The Capitalisation of Fixed per hectare Payment into Land Rental Prices: a Spatial Econometric Analysis of Regions in EU

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"Feeding the Planet and Greening Agriculture:
Challenges and opportunities for the bio-economy"
25-27 June, 2014
Alghero, Italy

AIEAA
ASSOCIAZIONE ITALIANA DI ECONOMIA AGRARIA E APPLICATA

Motivation

- As a consequence of the introduction of the decoupled payments scheme in the UE, interest is growing on the *capitalisation effect*
- Many studies approach the issue using farm-level data, focusing on either land rents or land market prices, usually employing data for a single country or region
- Farmland rents (the dependent variable) are however characterized by a large heterogeneity which is unobservable in covariates to the largest extent (characteristics of land, presence of buildings, …)
- In addition agricultural productivity and payments refer to total land, not rented land only
- In summary, there are non-negligible identification problems in the use of farm level data
- This research provides a different view, approaching the capitalisation effect from a territorial perspective, in an attempt to mitigate such identification problems

A Territorial approach

- Different studies have attempted to empirically assess the incidence of EU payments on land prices (Patton *et al*., 2008; Breustedt and Habermann, 2011; Ciaian *et al*., 2011; Ciaian and Kancs, 2012; Guastella *et al*., 2013) using farm level data
- In the EU, the study by Kilian *et al.* (2008) is the only using municipality data on farmland rents to estimate the capitalisation decoupled subsidies
- The interest in using territorial data is growing because, following the 2003 reform, agricultural payments are expected to converge to fixed per-ha amounts at the regional level
- One can reasonably expect the cross-regional variation to be substantially more relevant than the variation between farms in the same region

The theoretical model

Let $$\pi_i = \sum_{k=1}^{K} p_k y_{ik}(a_{ik}) a_{ik} + g\left(\sum_{k=1}^{K} a_{ik}\right) - r\left(\sum_{k=1}^{K} a_{ik}\right)$$

represent the profit function for the representative farmer in the region, where

- π is the total profit
- p_k is the price of the k^{th} output
- y is the per ha productivity of output k and is a function of land used in production a only

each farmer receives a fixed per-ha amount g and pays a rent r for each ha of land used

The theoretical model (II)

Assuming that production is related to land by a CD, the FOC for land quantity is

$$r = \sum_{k=1}^{K} \beta_k \alpha_k Y_k + \gamma g$$

where

- $\alpha_k = a_k / \sum a_k$
- $Y_k = p_k$
- β and γ are parameters to be estimated
- k: crop (including cereals, proteins, potatoes, sugar beet, oil-seed and industrial crops), energy crops, vegetables and flowers, fruits, wines and grapes, olives, forage crops and other crops

The empirical model

The following equation is then estimated

$$r_{st} = d_s + \sum_k \beta_k X_{k,st} + \gamma_1 SPS_{st} + \gamma_2 ECP_{st} + Z'_{st}\,\delta + \varepsilon_{st}$$

where

- X is the productivity of output in a region weighted by the coefficient of output specialization
- SPS is the per ha amount of agricultural payment received under the single payment scheme
- ECP is the per ha amount received for energy crop
- Z includes control such
  - Average size of farms
  - Average share of family-to-total labour
  - Average amount of capital (B + ME) per ha
  - Density of animals (nitrate directive)
  - Proportion of rented to total land in the region (propensity to rent)

Introducing spatial relations

- Consider the linear model described before in compact form

$$r = Q'\theta + \varepsilon$$

- Consistency of the OLS estimator is threatened by the possibility that errors are not independently distributes but, on the opposite, are related among neighbouring regions
  - Omitted variables with a specific territorial effect
  - Farmland price transmission across neighbours
  - Unobserved spatial heterogeneity in the sample

- Space is accounted for by introducing a standard contiguity matrix

$$w_{ij} = \begin{cases} \dfrac{d_{ij}^{-1}}{\sum_j d_{ij}^{-1}} & \text{if } d_{ij} < d^* \\ 0 & \text{otherwise} \end{cases}$$

