The Capitalization of Area Payment into Land Rental Prices: Micro-evidence from Italy

Moro D.[1], Guastella G.[1] , Sckokai P.[1] And Veneziani M.[1]

[1] Institute of Agricultural Economics, Catholic University, Piacenza, Italy
giovanni.guastella@unicatt.it

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Summary

This paper analyses the extent to which agricultural subsidies are capitalised into land rental price. By using Italian data at the farm level the analysis proposed in this paper innovates with respect to existing studies in different ways. Thanks to the long time span available in the FADN database it is possible to compare the two time periods, before and after the 2005 CAP reform, to test whether any change occurred as a result of the introduction of the decoupled payments scheme. In contrast to previous empirical literature, which has either focused on the unobserved farm-level heterogeneity issue or on the selectivity issue, the method proposed in this paper accounts for both simultaneously. Finally, the same method is extended to account for endogeneity of some covariates. Overall, the results in the paper confirm previous evidence, rejecting the hypothesis that agricultural payments are capitalized into land prices in both periods.

Keywords: Sample selection; Panel Data; Capitalization Effect; Italian Farms
JEL Classification codes: C33; Q15; Q18

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1. Introduction

Agricultural subsidies are primarily designed to support farmers' income. However non-negligible secondary effects might also emerge, influencing farmer's decision on amount and composition of factors (i.e., labour, capital and land) to be used in production. Such effects are documented by, among others, Lence and Mishra (2003) for what concerns land markets, Rude (2008) in relation to farmers' production decisions and Sckokai and Moro (2009) in relation to farmers' investment decisions.

After the 2005 Common Agricultural Policy (CAP) reform, that introduced decoupled direct payments in the EU, much attention has been devoted to the effect of agricultural subsidies on land prices and, in greater detail, to the so called "capitalisation effect" in both the sale and rental prices (Ciaian and Swinnen, 2006). In fact, if payments are capitalised in land prices, subsidies originally intended to support farmers' income might be transferred to sectors other than agriculture. The decoupling reform, attaching subsidies' payment to the amount of land used in production, is expected to increase the likelihood of such an effect (Roberts et al., 2003).

Many existing studies explore the capitalisation effect of agricultural payments using US farm data, while only a minority has dealt with the topic using EU data. Furthermore, existing studies on EU agriculture are heterogeneous in terms of both the spatial and temporal coverage of the empirical analysis. For instance the study by Patton et al. (2008) examines the capitalization of subsidies in Ireland focusing on the period before the 2005 reform; Kilian et al. (2008) analyse data for Bavarian farms in 2005, the first year after the implementation of the reform; Breustedt and Habermann (2011) focus on German farms as well, but in the period before the reform implementation; Ciaian and Kancs (2012) study the effect of agricultural payments on rents in new member states, where only decoupled support has been rolled-out.

This evidence, based on the estimated coefficients from a regression of rental price on land productivity and subsidies, is rather mixed and definitively not conclusive. Furthermore, few studies account for the several sources of endogeneity bias in estimation. Firstly, one source of endogeneity is related to the cross-section nature of the data, which prevents from accounting for unobserved heterogeneity at the farm level. Secondly, using the rental price per hectare as the model's dependent variable requires the issue of selectivity to be taken into appropriate consideration, since the choice of renting is likely to be endogenous. Whereas some studies have estimated the capitalisation effect using panel data, hence accounting for the role of time-invariant individual unobservables, some others have focused solely on the issue of selection. Nonetheless, none has considered both these effects simultaneously. Although theoretical estimators have been developed (Wooldridge (1995); Kyriazidou (1997); Rochina-Barrachina (1999)), their use in applied econometrics, in facts, has been rather limited (Dustmann and Rochina-Barrachina, 2007).

By exploring the relation between rental price, on the one side, and land productivity and payments, on the other side, this paper provides several contributions to the existing empirical literature on the capitalisation effect. Firstly, we apply the Wooldridge (1995) estimator to simultaneously account for selectivity and farm heterogeneity in both the selection and main equations. Due to the unbalanced nature of our panel, this estimator is to be preferred to those suggested by Kyriazidou (1997) and Rochina-Barrachina (1999). Secondly, we extend existing model framework to take into appropriate account the potential endogeneity of productivity and payments discussed in Lence and Mishra (2003) and Patton et al. (2008). Thirdly, the long time-span of the series of our database allows us to estimate the capitalization effect for both the periods before (1995-2004) and after (2005-2008) the decoupling reform. This allows to directly test the effect of such an important reform by monitoring changes in the capitalisation effect after the introduction of the Single Farm Payment (SFP) scheme. Finally, we provide novel evidence for Italy where this effect has not been investigated, yet.

