Factors influencing German and Italian farmland prices – common grounds and differences

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***Abstract* - This study develops a hedonic model of farmland prices for Germany and Italy in 2000 and 2010 based on NUTS3-level data in order to analyse the impact of several agricultural and non-agricultural variables. The empirical results show that gross value added per capita, livestock unit per hectare and agricultural gross value added per hectare have a positive impact, while the share of agricultural farms having livestock on the total amount of farms has a negative effect on farmland prices in both countries. However, average farm size has a negative impact in Italy but a positive in Germany.**

Introduction

Land is a non-renewable and scarce resource needed to all human activities. Hence, competition for land takes place between different market players. The importance of farmland for the agricultural sector is underlined by its dominant position among the agricultural farm assets (Hüttel et al., 2013; Huang et al., 2006). In particular, the recent development of increasing farmland prices in many member states of the European Union (Ciaian et al., 2010) strengthen the need of a better understanding of the price mechanism. According to Devadoss and Manchu (2007) as well as Choumert and Phélinas (2015) three types of theoretical models have been developed to explain the value of farmland: (i) the Demand–Supply Model (DSM), (ii) the Net Present Value Model (NPVM) and (iii) the Hedonic Price Method (HPM). Almost all studies refer to NPVM or HPM (Feichtinger and Salhofer, 2013). The latter one models farmland prices as a function of various factors, which could be agronomic (e.g. soil quality, livestock density), economic (e.g. interest rate), demographic (e.g. population density) and spatial (e.g. distance to markets) (Sklenicka et al., 2013; Feichtinger and Salhofer, 2013; Huang et al., 2006). The overall objectives of this comparative study are (i) to investigate the factors influencing the farmland prices in Germany and Italy in 2000 and 2010 and (ii) to find common determinants in both countries.

Data and Methods

Comparing Germany and Italy differences in the development and in the level of farmland prices become obvious. In Germany, the average farmland price was relative constant until 2006, but than strongly increased reaching an average absolute level of 18.099 €/ha in 2014 (Destatis). Oppositely, the trend of farmland prices in Italy was characterised by an upward phase until the end of 2005, reaching an average value of 20.001 €/ha in 2014 (ISTAT).

The hedonic price approach is statistically realized by a multiple linear regression. The dependent variable is the yearly average farmland price per hectare (LVAL_HA) at Italian and German NUTS3-level[2] in 2000 and 2010. Table 1 contains the definition of the variables used in the model and some descriptive statistics. For Germany, all data are provided by the German Federal Bureau of Statistics (Destatis). For Italy, agricultural variables are provided by the National Institute of Agricultural Economics (INEA) and econometric variables are obtained by the Italian national statistical institute (ISTAT).

The parameter estimations are based on ordinary least squares (OLS). To fulfil the assumptions of normal distribution of residuals and homogeneity of variance the logarithm of the dependent variable is used. To avoid multicollinearity some predictors are removed from the model. As a result, no variance inflation factor (VIF) exceeds the value of 10. The final model for each year in each country was performed applying the 'Akaike information criterion' (AIC). This leads to four different models, characterised by a different combination of independent variables, respectively (Table 2).

Results and Discussion

Comparing both countries (Table 2), most of the variables have the same impact direction, but partially differ in the significance level. Livestock density has a strong positive influence on the farmland price. Drescher and McNamara (2000) also identified livestock density as one of most important impact factor due to the need of sufficient amount of land for fertilizer application. Agricultural gross value

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[2] NUTS3-level corresponds with county level in Germany and provinces in Italy and is used to have comparable areal units.

added per hectare and wheat yield (indicators for profitability of land) positively influence the farmland prices, too. This is in line with Hüttel et al. (2013) who found a significant positive effect of soil quality and the share of arable land for farmland prices.

Table 1. Variable definition and summary statistics.

