	0.53 ***	-0.02
indic_maerot1	0.17	-0.04	-0.06	-0.04
indic_phaepmsee1	0.06	-0.17 *	-0.27 .	-0.22 *
indic_dja1	0.14	-0.21 .	0.28	-0.24 .
indic_foret1	-0.01	-0.05	0.00	-0.04
indic_forma1	0.06	-0.05	0.00	-0.05
indic_ichn1	-0.16	-0.10 *	-0.08	-0.05
indic_poa1	0.06	-0.01	0.17	-0.01
indic_preret1	0.23 **	0.00	0.25 *	0.03
PRED_121_payment				
PRED_121_benef				
PRED_214A_area				
PRED_214D_area				
PRED_214I_area		0.19 .		-0.13
PRED_214A_benef		0.20		0.31 .
PRED_214D_benef		0.17		-0.34
PRED_214I_benef				
PRED_Axis3_benef		0.44 *		0.84 ***
Rho (spatial lag)			0.17 **	

Considering the presence of beneficiaries, we find for investment aids a result that was regularly observed for agrienvironment measures on both individual farm and spatial data bases: voluntary measure uptake is boosted by previous uptake of similar measures. Indeed, indic_meca1, indic_ctecad1 and indic_preret1 represent pre-2007 measures that include investment aids. Except for indic_meca1, which is the closest measure of the measure 121, this result is not confirmed by higher density of farmer beneficiaries nor higher payments per hectare.

Regions endowed with pre-2007 grassland premiums have a lower density of farmer beneficiaries and lower payments per hectare. Region endowed with pre-2007 Less Favoured Area payments have a lower density of farmer beneficiaries, all other variables held constant.

So despite the fact that present investment aids target animal farms, the regions with most extensive cattle and sheep productions get relatively less investment aids.

Among the other present rural development measures, only the axis 3 measures have a positive impact on investment aids (beneficiary density and payments per ha). But only a limited number of regions are concerned by axis3 measures (23%) and usually with very low uptake rate.

7. Axis 2 approach, French case study

The LFA payments are not studied. Only the main agrienvironment measures are considered. The grassland premium is a “top up” scheme financed by the French national budget. Eligible conditions include a minimal share of grassland in the UAA, a minimal share of natural meadows within the grassland and boundaries for animal density. So it targets extensive grazing animal farms, mostly located in less favoured areas. The minimal share of natural meadows within the grassland and adapted requirements according to regions has been introduced after discussions with the European Commission who suspect previous grassland premiums to be simple income aids rather than an adequate agrienvironment measure.

The conversion to organic farming is a standard agrienvironment measure co-financed by the EU and the national budget until the health check, when it was shifted towards the first pillar to finance 100% of farmers’ payments from the EU budget. It also includes different sub-measures according to farm types. The beneficiary’s commitment lasts 5 years but payments may last a shorter period according to the type of production.

The measure 214I includes many different geographically targeted measures for water or biodiversity protection. The national counterpart of the EU funding is mainly brought by NUTS2 regional councils, with sometimes contributions of NUTS3 regional councils and, usually for water protection measures, contributions of water agencies which are six national public bodies financed by the State and dedicated taxes paid by water users of the six corresponding water basins. Biodiversity measures typically include late mowing and/or animal density & agri-input restrictions in peat lands and high dry meadows, grassland or flower rich fallow stripes in arable land and hedge, ditch, and slope maintenance. Water protection measures typically include animal density & agri-input restrictions around water catchment, catch crops in arable land, grassland stripes and hedge maintenance along rivers. While they may not differ a lot according to requirements, biodiversity and water protection measures differ according to their targeted area, funding and premiums. Water protection measures usually get more designated areas, more funds and better premiums, reflecting the priorities of regional authorities and their opportunity to use EU money to solve regional problems.

- **Measure 214 A: the grassland premium**

$$\boldsymbol{Indic\_214A\_area} = \frac{\sum_{2007}^{\mathbf{2009}} Area\ (ha) covered\ by\ 214A\ measure}{Permanent\ and\ Temporary\ Grassland\ areas\ (ha) in\ 2007}$$

$$\boldsymbol{Indic\_214A\_benef} = \frac{\sum_{2007}^{\mathbf{2011}} Nb\ of\ 214A\ beneficiaries}{Nb\ of\ farms\ in\ 2007}$$

- **Measure 214 D: conversion to organic farming**

$$\boldsymbol{Indic\_214D\_area} = \frac{\sum_{2007}^{\mathbf{2009}} Area\ (ha) covered\ by\ 214A\ measure}{UAA\ (ha)\ in\ 2007}$$

$$\boldsymbol{Indic\_214D\_benef} = \frac{\sum_{2007}^{\mathbf{2011}} Nb\ of\ 214D\ beneficiaries}{Nb\ of\ farms\ in\ 2007}$$

- **Measure 214 I: geographically targeted measures for water or biodiversity protection**

$$\boldsymbol{Indic\_214I\_area} = \frac{\sum_{2007}^{\mathbf{2011}} Area\ (ha) covered\ by\ 214I\ measure}{UAA\ (ha) in\ 2007}$$

NB: This indicator is computed only for NUTS4 levels being 214I recipient at least once over the period (2007-2011), to account for targeting restrictions in the calculation

$$\boldsymbol{Indic\_214I\_benef} = \frac{\sum_{2007}^{\mathbf{2011}} Nb\ of\ 214I\ beneficiaries}{Nb\ of\ farms\ in\ 2007}$$

NB: This indicator is computed only for NUTS4 levels having at least one 214I beneficiary over the period (2007-2011), to account for targeting restrictions in the calculation.

Table: Descriptive statistics on indicators to be used as dependant variables

	NA's	Zeros	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
Indic_214A_area	58	1027	0.0000	0.0000	0.0589	0.1541	0.2383	1.2407
Indic_214A_benef	12	1149	0.0000	0.0000	0.0377	0.1751	0.2455	1.7143
Indic_214D_area	8	1915	0.0000	0.0000	0.0000	0.0054	0.0039	0.5982
Indic_214D_benef	13	1523	0.0000	0.0000	0.0081	0.0261	0.0256	1.5000
Indic_214I_area	1498	28	0.0000	0.0187	0.0444	0.0835	0.0949	2.4530
Indic_214I_benef	1613	0	0.0052	0.0886	0.1592	0.2292	0.2857	3.0000

Grassland premium beneficiaries are present in about two thirds of our revisited NUTS4 regions. On average they represent 17.5% of farmers and 15% of the utilised agricultural area (UAA). Area and participant data come from different data bases with are difficult to match.

In addition few areas of one region are operated by farmers belonging to other regions. Same problems occur for other measures.

The beneficiaries of the organic farming conversion are present in three fifths of our regions. They represent 2.6% of farmers but only 0.5% of UAA receive payments on average.

Despite their diversity of environmental objectives, the geographically targeted measures do not concern 40% of our regions. 23% of farmers are beneficiaries and 8% of the UAA is under contract.