Our results are based on FADN data. Farms in the final dataset are selected from those specialised in field-cropping. After eliminating the inconsistent values, we obtain, over a 15-year period, a dataset of 73,342 observations related to 29,540 unique farms with varying degrees of permanence in the panel. The actual incidence of non-renting farms is approximately 51%, and this indicates the potential magnitude of the selection bias. Preliminary results reject the hypothesis of a capitalization effect in Italy in both periods, before and after the introduction of the decoupling reform.

In the remaining of the paper, the next section presents a brief note on estimation of panel data models in presence of selectivity and describes the dataset used for estimation. Model results are presented and discussed in the third section comparing estimates obtained using the methodologies described in Wooldridge (1995) and in Semykina and Wooldridge (2010). A brief summary of evidence concludes the work.

2. ESTIMATION OF CAPITALIZATION EFFECT

2.1. Empirical Model and Econometric Strategy

The empirical assessment of the capitalisation effect is carried out by either examining prices of land transaction or by analysing rental values of land. In the former case existing studies refer to the Net Present Value model or to the hedonic pricing approach to derive the empirical specification (Feichtinger and Salhofer, 2011). In the latter case, empirical models are derived from the profit-maximizing behaviour of farmers. Lence and Mishra (2003) represent a key reference in this type of literature. In their model rental price per hectare is determined by the expected productivity of agricultural land and by expected per hectare payments received by government. Similarly in Ciaian and Swinnen (2006) the capitalisation effect is studied in a partial equilibrium framework derived from a profit-maximization setting. Also in this case market clearing conditions relate rental price to farm subsidies and farm output. This framework is adopted, among others, by Patton et al. (2008) by Kirwan (2009) and by Breustedt and Habermann (2011). Accordingly, in a panel data setting, a general empirical specification follows the one proposed hereby:

$$r_{it} = \alpha_i + \beta Y_{it} + \gamma P_{it} + X'_{it}\delta + \varepsilon_{it}. \quad (1)$$

In equation 1 r_{it} is the net rental price per hectare of rented land, Y_{it} is the output per hectare, P_{it} is the per hectare amount of payment received by the farmer. i and t denote, respectively, the farm and the year for which values are observed. β and γ are the parameters of interest in this study. However, while the slope of β is expected larger than zero, that of γ is expected to equal zero under the null that agricultural payments are not capitalized into land rental prices. X_{it} is a matrix of additional control variables capable of explaining residual variation in the distribution of land rental prices and δ is the vector of associated coefficients. ε_{it} is the usual vector of residuals.

Three main estimation issues are concerned with estimation of both β and γ. Firstly it is likely that unobserved farm-specific effect are correlated with covariates, especially with productivity and payments. While many farm-specific characteristics affecting both rental price and productivity and payments, such as size, capitalization and type of production, can be directly observed, some others, such as soil quality, are unobservable. The individual heterogeneity bias derived from unobservable characteristics is only considered in studies where more than one year is observed and different panel data methodologies can be applied. For instance, the capitalization effect is estimated employing GMM techniques in Patton et al. (2008), using the first difference estimator in Kirwan (2009) and the long difference estimator in Ciaian and Kancs (2012). Secondly only a sub-sample of farms do actually use rented land in production, making estimation possible only on selected farms. As described by Heckman (1979) a problem of selection bias occurs if selection is endogenously determined and, hence, if the probability of renting is somehow related with the model's right hand side. While the selection issue is easily tractable in the cross-section framework, extension to panel data is complicated by the possible correlation between selection and unobserved farm-level characteristics. To the authors knowledge the study by Ciaian and Kancs (2012) is the only accounting for selectivity by adapting cross-section sample selection methods to long-differenced series. Thirdly, the use in estimation of actual values of productivity and payments in place of the relative expected values represents a third source of endogeneity caused by the influence of expectation errors on residuals. GMM methodologies are applied by Lence and Mishra (2003) and Patton et al. (2008) to account for the endogenous nature of productivity and payments.