Model specification

- Space in the dependent variable (price contagion) [1]

$$r = \rho W r + Q'\theta + \varepsilon$$

- Space in the error term (unobserved spatial heterogeneity and omitted spatial variables) [2]

$$r = Q'\theta + \varepsilon$$

$$\varepsilon = \lambda W \varepsilon + u$$

- Space in the dependent variable and covariates [3]

$$r = \rho W r + \theta Q + \varphi W Q + u$$

- It can be shown that both [1] and [2] are nested in [3] and specification tests (LR-test) can be conducted accordingly

Data

- FADN regional (NUTS I and II) aggregates using sampling weights
- All territories in EU25, years 2005-2008

Variable	Description	Mean	SD	CV
R	Rent per ha	199.052	185.863	0.934
Y1	Output value per ha – Cereals	1466.269	1436.281	0.980
Y2	Output value per ha – Energy Crops	968.642	2511.057	2.592
Y3	Output value per ha – Vegetables and Flowers	34096.5	66345.69	1.946
Y4	Output value per ha – Fruits	7375.31	7309.231	0.991
Y5	Output value per ha – Wines and Grapes	10177.35	15064.98	1.480
Y6	Output value per ha – Olives	2483.117	2235.006	0.900
Y7	Output value per ha – Forage Crops	186.52	269.33	1.444
Y8	Output per ha – Other Crops	81805.05	697388.2	8.525
SAP	Payment per ha under either SAPS or SPS	482.77	1885.702	3.906
ECP	Payment per ha for Energy Crop	75.167	678.804	9.031
Asize	Average farm size (in ha)	81.926	116.214	1.419
FamLab	Share of family to total labour	0.725	0.229	0.316
FixAss	Value of Fixed Assets (Machinery and Equipment) per ha	3381.808	4048.983	1.197
AnimalD	Number of animal units (in livestock equivalent) per ha	1.031	1.188	1.152
RentProp	Ratio between rented and total UAA	0.541	0.241	0.445

Results

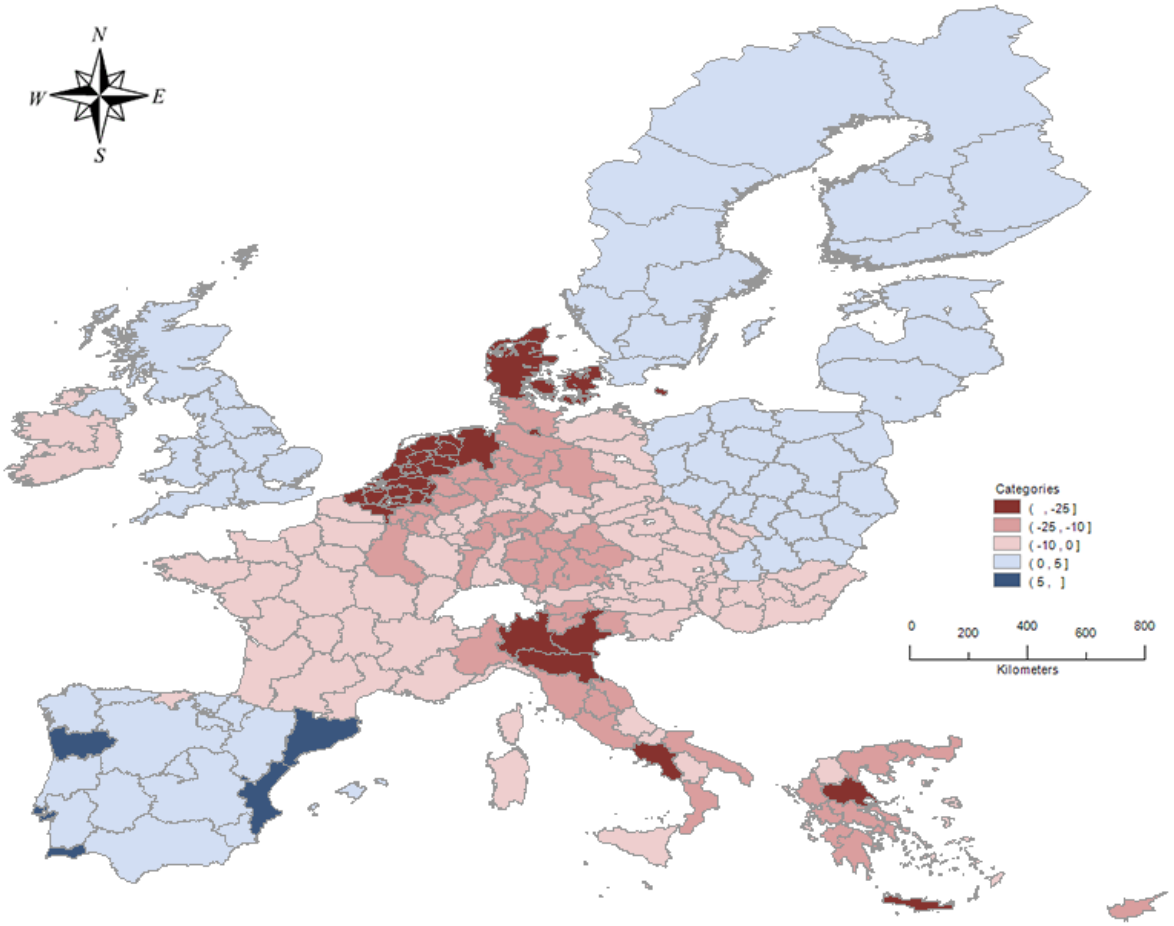
Veg and Flowers contribute to higher regional prices to the largest extent