These figures are not real participation rates. For the grassland premium, the eligible population is not known. Then, even if we restricted the denominator to grasslands, we do not know the real eligible area, because some of these grasslands are operated by farmers which are eligible. So we face a lack of data. It is well known from previous studies that almost every eligible farmer to the grassland premium is a beneficiary.

The same lack of data exists for the geographically targeted measures. Our only possibility was to exclude regions without beneficiaries, assuming that it indicates that no measure was proposed. In this case, the entered area is usually far smaller than the eligible area, according to previous or on-going studies.

Finally the conversion to organic farming is probably the case with the best participation indicators. Their denominators should exclude already converted farms and areas which are not eligible. However these already converted areas and farms are around 4% of the total population (4.5% of farms and 3.5% of UAA in 2011).

For each indicator, Inverse Mills Ratios (IMRs) were derived from Probit regressions to take into account the zeros, with missing values assimilated to zeros.

For the grassland premium, the IMR is significant the regressions explaining the share of entered area. This effect probably catches the proportion of eligible area in the region which increases with the share of grassland, which in turn favours higher share of entered area. But surprisingly, IMR is not significant for the share of beneficiaries.

The opposite holds for the conversion to organic farming: IMR is not significant for the entered area, but is for beneficiaries. This result suggests that local professional networks of organic farmers favour participation.

In both cases, the IMR effect decreases or vanishes with the introduction of the spatial lag.

IMRs are not significant for the geographically targeted measures.

7.1. Spatial correlations and spill-overs

Moran's I are especially high for the indicators related to measures 214A (grassland premium) and relatively high for the 214D (conversion to organic farming). The high Moran's I of measure 214A indicators reflect the spatial importance of grassland areas, while Moran's I related to measure 214D provide information on spatial clusters of both beneficiaries and secondarily areas concerned by the measure.

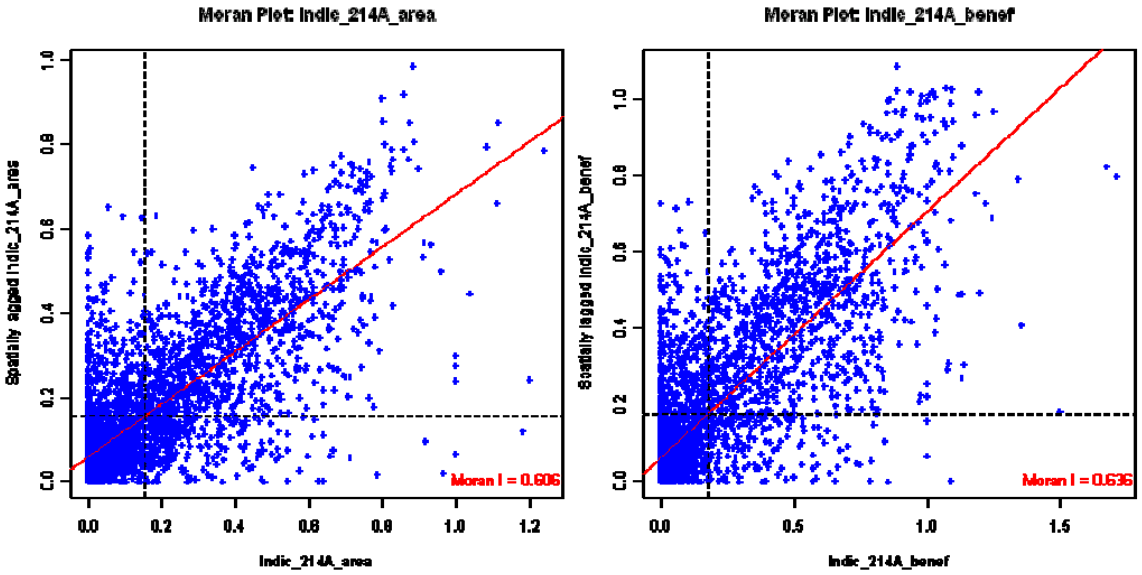
A spatial lag is specified in the probit regressions that explain the strictly positive uptake in the region. It is very significant and positive for all the studied agrienvironmental measures.

For grassland premium and conversion to organic farming, it exceeds 0.3 for the presence of beneficiaries and 0.5 for the presence of entered areas. For geographically targeted measures, it is 0.7 for both.

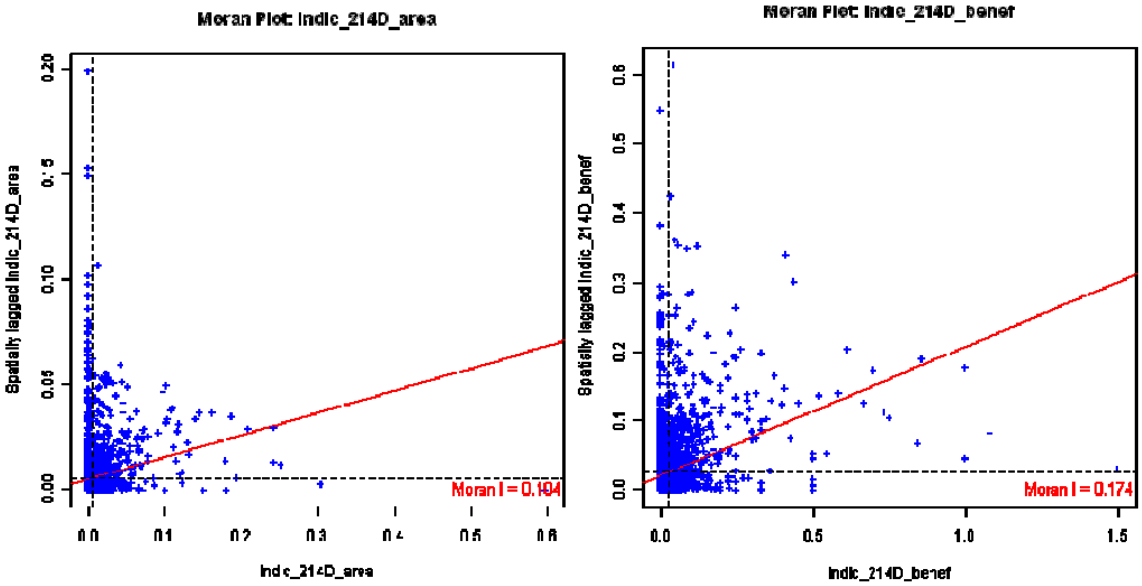
The introduction of this spatial lag slightly improves the fit of the probit model, except for the conversion of organic farming. It does not really affect the other variable effects: the positive effect the grassland index disappears for the grassland premium and the negative effect of LFA payments vanishes for geographically targeted measures.

The main consequences of the spatial lag come from the use of the IMRs which are derived from the Probit regressions with spatial lag. To explain the share of entered area in the grassland premium, the negative effect of axis3 participation prediction completely disappears while the predicted participation in organic conversion becomes significantly positive and the predicted participation in geographically targeted measures becomes significantly negative. To explain the participation proportion in organic conversion, the positive effects of grassland premium and axis3 predicted participations become significant. To explain the participation in geographically targeted measures, the positive effect of predicted grassland premium presence disappears while the predicted participation in axis 3 becomes significantly positive. For visual exploration of spatial autocorrelation, Moran plots (spatial data against its spatially lagged values) have been produced (see panels below).