All these estimation issues have been considered separately by the studies in which the capitalization effect has been estimated. The econometric framework proposed in this work attempts to consider all issues simultaneously. In Wooldridge (1995) (hereinafter W95) a correction procedure is proposed to estimate panel data models in presence of endogenous selectivity and individual heterogeneity. The methodology relies on a two-step procedure similar to the one proposed by Heckman (1979). Following Mundlak (1978), correlation between individual effects and covariates is allowed by including individual average of covariates among the regressors in the main equations. The procedure requires T different probit models to be estimated, one for each year $t = 1, 2, ..., T$. From probit estimates T different Inverse Mill's Ratios (IMR) are computed and included in the main equation after pooling. Robust standard errors for the set of model coefficients can be estimated using formulas in the appendix of Wooldridge (1995). Alternative estimators have been proposed by Kyriazidou (1997) and Rochina-Barrachina (1999). Both estimators rely on first-differencing of data to eliminate individual heterogeneity and use only observations for which the selection indicator is constant for two consecutive time periods. This generally implies a loss in efficiency with respect to W95, especially in the case of strongly unbalanced panel data. The comparison of the three estimators is discussed in greater detail in Dustmann and Rochina-Barrachina (2007).

Semykina and Wooldridge (2010) (hereinafter SW10) extend the W95 approach by allowing to correct for endogeneity bias due to non-zero correlation between explanatory variables and idiosyncratic errors. The procedure again works in two steps. In the first step T different probit equations are estimated to derive IMRs. In the second step a pooled OLS estimator is used adding individual means of first step variables and IMRs as covariates and instrumenting endogenous variables with a subset of variables used in first step.

The capitalization effect is estimated in this paper using the procedure described in W95 to account for selectivity and individual heterogeneity as well as with the SW10 procedure to account for possible correlation of productivity and payments with residuals, caused by expectation errors. Consider the model in equation 1, where r_{it} is observed only if hectares of rented land used in production are larger than zero. Define s_{it} the selection indicator following a binary rule and taking non-zero values when r_{it} is observed. Following W95, for each t the probit equation

$$P(s_{it}=1\,|\,W_i)=\Phi(W_i\theta_t) \tag{2}$$

is estimated and, for $s_{it}=1$, $\hat{\lambda}_{it}=\lambda(W_i\hat{\theta}_t)$ is computed, $\lambda(\cdot)$ denoting the usual IMR. W_{it} is such that $\mathbf{W}=[\mathbf{Y},\mathbf{P},\mathbf{X},\mathbf{Z}]$. This ensures that variables in the second step represent only a subset of variables in the first step and Z_{it} are used as exclusion restrictions. In the second step the equation

$$r_{it}=\beta Y_{it}+\gamma P_{it}+X_{it}^{'}\delta+\beta_1 Y_i+\gamma_1 P_i+X_i^{'}\delta_1+\rho\hat{\lambda}_{it}+\varepsilon_{it} \tag{3}$$

is estimated using only selected observations. Based on Chamberlain (1982) the presence of Y_i, P_i and X_i in the second step controls for unobserved heterogeneity allowing correlation between individual effects and covariates in equation 1, while the $\hat{\lambda}_{it}$ term controls for selectivity. Accordingly parameters β, γ and δ can be consistently estimated by applying Pooled OLS to equation 3. Using a conservative approach in terms of degrees of freedom, Y_i, P_i and X_i are replaced by $\overline{Y}_i$, $\overline{P}_i$ and $\overline{X}_i$ in the empirical application. Furthermore, interactions between λ_{it} and $T-1$ time dummy variables are included to take into appropriate account that T values of θ have been used in computing $\hat{\lambda}_{it}$.

Taking into account endogeneity of productivity and payments requires minor changes with respect to the approach above. Following SW10 in the first step only strictly exogenous variables are used as explanatory variables. Thus, for each t , the equation

$$P(s_{it}=1\,|\,M_i)=\Phi(M_i\theta_t) \tag{4}$$

is estimated, where now $\mathbf{M}=[\mathbf{X},\mathbf{Z}]$. As in the previous case, IMR is computed based on first step estimates of θ and is included in the second step regression

$$r_{it}=\beta Y_{it}+\gamma P_{it}+X_{it}^{'}\delta+X_i^{'}\delta_1+\rho\hat{\lambda}_{it}+\varepsilon_{it} \tag{5}$$

which is modified accordingly. Notation in equation 5 corresponds to that in equation 3 except for the fact that now individual averages of endogenous variables are excluded from the right hand side. Differently from W95, equation 5 is estimated by applying the standard IV estimator on pooled data and using M_{it}, M_i and $\hat{\lambda}_{it}$ as instruments. Exactly as in the previous case, $\overline{X}_i$ are used in place of X_i and interactions between $\hat{\lambda}_{it}$ and $T-1$ time dummy variables are included to allow ρ to be non-constant.