It is estimated that 20% of the additional payment gets capitalized into farmland rents in Europe

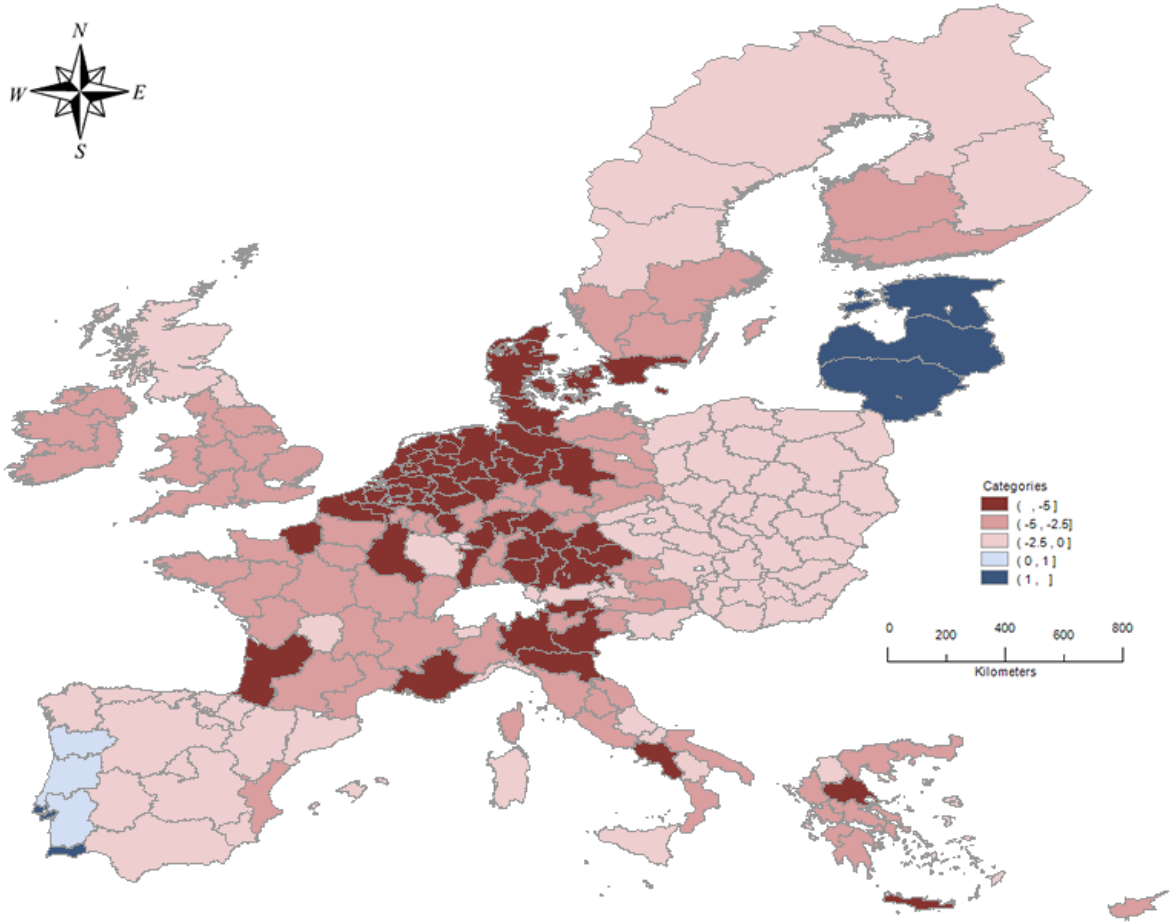
More than 90% of regional variation is explained