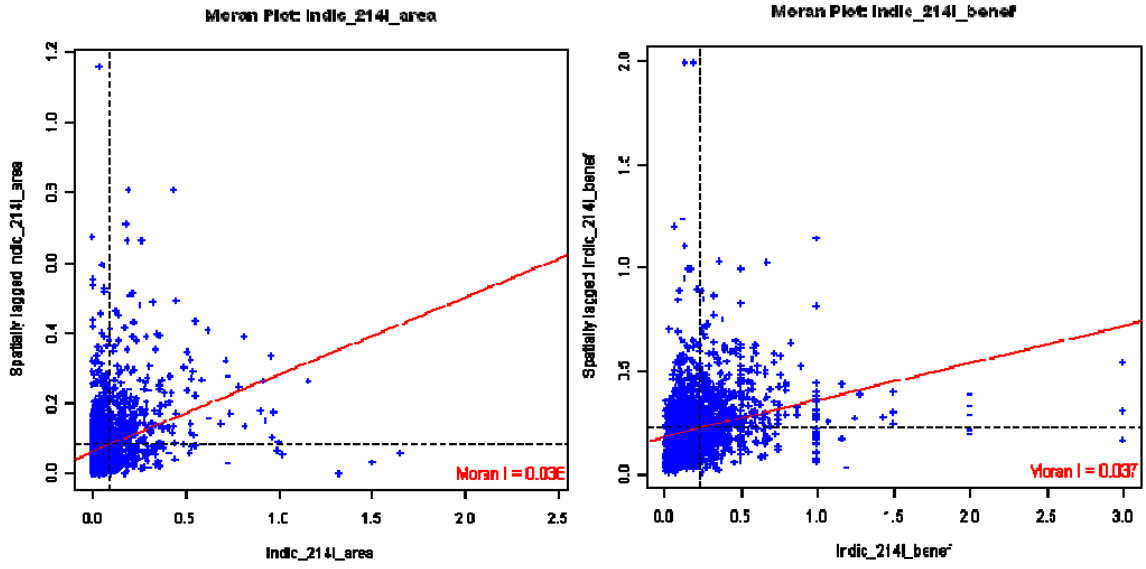
- ***Measure 214A grassland premium***



- ***Measure 214D conversion to organic farming***



- ***Measure 214I geographically targeted measures***



7.2. The effect of the local economic and environmental conditions

Table: The explanatory variables describing the local economic and environmental conditions aggregated at 'revisited NUTS4' level

Variable names	Units	Year	Description
alt_moy	m	-	Average altitude
log_denspop06p1	-	2006	Log of population density
txchom06	%	2006	Unemployment rate
Indic_FI_2007	-	2007	Forest index
INDIC_AOC1	-		Dummy indicating the presence of areas supporting Protected Designation of Origin (PDO) products
zauer4561	-		Dummy indicating the presence of rural areas according to the French classification.
ZVul1	-		Dummy indicating the presence of nitrate vulnerable zones
natura20001	-		Dummy indicating the presence of Natura 2000 areas
CSP_max2	-		Dummy indicating that 'craft and retailed trades workers' socio-professional group is the most represented
CSP_max3	-		Dummy indicating that 'manual worker' socio-professional group is the most represented
CSP_max4	-		Dummy indicating that 'intermediate non manual workers' socio-professional group is the most represented
CSP_max5	-		Dummy indicating that 'executives & intellectual persons' socio-professional group is the most represented
CSP_max6	-		Dummy indicating that 'employees' socio-professional group is the most represented

- ***Measure 214A grassland premium***

Regression results	Presence of farmer beneficiaries Probit with spatial lag	Density of beneficiaries Tobit	Entered area Probit with spatial lag	Area share Tobit
(Intercept)	-3.35 **	-2.33 **	-2.62 *	-2.04 .
alt_moy	0.00 **	0.00 ***	0.00 *	0.00
log_denspop06p1	-0.08 *	0.21 ***	-0.06	0.14 *
txchom06	-0.97	0.21	-1.50	-4.30 ***
Indic_FI_2007	0.00	-0.03	-0.29 **	-0.01
INDIC_AOC1	-0.03	0.02	0.04	-0.07
zauer4561	0.03	0.09 *	-0.13	0.04
ZVul1	-0.12 .	-0.37 ***	-0.21 **	-0.35 ***
natura20001	-0.02	0.03	-0.10	-0.14
CSP_max2	-0.60	0.31	-0.36	-0.26
CSP_max3	-1.10 *	-0.18	0.25	-0.22
CSP_max4	-0.93 *	-0.06	0.17	-0.27
CSP_max5	-0.95 *	-0.06	0.37	-0.16
CSP_max6	-0.97 *	-0.10	0.24	-0.18

The probability to observe beneficiaries of the grassland premium increases with altitude. The density of beneficiaries increases with the population density. The presence of entered areas is less likely in more forested regions. Beneficiary density, presence of entered areas and the share of entered area decrease in nitrate vulnerable zones, which are usually arable land regions. These first results may be fully explained by the eligibility criteria of the measure,

which requires a high share of grassland. The share of entered areas decreases with the unemployment rate. This unexpected result might mean that farmers of the regions with the highest unemployment have more labour intensive farms.

- ***Measure 214D conversion to organic farming***

Regression results	Presence of farmer beneficiaries Probit with spatial lag	Density of beneficiaries Tobit	Entered area Probit with spatial lag	Area share Tobit
(Intercept)	-2.33 **	-2.59 **	-1.48 .	-6.21 **
alt_moy	0.00	0.00 **	0.00	0.00
log_denspop06p1	-0.22 ***	-0.01	-0.16 ***	-0.03
txchom06	1.97 *	2.70 **	1.49 .	1.18
Indic_FI_2007	0.18 **	0.24 ***	0.10	0.29 .
INDIC_AOC1	0.13 **	0.15 **	0.14 **	-0.03
zauer4561	-0.09	0.00	-0.19 **	0.11
ZVul1	0.01	-0.08 .	0.02	-0.08
natura20001	0.06	-0.19 **	-0.01	-0.04
CSP_max2	0.11	0.62 .	0.25	0.63
CSP_max3	0.15	0.27	-0.07	0.66 .
CSP_max4	0.23	0.41 *	0.01	0.49
CSP_max5	0.47 .	0.85 ***	-0.15	1.12 *
CSP_max6	0.21	0.35 *	-0.03	0.64 .

The location of organic farming conversion looks quite specific. Its presence decreases with the population density. However entered area is less observed in typical rural areas (according to the French classification). It means that organic conversion takes place in the fringes of urban or suburban areas. Beneficiaries are more likely observed in regions with appellations controlees and forests and where upper social groups are overrepresented. This might indicates the role of relationships between farmers and non agricultural social groups through local markets or social networks that favour organic conversion.