2.2. Data and Description of Variables

The data used in this work come from the FADN database of the European Commission. The sample we consider includes all Italian farms recorded in the database which are specialized in field-cropping. The sample covers years from 1994 to 2008 and hence includes both periods before and after the 2003 decoupling reform. The initial database counts 77,913 farms for that period. Production is divided in five main output categories, namely cereals, grain maize, oilseeds, proteins and other types of crop productions and 515 observations in the dataset are associated to a null value of output in any of these categories. These farms cannot be considered specialized in field-cropping and are therefore excluded from the database. 423 farms are excluded as well since the reported value of production is negative. Although FADN documentation provided by the Commission explains in detail this evidence, in fact null or negative values of production cannot be used for the empirical estimation.

Since per hectare production and payments represent the two most important explanatory variables in this work, all values causing either per hectare production or per hectare payment to be missing have been excluded from the final database. In more detail, in 3,096 observations it was found a positive value of production in correspondence with a null number of hectares of land (or, by the opposite, a null value of production in correspondence with a positive number of hectares of land) in at least one of the five output categories mentioned above. Considering the same categories, in none of the observations it was found a positive value of payment in absence of eligible land (or the opposite). Furthermore there were 429 observations for which a coupled payment was registered in at least one category of production without the relative value of production being larger than zero and these observations have been excluded as well. Finally out of the 73,440 observation considered, 98 were unselected because the value of one or more of the other explicative variables was missing. The database used for empirical estimation is hence composed of 73,342 observations, of which 15,371 in year 2005-2008.

Table 1 summarizes mean values of the dependent variable (r) , the rental price per hectare, of the selection indicator (s) and of the two main independent variables, per hectare output (Y) and per hectare payment (P). In table 1 is possible to note the relevance of selection issues, provided than in both period almost half of the farms in the database do not rent land for production and hence are excluded from the estimation sample.

Table 1. Summary statistics of dependent and main independent variables

	1994-2004	**2005-2008**
N of obs	*57971*	*15371*
N of farms	*22489*	*7051*
N of years	*11*	*4*
r (thousand of Euro per hectare)	1.915	2.8303
s (1 if rented land is used in production)	.5031	.5068
Y (thousand of Euro per hectare)	.0217	.0403
P (thousand of Euro per hectare)	.2691	.5115

In the FADN database, production and payments are recorded separately and based on different aggregation schemes. In order to produce comparable measures of per hectare output and payment, aggregation has followed the scheme proposed in the FADN database for the classification of payments. Notably, in fact, production data are reported in the FADN database following a more detailed classification scheme. Table 4 in the appendix summarizes the procedure used to obtain comparable values. The total value of production is computed summing up the values of production of cereals, grain maize, oilseeds and crops and hence excluding other crop productions, by-product output and output from livestock production. Accordingly only land used for production of cereals, grain maize, oilseeds and crops is considered in the denominator of Y. The same procedure is adopted for payments, counting only the effective number of eligible hectares in the denominator of P.

Monetary values in the final database have been reconverted using a fixed exchange rate for the years before the introduction of the common currency and then deflated using Eurostat agricultural output price deflators (Eurostat reference: *apri_pi00_outa*[1]). In the case of cereals production and of payments for cereals, a specific deflator was available while in the case of oilseeds and proteins the deflator for industrial crop production was used. The generic crop output deflator was used in all other cases, for instance in the case of other crop output and by-product output. Finally, output from livestock and livestock products was deflated with the specific deflator.

Table 2. List of Variables for the empirical model

Variable	Description
Dependent Variable	
Rent	Yearly value of rental contract divided by the number of rented has
Endogenous Covariates	
Productivity	Yearly value of cereals, maize, proteins and oilseeds production divided by the number of has used for these productions
Payments_c	Amount of coupled payments related to the productions of cereals, maize, proteins and oilseeds divided by the relative number of has eligible for support
Payments_d	Amount of decoupled payments divided by the number of has eligible for support
Exogenous Covariates	
size	Size categories based on farm has: 1 (<2) 2 (>2 and <5) 3 (>5 and <10) 4 (>10 and <20) 5 (>20 and <30) 6 (>30 and <50) 7 (>50 and <100) 8 (>100)
livestock output	Ratio between output from livestock and livestock products and total farm output
by-product output	Ratio between output from by-product activities and total farm output
Additional controls (at the regional level)	
animal density	Regional aggregate number of livestock units divided by the regional area
wage	Average regional wage per hour worked
intermediate input price	Regional price index for intermediate inputs (energy, fertilizers, ...) expenditure
Exclusion Restriction	
labour	Ratio between family and total labour (in number of hours)
capital	Value of assets (buildings, equipment and machinery) divided by the number of farm has
share cereals	Ratio between land used for production of cereals and total farm land
share maize	Ratio between land used for production of maize output and total farm land
share proteins	Ratio between land used for production of proteins output and total farm land
share oilseeds	Ratio between land used for production of oilseeds output and total farm land