	FE	[1]	[2]	[3]	
X-Cereals	-0.097**	-0.106***	**-0.146*** **	-0.164***	0.549
	(0.046)	(0.038)	**(0.042)**	(0.039)	(0.373)
X-Energy Crops	-0.010	-0.010	**-0.011**	-0.016	0.056
	(0.013)	(0.010)	**(0.011)**	(0.011)	(0.079)
X-Veg and Flow	0.049*	0.049**	**0.045** **	0.035	-0.206
	(0.029)	(0.023)	**(0.023)**	(0.023)	(0.445)
X-Fruits	-0.022	-0.022	**-0.022**	-0.034**	-0.528
	(0.020)	(0.016)	**(0.015)**	(0.016)	(0.331)
X-Wines Grapes	-0.033	-0.034	**-0.040***	-0.047**	0.047
	(0.030)	(0.024)	**(0.024)**	(0.024)	(0.333)
X-Olives	-0.046	-0.047	**-0.045**	-0.024	0.302
	(0.051)	(0.041)	**(0.041)**	(0.041)	(0.705)
X-Forage	-0.009	-0.011	**-0.019**	-0.031**	-0.046
	(0.019)	(0.016)	**(0.016)**	(0.016)	(0.234)
X-Other Crops	-0.039*	-0.039**	**-0.042** **	-0.046***	-0.207
	(0.021)	(0.016)	**(0.016)**	(0.016)	(0.275)
SAP	0.225***	0.224***	**0.224*** **	0.229***	-1.175***
	(0.030)	(0.024)	**(0.025)**	(0.024)	(0.317)
ECP	0.002	0.001	**-0.002**	-0.002	0.322***
	(0.010)	(0.008)	**(0.008)**	(0.008)	(0.123)
Asize	-0.580***	-0.594***	**-0.665*** **	-0.703***	3.466*
	(0.185)	(0.149)	**(0.150)**	(0.149)	(2.005)
FamLab	-0.442*	-0.448**	**-0.469** **	-0.525***	2.208
	(0.232)	(0.185)	**(0.185)**	(0.182)	(2.081)
FixAss	0.053	0.041	**-0.007**	-0.018	3.004***
	(0.097)	(0.078)	**(0.081)**	(0.079)	(0.917)
AnimalD	-0.116	-0.114*	**-0.106***	-0.123*	-2.135**
	(0.083)	(0.066)	**(0.066)**	(0.065)	(1.029)
RentProp	-1.140**	-1.170***	**-1.297*** **	-1.400***	-0.586
	(0.481)	(0.386)	**(0.385)**	(0.395)	(6.309)