- ***Measure 214I geographically targeted measures***

Regression results	Presence of farmer beneficiaries Probit with spatial lag	Density of beneficiaries Tobit	Entered area Probit with spatial lag	Area share Tobit
(Intercept)	-0.85	1.03	0.40	-2.42 *
alt_moy	0.00	0.00	0.00	0.00
log_denspop06p1	-0.15 ***	-0.01	-0.14 ***	-0.13 .
txchom06	1.90 *	1.59 *	0.68	1.41
Indic_FI_2007	0.05	-0.17 **	0.09	0.31 **
INDIC_AOC1	0.07	-0.02	0.09 .	0.18 *
zauer4561	-0.23 ***	-0.04	-0.18 **	-0.06
ZVul1	0.12 *	0.14 **	0.13 *	0.32 ***
natura20001	0.63 ***	0.30 ***	0.72 ***	0.37 ***
CSP_max2	-0.01	0.27	-0.46	-0.21
CSP_max3	0.03	0.44 **	0.18	0.21
CSP_max4	0.11	0.57 ***	0.30	0.37
CSP_max5	0.40	0.10	0.34	-0.20
CSP_max6	0.09	0.43 **	0.29	0.29

Expectedly the presence probability and the uptake density of geographically targeted measures for water and/or biological diversity protection are higher in regions characterised by Natura2000 and Nitrate vulnerable zones. Again these effects probably reflect the eligibility criteria, like the grassland premium. Like organic farming, the presence of geographically targeted measures decreases with the population density and is less observed in typical rural areas. It means that the uptake takes place in the fringes of urban or suburban areas, possibly where water catchment are to be protected from agricultural pollution. However, in contrast with organic conversion, the beneficiary density increases in regions where lower social classes are overrepresented.

7.3. The effect of agricultural features of the region

Table: The explanatory variables describing agricultural characteristics aggregated at 'revisited NUTS4' level

Variable names	Units	Year	Description
sth_sau_2000	-	2000	Share of grassland within the UAA
log_mo2006	-	2006	Log value of labour present on farm (farm heads, family labour and hired labour in AWU)
SUPMOYexpl.2006	ha	2006	Average farmsize
MONO1	-		Dummy variable indicating the presence a dominant (more than 50% of the farms and more than 60% of the area) crop in the NUTS4
AGE_MOY.2006	year	2006	Average farmers' age
ASB06_RNET	-	2006	Share of agricultural incomes within household incomes
log_montanttotp1	-		Log value of cattle direct payments (1,000 €)
pct_ste.2006	-	2006	Share of partnership farms within all farms
pct_comp.2006	-	2006	Share of company farms within all farms
Indic_Ann.Crop.2007	ha	2007	Average size of plots with annual crops
Indic_Grassland.2007	ha	2007	Average size of grassland plots
Indic_Per.Crops.2007	ha	2007	Average size of plots with permanent crops
Indic_Other.2007	ha	2007	Average size of other plots
Indic_Total.2007	ha	2007	Average size of all plots
Indic_CDI_2007	-	2007	Crop diversity index
OTE11	-		Dummy indicating that 'field-crop' type of farming is dominant
OTE231	-		Dummy indicating that 'wine, fruits and vegetables' type of farming is dominant
OTE431	-		Dummy indicating that 'mixed cattle' type of farming is dominant
OTE4ab51	-		Dummy indicating that 'beef and dairy' type of farming is dominant
OTE61	-		Dummy indicating that 'mixed crop and livestock' type of farming is dominant

▪ *Measure 214A grassland premium*

Regression results	Presence of farmer beneficiaries Probit with spatial lag	Density of beneficiaries Tobit	Entered area Probit with spatial lag	Area share Tobit
sth_sau_2000	1.39 ***	2.47 ***	0.96 ***	2.31 ***
log_mo2006	0.29 ***	-0.42 ***	0.15 *	-0.22 .
SUPMOYexpl.2006	0.00 *	0.01 ***	0.00	0.01 ***
MONO1	0.00	-0.10	-0.17	-0.16
AGE_MOY.2006	0.05 *	-0.01	0.02	-0.01
ASB06_RNET	-3.04 *	3.83 ***	-1.16	3.54 *
log_montanttotp1	0.10 *	0.05 *	0.10 **	-0.03
pct_ste.2006	-1.17	-0.06	-1.43 *	-1.71 **
pct_comp.2006	-1.22 ***	-0.50 .	-0.43	-1.27 **
Indic_Ann.Crop.2007	0.01	0.01	0.02	0.04 **
Indic_Grassland.2007	0.06 .	0.11 ***	0.13 ***	0.06 *
Indic_Per.Crops.2007	-0.01	0.00	0.01	0.00
Indic_Other.2007	0.00	0.00	0.09 ***	-0.01
Indic_Total.2007	-0.03	-0.03 **	-0.11 ***	-0.07 ***
Indic_CDI_2007	-0.07 .	-0.19 ***	0.06	-0.26 ***
OTE11	-0.03	0.05 *	-0.07	-0.02
OTE231	0.01	-0.06	-0.08	0.45
OTE431	0.20	-0.50 .	-0.14	-0.47 *
OTE4ab51	-0.21	0.01	-0.37	-0.24
OTE61	0.01	0.11 ***	-0.31	-0.09

Among agricultural characteristics influencing the uptake of the grassland premium, variables with a similar effect on the uptake probability in the region and the uptake density within the region are to be distinguished from others.

The variables with a similar effects are:

- The share of permanent meadows in the utilised agricultural area (positive effect): this is a key criteria of the eligibility to grassland premium.
- The average farm area (positive effect): this effect can be related to results obtained by using individual data that show the importance of agrienvironmental measure fixed transaction costs at the farm level that discourages the uptake by smallest farms.
- The cattle CAP payments that indicates the importance of suckling cow herds in the region (positive effect): as suckling cow farms are mostly extensive cattle farms, this variable is also related to eligibilty criteria, indirectly.
- The average plot size and crop diversification index (negative effects): as largest plot sizes and most diversificated crop farms are found in arable crop regions, this variable is also related to farm eligibility.
- The average grasssland plot size (positive effect): this effect has never been measured in previous French studies and might relates to non linear technical costs to implement the

measure. Indeed the grassland premium contract requires the maintenance of plot fringes (slopes, hedges and ditches) that are relatively densier where plots are smaller.

- The proportion of farm companies and farm cooperatives (negative effect): The effect is difficult to explain. However, it is very important since these types of farms fastly increases in France. It might catch part of the usual positive effect of the farmer's age which was measured repeatedly on invividual farm data.

The variables with dissimilar effects are:

- The region agricultural labour increases the probability of grassland premium uptake in the region but decreases the participants' share within the region. These effects are less significant for area indicators. It means that the uptake is more frequent in regions with more farms. However the labour force being related to the denominator of the participation rates, these participation rates descrease with the total agricultural labour force. The result also means that beneficiary farms are less labour intensive than others.
- The same type of mixed effect is measured for the share of agricultural income in farm household income: regions where the share of agricultural income is high have a lower probability to have beneficiaries. However the farm share in household income increases the participation. For the farms concerned by the grassland premium, the share of agricultural income is mainly related to part time farming, especially in mountainous areas, and probably indicates the part time farmers are less frequently participants.