A list of variables used in the empirical model is presented in table 2. Among covariates in the land price model, productivity and payments are expected to capture the largest part of the variation in rental price. As discussed by Lence and Mishra (2003) and Patton et al. (2008), with respect to both productivity and payments, the endogeneity issues related to errors in expectations must be carefully addressed in empirical estimation of the rental price equation. In selecting exogenous covariates for the empirical model, previous literature has been considered (Kilian and Salhofer (2008); Patton et al. (2008); Breustedt and Habermann (2011); Ciaian and Kancs (2012)). The size of farm is the most important farm-specific characteristic which is capable of influencing farm rental price. Following the classification scheme adopted by Eurostat to present statistics on the distribution of farm size, eight dummy variables for different size classes has been included in the regression model. Since the focus of the paper is to estimate the capitalization effect for farming activities using land as a primary production factor, only farms specialized

[1] Since price deflator for 1994 is not available at Eurostat, the 1995 value has been used instead.

in field-cropping are used for the estimation. Nonetheless a non-negligible share of farms report differentiated sources of agricultural income and, therefore, the share of output produced by activities not related to field-cropping has been included as control. Primarily output derived from livestock production and from by-product activities has been considered. Finally, some regional characteristics are included to account for variation in rental price of land related to factors external to the farm. The most relevant of these factors are the prices of input different from land, namely labour and intermediate inputs, for which the regional wage and the regional input price index have been considered as good proxy, and the demand for rent land deriving from manure spreading activities, as proxy by the animal density.

Additional variables are used as exclusion restriction and hence included only in the probit equations. Among determinants of the rent decision this work considers the ratio of family to total labour and a measure of farm capitalization. These are expected to capture the influence of a managerial approach to farming, which might significantly affect the decision to rent but is unlikely related to rental price. Furthermore composition of production, as proxy by land shares for the four categories mentioned above, is considered among exclusion restrictions. Although composition of production might have, in fact, only a marginal or altogether negligible role in explaining rent decision at the farm level, it is worth noting that, for the purpose of estimation of the model with selectivity, heterogeneity and endogenous regressors (Semykina and Wooldridge, 2010), instruments for productivity and payments must be selected among the set of variables excluded from the second step. Therefore, an extended set of variables in used as exclusion restrictions in both models and the same variables are used as instruments in the model with endogenous covariates. The choice to use land shares as instruments for productivity and payments is motivated by the fact that, on the one side, both variables, at the aggregate sector level, are strongly influenced by composition of production and, on the other side, expectation errors in productivity and payments are expected to be not systematically correlated with the farmer's choice about types of crop production.

3. RESULTS

The rental price model is estimated by using both the W95 methodology and the SW10 methodology, in this second case accounting for the endogeneity of productivity and payments. Estimation results are presented in table 3 for both the period before the decoupling reform was introduced and the period after the reform. The presence of any capitalisation effect is assessed through a test on the significance of coefficients related to *Payments_c* and *Payments_d*, respectively for the coupled and decoupled payment schemes.

Estimation with the W95 procedure produces results in the first two columns of table 3. For both periods there is evidence that the effect of productivity is positive and significant, larger for the period after decoupling reform. The coefficient related to the capitalisation effect is negative and significant in the period before the reform and turns out to be not significantly different from zero for the period after the reform. Many of the size coefficients are significantly different from zero, as expected. However, it is important to note that evidence suggest that higher rents were paid by large farm in the period before the reform, while the average rent has been higher for middle-size farm in the period after the reform. There is weak evidence that non crop productions affect the rental price of land as the only coefficient for livestock production in the pre-reform period is significant. Concerning regional variables, the coefficient related to animal density is negatively sloped and significantly different from zero for the first period. The same coefficient, however, turns positive in the second period. Finally evidence indicate that land rental prices react positively to an increase in price of intermediate inputs and negatively to an increase in the price of labour, although this second effect seems to disappear in the period post reform.