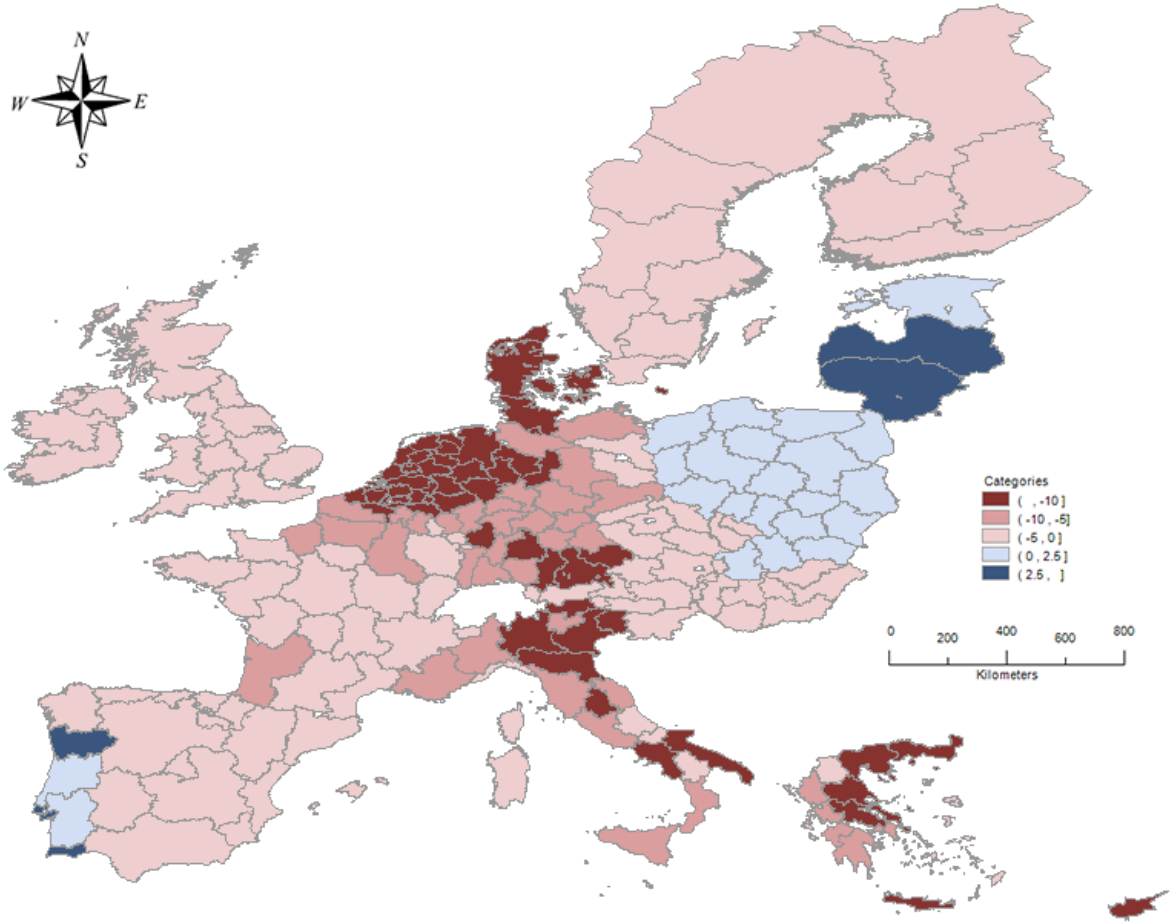
EU flat rate



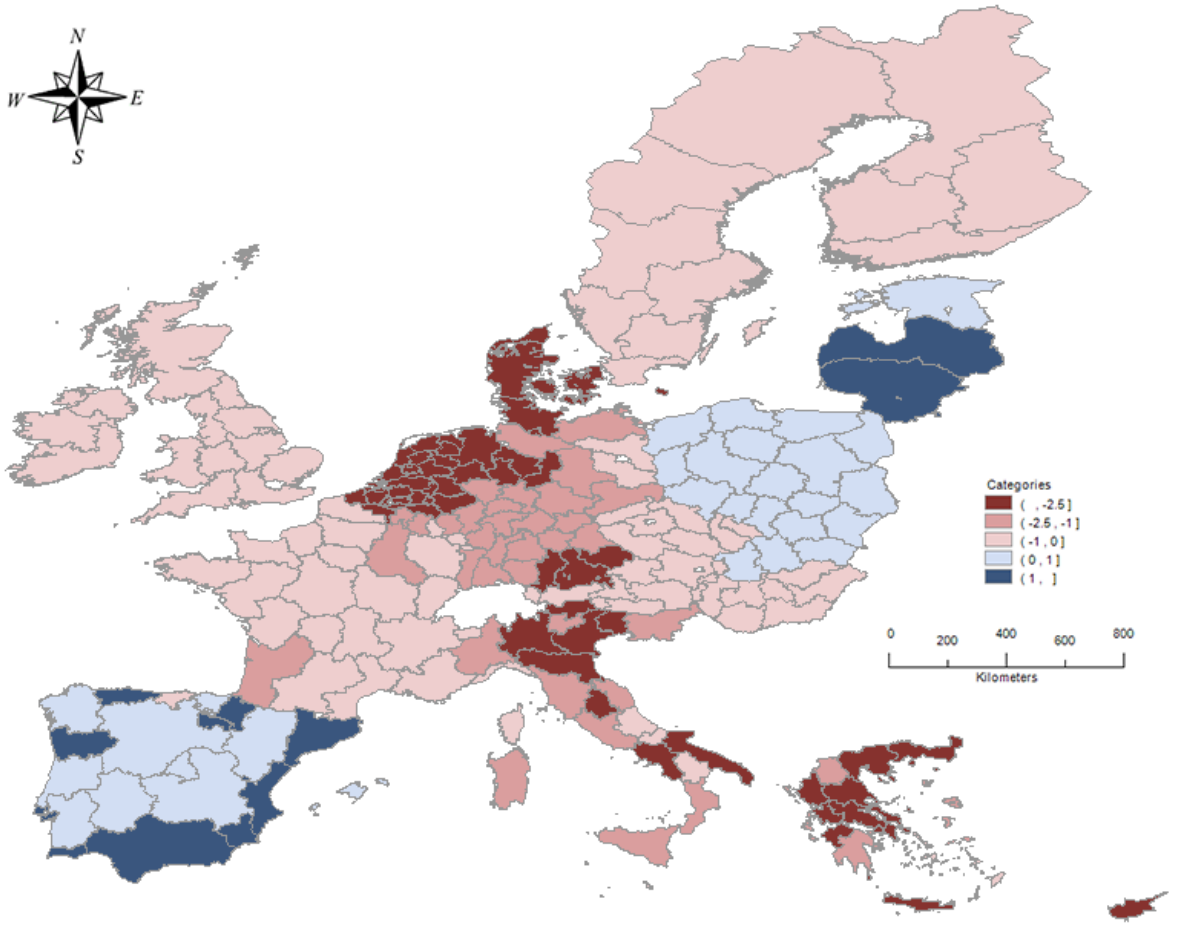
Min 80%



Min 90% and objective criteria



Integration



Conclusion

- Evidence suggests that EU decoupled payments are capitalized into farmland rents, supporting previous literature using territorial data
- This overall result may potentially mask spatial heterogeneity in the degree of capitalization (EU15-EU10) not accounted for in this model

- The introduction of a flat rate rebalances substantially the distribution of payments across MS and across regions within each MS, causing farmland prices to increase

The research was developed as part of the 7th FP-financed FADNTOOL project (Grant 265616/FP7-KBBE-2010-4)