▪ *Measure 214D conversion to organic farming*

Regression results	Presence of farmer beneficiaries Probit with spatial lag	Density of beneficiaries Tobit	Entered area Probit with spatial lag	Area share Tobit
sth_sau_2000	-0.34 *	-0.34 *	-0.03	-0.69 *
log_mo2006	0.61 ***	-0.20 **	0.48 ***	-0.34 *
SUPMOYexpl.2006	0.00	0.00 *	0.00	-0.01 ***
MONO1	-0.25 .	0.08	0.02	0.05
AGE_MOY.2006	-0.01	-0.01	-0.03	0.08 *
ASB06_RNET	-6.64 ***	-1.28	-3.27 **	1.78
log_montanttotp1	-0.02	-0.25 ***	-0.03	-0.34 *
pct_ste.2006	0.34	1.27 **	0.04	-0.01 ***
pct_comp.2006	-0.60 *	1.43 ***	-0.26	0.05
Indic_Ann.Crop.2007	-0.01	0.00	0.00	0.08 *
Indic_Grassland.2007	0.01	0.07 ***	0.05 .	1.78
Indic_Per.Crops.2007	-0.01 ***	0.00	0.00 .	-0.01
Indic_Other.2007	0.00	-0.01	-0.01	-0.02
Indic_Total.2007	0.00	-0.02	-0.01	-0.02
Indic_CDI_2007	0.07 .	-0.07 *	0.06 .	-0.20 **
OTE11	0.25	-0.89 ***	0.14	0.03
OTE231	0.23	0.09	0.24	0.62
OTE431	0.32 .	-0.11	0.30	0.51
OTE4ab51	0.28	-0.46 *	-0.02	0.47
OTE61	0.05	-0.32 *	0.13	0.35

The conversion into organic farming presents some common features with the grassland premium uptake, but also very contrasted effects that justify our choice for a separated analysis.

Common features concern the variables with dissimilar effects on the uptake probability in the region and the uptake density within the region:

- The region agricultural labour increases the probability of conversion aid uptake in the region but decreases the participants' share within the region. It means that the uptake is more frequent in regions with more farms. However the labour force being related to the denominator of the participation rates, these participation rates descrease with the total agricultural labour force. The result also means that beneficiary farms are less labour intensive than others.
- Regions where the share of agricultural income is high have a much lower probability to have beneficiaries. However the farm share in household income does not affect the participation. For the farms in organic conversion, the share of agricultural income in the farm household income is probably related to off farm jobs and revenues of the farmer's husband or wife. This evidence is quite new are should be deepened by further analysis.
- Farmer's age slightly increases the share of entered area
- The grassland plot size increases the proportion of participants among farmers.

Most of the other variable effects differ from the grassland premium regressions.

- The share of permanent meadows in the utilised agricultural area has a negative effect for no obvious reasons because farms with more permanent meadows use less pesticides and less veterinary medecines and look closer to organic farming than others. Hence a possible explanation is not technical: this variable may indicate a remoteness from markets and networks that favour conversion to organic farming.
- More intuitively, conversion probability is lower in regions with high shares of specialised farms, higher CAP payments for suckling cows and where permanent crop plots are larger. Participation also increases where vegetable and mixed cattle farms dominate.
- The crop diversification index has dissimilar effects on the probability to the presence of organic conversion (positive) and the participation density (negative) which are difficult to interprete.

- Also the proportion of farm cooperatives and companies induces higher participation rates in the region, but has a rather negative effect on the entered area. This result is also difficult to interprete.

▪ *Measure 214I geographically targeted measures*

Regression results	Presence of farmer beneficiaries Probit with spatial lag	Density of beneficiaries Tobit	Entered area Probit with spatial lag	Area share Tobit
sth_sau_2000	0.42 *	1.50 ***	0.50 **	1.39 ***
log_mo2006	0.29 ***	0.02	0.31 ***	-0.01
SUPMOYexpl.2006	0.00	0.00 **	0.00 .	-0.01 **
MONO1	0.36 *	-0.02	0.24	0.11
AGE_MOY.2006	-0.03 *	-0.07 ***	-0.06 ***	-0.03
ASB06_RNET	-3.09 **	-2.74 *	-3.65 **	-5.10 **
log_montanttotp1	0.07 **	-0.16 ***	0.08 ***	-0.15 ***
pct_ste.2006	1.30 **	1.26 **	1.30 **	1.35 *
pct_comp.2006	0.33	0.80 **	0.26	1.49 ***
Indic_Ann.Crop.2007	-0.01	0.01	-0.01	0.00
Indic_Grassland.2007	0.01	-0.03	0.00	0.01
Indic_Per.Crops.2007	0.01 *	0.00	0.01 *	0.00
Indic_Other.2007	-0.01	0.01 **	-0.01	-0.01
Indic_Total.2007	0.01	0.00	0.01	0.01
Indic_CDI_2007	0.04	0.07 *	0.04	0.05
OTE11	-0.31	-0.34 *	-0.20	-0.86 **
OTE231	-0.82 **	0.37 .	-0.67 **	0.08
OTE431	-0.42 *	-0.50 **	-0.47 **	-0.46 *
OTE4ab51	-0.83 **	-0.58 **	-0.81 ***	-0.67 *
OTE61	-0.21	-0.28 *	-0.27 .	-0.43 *

For these geographical targeted measures for water and biodiversity protection, the agricultural determinants are more significant than for previous measures. The variable effects also differ. All variables apart from two have similar effects in probit and tobit specifications. Only one variable has opposite effects on participant and entered area densities.

This variable is the average farm size that favours the rate of farmer participation and the probability to observe entered area in the region, but decreases the regional density of entered area. This result may indicate that eligible area is smaller where farms are larger. This might be linked to the environment objective. Roughly, water protection areas are smaller than biodiversity protection areas and are more frequently located in regions where large crop farms dominate while biodiversity protection areas are more frequently located in regions where smaller animal farms dominate.

Like in the cases of grassland premium and organic conversion, the agricultural labour force favours the presence of the measure participation, without favouring the participation rate. This is probably because the variable is correlated to the denominator of the participation rate.

The CAP payments coupled with suckling cow have an even more contrasted effect: it is significantly positive on the presence of participants and significantly negative on participation rates. These payments are higher in regions dominated by rather extensive cattle farms. In these farms, contract specifications imply lower profit losses than it does in other farm types and therefore a higher participation probability. However, for these farms that receive cattle payments, the more intensive they are the farms the higher the payments and the higher the profit losses. This explains why payments decrease the participation rates in the regions where uptake is observed.

The interpretation of the effect of the permanent grassland share looks more straightforward: permanent grassland reduces the expected profit loss and therefore increases the participation. Permanent grassland may also indicate particular habitats with are targeted by the measures: highland meadows and marshes for example. If correct, this latter effect is more connected to eligibility of the area than to the farmer's behaviour.