Table 3. Land Price model Estimates - correlated farm effects and selectivity

	W1995		SW2010	
Productivity	1.837**	4.381**	17.235***	18.172***
	(0.834)	(1.864)	(4.980)	(6.094)
Payments_c	-0.109**		0.235	
	(0.055)		(0.262)	
Payments_d		-0.017		0.412
		(0.019)		(0.443)
Cash Flow	-0.007	0.002	-0.002**	-0.003
	(0.004)	(0.004)	(0.001)	(0.002)
2 to 5 has	-1.307**	-1.893	-1.563	-0.640
	(0.599)	(1.260)	(1.531)	(1.045)
5 to 10 has	-1.345**	-2.284*	-1.410	-0.320
	(0.648)	(1.308)	(1.761)	(1.216)
10 to 20 has	-1.296**	-2.672**	-1.262	-0.432
	(0.650)	(1.341)	(1.759)	(1.357)
20 to 30 has	-1.134*	-2.545*	-1.071	-0.090
	(0.654)	(1.368)	(1.761)	(1.397)
30 to 50 has	-1.116*	-2.971**	-1.025	-0.503
	(0.657)	(1.377)	(1.764)	(1.457)
50 to 100 has	-1.112*	-3.853***	-1.000	-1.209
	(0.663)	(1.409)	(1.765)	(1.494)
more than 100 has	-0.991	-3.369**	-0.840	-0.379
	(0.681)	(1.451)	(1.776)	(1.622)
livestock output	-0.148*	-0.008	-0.065	-0.063
	(0.083)	(0.210)	(0.093)	(0.276)
by-product output	-0.020	0.803	0.242	0.406
	(0.275)	(0.743)	(0.277)	(0.983)
animal density	-0.458***	4.027***	-0.488***	5.606***
	(0.134)	(1.238)	(0.154)	(2.142)
wage	0.028**	-0.017	0.039**	0.027
	(0.014)	(0.024)	(0.016)	(0.073)
intermediate input price	-0.081***	-0.057***	-0.061***	-0.005
	(0.012)	(0.012)	(0.014)	(0.046)
intercept	10.029***	15.279***	5.103**	2.928
	(1.176)	(2.174)	(2.066)	(7.312)

Notes to table 3:
Asymptotic SE in parenthesis.
***, ** and * indicate statistical significance at 1%, 5% and 10% confidence levels.

Estimation with the SW10 procedure produces similar results. The size of the coefficient related to productivity is now much larger than in previous case and continues to be, on average, larger in the period post reform. In both periods the coefficient is highly significant. Concerning payments, for both coupled and decoupled payments the related coefficient is now correctly sloped but in neither case significantly different from zero. Opposite to previous results, none of the size dummy variables has significant coefficient while the coefficient of cash flow turns now to be significant. Concerning the effect of productions other than crop, there is no evidence indicating that land rental price might be affected by output composition. Estimates confirm previous evidence that the density of animals had a negative effect on land price in the period before the reform and that effect is positive in the period after the introduction of decoupling reform. Finally, previous results are also confirmed for what concerns the price of other inputs, but only for the first period, as both coefficients are not significant in the second period.

4. CONCLUSION

Much concern has risen in relation to the so-called *capitalisation effect* in Europe after the introduction of decoupled agricultural payments in 2005. Many studies attempted to test the hypothesis that agricultural subsidies are capitalized into land rental prices and the evidence is rather mixed. This paper innovates with respect to previous studies since panel methodologies capable of correcting estimates for unobserved heterogeneity at the farm level, selection arising from the endogenous decision of renting, endogeneity of productivity and payments due to expectation errors are used. Employing Italian FADN data, the capitalisation hypothesis is tested using a sample of farms specialized in field-cropping in the period 1994-2008.

Overall, the evidence in this paper reject the hypothesis that agricultural payments are capitalized into land rental price at the farm level. The conclusion is similar for both periods, before and after the introduction of the reform. Findings are coherent with evidence in previous studies finding a weak or altogether absent capitalisation effect and in assigning a primary role to land productivity.

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APPENDIX

Table 4. Aggregation scheme for production values and subsidies

	Payments and number of eligible hectares (table M)	Productions and number of hectares (table K)
Cereals	602	120
	608	121
	618	122
		123
		124
		125
		127
		128
Grain Maize	606	126
Proteins	604	129
	614	
Oilseeds	603	132