Compared to the regions where dairy farms prevail, all other farming types discourage participation. Vegetable systems are an exception. Due to very few regions dominated by vegetables, the probit results show a strong negative effect of vegetable. Surprisingly, the tobit result for the participation rate is opposite (and not significant for the entered area rate). This result stems from a relatively successful measure that introduces cereals into field vegetable rotations in Brittany and Normandy. This measure met the objective of many vegetable farms to reduce their labour use because of difficulties to attract hired labour.

For this measure, the legal status of farms also matters. Like for organic farming conversion, cooperatives and companies are more frequently participants. Unlike organic conversion, this positive effect also holds for the entered area rate.

7.4. The effect of other measures

Table: The explanatory variables describing the uptake of previous and other second pillar measures

indic_meca1	-	-	Dummy for previous existence of 'mechanisation' payments from RDP1
indic_ctecad1	-	-	Dummy for previous existence of 'AES payment' (other than grassland or crop diversification) payment from RDP1
indic_maerot1	-	-	Dummy for previous existence of 'AES crop diversification payment' from RDP1
indic_phaepmsee1	-	-	Dummy for previous existence of AES grassland premium from RDP1
indic_dja1	-	-	Dummy for previous existence of payment for setting up of young farmers from RDP1
indic_foret1	-	-	Dummy for previous existence of afforestation payments from RDP1
indic_forma1	-	-	Dummy for previous existence of training payments from RDP1
indic_ichn1	-	-	Dummy for previous existence of LFA payments from RDP1
indic_poa1	-	-	Dummy for previous existence of Agricultural Orientation Premium
indic_preret1	-	-	Dummy for previous existence early retirement payments from RDP1
PRED_121_payment	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 121_payment
PRED_121_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 121_benef
PRED_214A_area	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214A_area
PRED_214D_area	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214D_area
PRED_214I_area	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214I_area
PRED_214A_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214A_benef
PRED_214D_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214D_benef
PRED_214I_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214I_benef
PRED_Axis3_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator Axis3_benef

The effects of other present measures are the only effects which are deeply affected and strengthen by the introduction of the spatial lag in the probit step of the tobit regression, implemented by using IMRs derived from the probit with the spatial lag.

▪ *Measure 214A grassland premium*

Regression results	Presence of farmer beneficiaries Probit with spatial lag	Density of beneficiaries Tobit	Entered area Probit with spatial lag	Area share Tobit
indic_meca1	0.20	0.17 **	-0.11	0.13
indic_ctecad1	0.27	-0.13	0.02	-0.44 .
indic_maerot1	0.08	-0.16 **	0.21 **	0.05
indic_phaepmsee1	1.20 ***	-0.12	1.00 ***	0.53 **
indic_dja1	-0.37 *	-0.07	0.02	-0.16
indic_foret1	0.05	-0.03	-0.16 .	0.12
indic_forma1	0.26 *	0.00	0.15	0.01
indic_ichn1	0.27 ***	0.66 ***	0.18 *	0.62 ***
indic_poa1	0.04	-0.06	0.01	-0.05
indic_preret1	0.04	-0.14 **	0.10	-0.13 .
PRED_121_payment		0.20		0.83 *
PRED_121_benef				
PRED_214A_area				
PRED_214D_area				
PRED_214I_area		0.01		-0.64 **
PRED_214A_benef				
PRED_214D_benef		1.21 **		1.55 **
PRED_214I_benef				
PRED_Axis3_benef		0.25		0.28
Rho (spatial lag)	0.35 ***		0.58 ***	

Several pre-2007 pillar II measures influences the presence of grassland premium (former grassland premium, less favoured area payments, crop rotation measure and training). Within region, only the less favoured area (LFA) payments and machinery investment aid have a positive impact on the participation rate while crop rotation measure and early retirement have a negative effect.

The share of entered area is mainly positively dependent on the former grassland premium and LFA payments. These results suggest that the former grassland premium accompanied the enlargement of beneficiary farm because it increased the entered area without increasing the participation rate.

Among present period measures, the conversion into organic farming clearly favours the grassland premium uptake, both in terms of participants and entered area. In addition the investment aid increases the entered area share, without improving the participation rate. Again farm enlargement must be involved.

▪ *Measure 214D conversion to organic farming*

Regression results	Presence of farmer beneficiaries Probit with spatial lag	Density of beneficiaries Tobit	Entered area Probit with spatial lag	Area share Tobit
indic_meca1	0.00	-0.05	-0.17 .	0.40 *
indic_ctecad1	0.22	-0.28	0.27 .	0.08
indic_maerot1	0.03	-0.07	0.01	-0.22 .
indic_phaepmsee1	0.23 **	-0.07	0.21 **	-0.01
indic_dja1	-0.30 *	-0.27	-0.18	0.68
indic_foret1	0.16 *	-0.08	0.01	-0.22 .
indic_forma1	0.11	-0.09	-0.04	-0.28 *
indic_ichn1	0.19 **	0.11 .	0.16 **	-0.22 .
indic_poa1	0.15 *	-0.03	0.20 **	-0.08
indic_preret1	-0.01	-0.06	-0.01	-0.13
PRED_121_payment		0.41		-1.57 *
PRED_121_benef				
PRED_214A_area				
PRED_214D_area				
PRED_214I_area		0.22		0.02
PRED_214A_benef		0.83 ***		0.80 .
PRED_214D_benef				
PRED_214I_benef				
PRED_Axis3_benef		1.25 ***		1.23 *
Rho (spatial lag)	0.31 ***		0.52 ***	

Several pre-2007 pillar II measures influences the presence of conversion into organic farming measure (former grassland premium, less favoured area payments, agricultural orientation premium, and the conversion into forest aid). Within region, only the less favoured area (LFA) payments and machinery investment aid have a positive impact on the participation rate and the entered area rate respectively, while training, crop rotation measure, forest aid and early retirement have a limited but negative effect on the entered area share.

Among present period measures, the conversion into organic farming is encouraged by the grassland premium and the axis3 measure uptake, both in terms of participants and entered area. In addition the investment aid decreases the entered area share, without any significant effect on the participation rate. These results question the fit of the French agricultural development tools to support the organic farming conversion since training and investment aid have no clear effects.

- ***Measure 214I geographically targeted measures***

Regression results	Presence of farmer beneficiaries Probit with spatial lag	Density of beneficiaries Tobit	Entered area Probit with spatial lag	Area share Tobit
indic_meca1	0.05	-0.15 *	0.07	-0.22 *
indic_ctecad1	0.46 *	0.84 ***	0.28 .	0.61 *
indic_maerot1	0.06	0.12 *	0.11 .	0.09
indic_phaepmsee1	-0.04	-0.05	-0.03	0.26
indic_dja1	0.19	-0.63 **	0.04	0.10
indic_foret1	0.05	0.18 **	0.01	0.06
indic_forma1	0.11	-0.12 *	-0.04	-0.10
indic_ichn1	-0.10	-0.07	-0.11 .	0.01
indic_poa1	0.02	-0.08 .	-0.01	-0.13 .
indic_preret1	0.03	-0.02	-0.01	-0.12 .
PRED_121_payment		-0.80 *		-0.03
PRED_121_benef				
PRED_214A_area				
PRED_214D_area				
PRED_214I_area				
PRED_214A_benef		0.27		-0.03
PRED_214D_benef		-0.48		-0.46
PRED_214I_benef				
PRED_Axis3_benef		0.40		1.49 ***
Rho (spatial lag)	0.70 ***		0.70 ***	

Several pre-2007 pillar II measures influences the participation in these measures for water and biodiversity protection. Most significant are the integrated contracts called “contrats territoriaux d’exploitation” and “contrat d’agriculture durables” that mixed investment aids and locally adapted agrienvironmental measures. Forest conversion and the measure for longer crop rotation also favour participation while young farmer’s aids, machinery investment aids and the training measure discourage it. However most of these measures do not affect the entered area proportion significantly. The young farmer’s aids, the agricultural orientation premium and early retirement slightly do. Indeed, these structural measures usually improved productivity and intensive use of inputs, while the measures for water and biodiversity protection usually require limitations of both in designed areas.

Among present period measures, the axis3 measure uptake strongly increases the entered area share, without any significant effect on the participation rate. These results question the fit of the French agricultural development tools to support the water and biodiversity protection measures since training and investment aids have negative effects.

8. Axis 3 approach, France case study

Only one dependant variable was calculated to explore the uptake of both 311 (diversification towards non agricultural activities) and 313 (support to agritourism) measures alltogether: the beneficiary density for the 2007-2011 period in reference to the beginning of the period (2007). These measures are available for every farm.

- **Measures 311 & 313**

$$\boldsymbol{Indic\_Axis3\_benef} = \frac{\sum_{2007}^{\mathbf{2011}}(Nb\ of\ 311\ beneficiaries + Nb\ of\ 313\ beneficiaries)}{Nb\ of\ farms\ in\ 2007}$$

	NA's	Zeros	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
Indic_Axis3_benef	13	2837	0.0000	0.0000	0.0000	0.0063	0.0000	0.8750

The participation indicator is nil or missing in more than two thirds of our revisited NUTS4 regions. The average participation is quite low 0.6%.

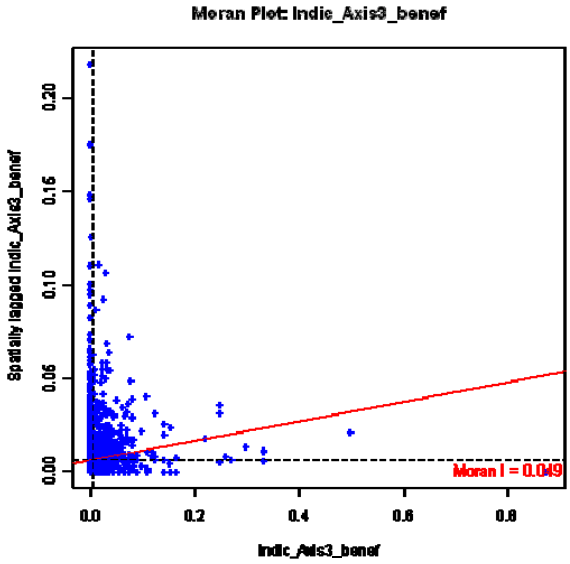
Inverse Mills Ratios (IMRs) were derived from Probit regressions to take into account the zeros, with missing values assimilated to zeros, with and without a spatial lag effect. The simple IMR is positive but not significant in the beneficiary rate regression. The IMR with spatial lag is significant but with a negative value. This result suggests that participation decreases when the conditions of such farm diversification are favourable in neighbouring regions. This might come from competition for a limited Axe3 budget in NUTS3 or NUTS2 regions or from direct competition between diversification projects like agritourism.

8.1. Spatial correlations and spillovers

This measure is not highly spatially concentrated.

	Moran I statistic	Expectation	Variance
Indic_Axis3_benef	**0.049**	-2.706e-04	8.646e-05

- ***Measures 311 and 313***



A spatial lag is specified in the probit regression that explain the strictly positive uptake. It is significantly negative. The introduction of this spatial lag significantly improves the significance of several other variable effects and slightly improves the overall regression. The main consequences of the spatial lag are the change in the effects of the permanent grassland share, farming types and pre-2007 rural development measures, when the IMRs are derived from the Probit regressions with spatial lag. Current other measures have no significant effects.

8.2. The effect of the local economic and environmental conditions

Table: The explanatory variables describing the local economic and environmental conditions aggregated at 'revisited NUTS4' level

Variable names	Units	Year	Description
alt_moy	m	-	Average altitude
log_denspop06p1	-	2006	Log of population density
txchom06	%	2006	Unemployment rate
Indic_FI_2007	-	2007	Forest index
INDIC_AOC1	-		Dummy indicating the presence of areas supporting Protected Designation of Origin (PDO) products
zauer4561	-		Dummy indicating the presence of rural areas according to the French classification.
ZVul1	-		Dummy indicating the presence of nitrate vulnerable zones
natura20001	-		Dummy indicating the presence of Natura 2000 areas
CSP_max2	-		Dummy indicating that 'craft and retailed trades workers' socio-professional group is the most represented
CSP_max3	-		Dummy indicating that 'manual worker' socio-professional group is the most represented
CSP_max4	-		Dummy indicating that 'intermediate non manual workers' socio-professional group is the most represented
CSP_max5	-		Dummy indicating that 'executives & intellectual persons' socio-professional group is the most represented
CSP_max6	-		Dummy indicating that 'employees' socio-professional group is the most represented

Regression results	Presence of farmer beneficiaries Probit with spatial lag	Density of beneficiaries Tobit
(Intercept)	-2.40 *	-2.11 *
alt_moy	0.00 ***	0.00
log_denspop06p1	0.13 **	0.25 ***
txchom06	2.71 **	0.32
Indic_FI_2007	-0.16 .	0.01
INDIC_AOC1	-0.02	0.07
zauer4561	0.03	0.07
ZVul1	-0.03	-0.01
natura20001	0.11	-0.06
CSP_max2	-0.19	0.01
CSP_max3	0.25	-0.02
CSP_max4	0.33	-0.02
CSP_max5	0.19	-0.06
CSP_max6	0.33	0.00

Only the forest index has a negative effect on the presence of axis3 payments, while it does not affect the participation rate. The strongest positive effect comes from the population density that favours the presence of beneficiaries in the region and even more the density of beneficiaries. This may catch a demand factor related to diversification activities. Although unemployment favours the presence of axis3 payments, it does not affect the beneficiary density in the end, meaning that within region opposite effect related to unemployment plays.

Surprisingly, “Appellation d’Origine Controllée” (presence of certified geographical indication labelling farm products) does not affect participation.

8.3. The effect of agricultural features of the region

Table: The explanatory variables describing agricultural characteristics aggregated at ‘revisited NUTS4’ level

Variable names	Units	Year	Description
sth_sau_2000	-	2000	Share of grassland within the UAA
log_mo2006	-	2006	Log value of labour present on farm (farm heads, family labour and hired labour in AWU)
SUPMOYexpl.2006	ha	2006	Average farmsize
MONO1	-		Dummy variable indicating the presence a dominant (more than 50% of the farms and more than 60% of the area) crop in the NUTS4
AGE_MOY.2006	year	2006	Average farmers' age
ASB06_RNET	-	2006	Share of agricultural incomes within household incomes
log_montanttotp1	-		Log value of cattle direct payments (1,000 €)
pct_ste.2006	-	2006	Share of partnership farms within all farms
pct_comp.2006	-	2006	Share of company farms within all farms
Indic_Ann.Crop.2007	ha	2007	Average size of plots with annual crops
Indic_Grassland.2007	ha	2007	Average size of grassland plots
Indic_Per.Crops.2007	ha	2007	Average size of plots with permanent crops
Indic_Other.2007	ha	2007	Average size of other plots
Indic_Total.2007	ha	2007	Average size of all plots
Indic_CDI_2007	-	2007	Crop diversity index
OTE11	-		Dummy indicating that 'field-crop' type of farming is dominant
OTE231	-		Dummy indicating that 'wine, fruits and vegetables' type of farming is dominant
OTE431	-		Dummy indicating that 'mixed cattle' type of farming is dominant
OTE4ab51	-		Dummy indicating that 'beef and dairy' type of farming is dominant
OTE61	-		Dummy indicating that 'mixed crop and livestock' type of farming is dominant

Regression results	Presence of farmer beneficiaries Probit with spatial lag		Density of beneficiaries Tobit	
sth_sau_2000	-0.03		0.72	**
log_mo2006	0.38	***	-0.62	***
SUPMOYexpl.2006	0.00	*	0.00	
MONO1	-0.11		0.29	
AGE_MOY.2006	-0.03		0.04	*
ASB06_RNET	-0.14		3.66	*
log_montanttotp1	0.03		-0.17	***
pct_ste.2006	-0.93		1.66	**
pct_comp.2006	-0.94	**	0.97	*
Indic_Ann.Crop.2007	-0.01		0.04	*
Indic_Grassland.2007	0.00		0.08	**
Indic_Per.Crops.2007	-0.01	*	0.00	
Indic_Other.2007	0.00		-0.01	*
Indic_Total.2007	0.01		0.01	
Indic_CDI_2007	-0.06		-0.11	*
OTE11	0.30		-0.81	**
OTE231	0.19		-0.14	
OTE431	-0.43	*	-0.32	
OTE4ab51	-0.36		-0.71	**
OTE61	-0.06		-0.15	

The active population in agriculture (log_mo2006) clearly enhance the presence of farmer beneficiaries and the presence of payment, but decreases the density of farmer beneficiaries. As already mentioned this might come from the fact that it is related to the denominator of the participation rate.
The share of permanent grassland has a positive effect. Compared to regions dominated by dairy specialised farms, field crops and mixed dairy and beef farms have lower participation rates. First pillar payments for cattle have also a negative effect.

The farm share in the farm household income has a positive effect, which might be explained by eligibility conditions: you must operate a full time farm to apply for diversification aids.
Surprisingly, the density of farm companies and cooperatives favours participation, with no clear interpretation hypothesis.
The same question holds for the positive effects of the plot sizes of annual crops and grasslands, or the negative effect of the crop diversity index…

8.4. The effect of other measures

Table: The explanatory variables describing the uptake of previous and other second pillar measures

indic_meca1	-	-	Dummy for previous existence of 'mechanisation' payments from RDP1
indic_ctecad1	-	-	Dummy for previous existence of 'AES payment' (other than grassland or crop diversification) payment from RDP1
indic_maerot1	-	-	Dummy for previous existence of 'AES crop diversification payment' from RDP1
indic_phaepmsee1	-	-	Dummy for previous existence of AES grassland premium from RDP1
indic_dja1	-	-	Dummy for previous existence of payment for setting up of young farmers from RDP1
indic_foret1	-	-	Dummy for previous existence of afforestation payments from RDP1
indic_forma1	-	-	Dummy for previous existence of training payments from RDP1
indic_ichn1	-	-	Dummy for previous existence of LFA payments from RDP1
indic_poa1	-	-	Dummy for previous existence of Agricultural Orientation Premium
indic_preret1	-	-	Dummy for previous existence early retirement payments from RDP1
PRED_121_payment	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 121_payment
PRED_121_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 121_benef
PRED_214A_area	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214A_area
PRED_214D_area	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214D_area
PRED_214I_area	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214I_area
PRED_214A_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214A_benef
PRED_214D_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214D_benef
PRED_214I_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator 214I_benef
PRED_Axis3_benef	-	-	Predicted probability from the Probit explaining the adoption, as regards the indicator Axis3_benef

Regression results	Presence of farmer beneficiaries Probit with spatial lag	Density of beneficiaries Tobit
indic_meca1	0.15	-0.06
indic_ctecad1	0.48 **	-0.70 *
indic_maerot1	0.10	-0.20 **
indic_phaepmsee1	-0.16 .	0.07
indic_dja1	-0.25	0.09
indic_foret1	0.07	-0.02
indic_forma1	0.16 .	-0.09
indic_ichn1	0.20 **	0.00
indic_poa1	0.03	-0.19 **
indic_preret1	0.08	-0.28 ***
PRED_121_payment		0.22
PRED_121_benef		
PRED_214A_area		
PRED_214D_area		
PRED_214I_area		-0.21
PRED_214A_benef		-0.26
PRED_214D_benef		0.85
PRED_214I_benef		
PRED_Axis3_benef		
Rho (spatial lag)	0.59 ***	

Several pre-2007 pillar II measures influences the participation in Axis3 measures. Most negatively significant are early retirement, agricultural orientation premium, and the longer crop rotation. The integrated contracts (called “contrats territoriaux d’exploitation” and “contrat d’agriculture durables”, both mixed investment aids and locally adapted agrienvironmental measures) favour the presence of axis3 beneficiaries, but have a negative effect on the participation rates in the end. This result suggests that the local environment or the local institutions that favoured these integrated contracts also favours axis3 projects. Like the former integrated contracts, axis3 measures operate with farm tailored contracts which need local skills in bureaucracy. In contrast, most integrated contracts where designed to improve agricultural productivity and production. This may explain why their effect is eventually negative on the participation rate.

No present period measures have a significant effect on the axis3 measure uptake.

9. Implications for further work

This work shows that many issues still have to be developed, refined or elaborated.

Among these:

- producing LISA maps;

- fine tuning the indicators (paying attention to the outliers);

- exploring other indicators, such as the evolution of unemployment rate or of the population within the areas of interest;

- testing additional explanatory variables (i.e. livestock density, Pillar I payment, etc) depending on data availability;

- fine tuning the regression to obtain a better goodness of fit;

- using multivariate Probits;

- proceeding with augmented regressions for impact indicators;

- elaborating relevant interpretations;

- providing regional focus(es) at NUTS2 level (ie Midi-Pyrénées) for selected measures or indicators of relevance.