Variable and Definition	Germany Mean (Std.Dev.)		Italy Mean (Std.Dev.)	
	2000	2010	2000	2010
LVAL_HA: Farmland price (€/hectare)	20882.5 (19073.5)	22705.5 (19552.8)	17010.3 (11221.5)	21736.6 (16635.8)
POP_DENS: Population density (number of inhabit-ants/km^2)	522.8 (670.7)	510.3 (661.2)	232.8 (323.0)	241.5 (325.9)
GVA_PC: Gross value added (€/capita)	21002.6 (8605.4)	26266.7 (10405.1)	17433.4 (4688.6)	22583.7 (6074.3)
PERM_BUILD: Construction permits (number/year)	576.9 (419.4)	311.9 (294.4)	613.8 (438.8)	325.27 (234.9)
PR_BUILD: Germany: price of building lands (€/m^2); Italy: price of residential buildings (€/m^2)	92.8 (105.7)	104.5 (105.4)	1143.9 (482.1)	1522.8 (614.7)
PERM_CROP: Share of permanent crop on UAA (%)	0.0 (0.1)	0.1 (0.7)	0.2 (0.1)	0.2 (0.2)
HOLD_AV: Average farm size (ha)	55.4 (63.4)	74.8 (76.1)	7.4 (5.7)	11.1 (8.1)
HOLD_TOT: Number of all farms	1117.6 (1061.1)	742.5 (659.7)	24227.5 (20507.8)	14867.3 (13199.8)
HOLD_LIVES: Share of livestock farms on all farms (%)	0.7 (0.2)	0.7 (0.2)	0,3 (0.2)	0.2 (0.2)
LSU_HA: Livestock density (livestock units/ha)	0.8 (0.5)	0.7 (0.5)	0.8 (0.9)	0.8 (0.9)
DURUM_HA: Wheat yield (100 kg/ha)	69.1 (11.6)	69.4 (10.2)	41.3 (15.2)	35.6 (12.4)
GVAAGRI_HA: Agricultural gross value added (€/ha)	1697.9 (2866.2)	1506.9 (1251.9)	2839.7 (2414.4)	3265.4 (3671.6)
UAA_Q: Share of utilised agricultural area (UAA) on total area	0.4 (0.2)	0.4 (0.2)	0.4 (0.2)	0.4 (0.2)
UAA_TOT: Absolute amount of UAA per areal unit	42774.6 (45110.4)	41731.6 (41851.8)	123423.3 (81478.0)	118597.5 (799284)

Source: Own calculations based on DESTATIS, ISTAT, INEA

However, the share of livestock farms on all farms plays the opposite role showing a negative effect on the farmland price. Huang et al. (2006) trace this back to the negative impact livestock farms have on the attractiveness of adjacent residential districts. The share of utilised agricultural area (UAA) on total area has a positive impact of the farmland price implying that a higher share of UAA (typical for rural regions) leads to higher prices. One would expect lower prices in areas with a larger supply of farmland. Possible, these areas are characterized by good agricultural conditions leading to high competition for farmland. As a non-agricultural factor gross value added per capita has a positive influence indicating a high ability to pay for land of non agricultural players. Hüttel et al. (2013) detected a positive impact on farmland prices in land market auctions if the share of non agricultural tenderers increases. Differences between both countries can be shown by two variables. The price of building lands only influences the farmland price in Germany with a high significance level. Additionally, the average farm size has a negative impact in Italy and a positive in Germany. This possibly reflects the differences in cultivated crops. In Germany arable land and grassland dominate the agricultural land use. An increase in farm size results in economies of scales. Thus, possibly leads to higher prices paid by larger and growing farms. In contrast, Italy has a large share of permanent crop land cultivated by profitable small scale farms.

Recent studies use spatial econometric models taking spatial dependence into account (i.a. Hüttel et al., 2013). Such an implementation will be a further step to improve the reliability of the results.

Table 2. OLS estimates for the farmland price determinants in Germany and Italy in 2000 and 2010.

	Italy		**Germany**	
	2000	2010	2000	2010
Constant	8.346***	8.115***	7.276***	7.668***
GVA_PC	0.00002	0.00003***	0.00001***	0.0002*
PR_BUILD	0.0001		0.001***	0.001***
HOLD_AV	-0.019**	-0.011*	0.001*	
HOLD_LIVES	-0.977***	-0.681*	-0.985***	-0.576***
LSU_HA	0.232***	0.212***	0.216***	0.197***
DURUM_HA	0.009**		0.008***	0.007***
GVAAGRI_HA	0.0001***	0.0001***	0.0001***	0.0001***
UAA_Q		0.851**	0.798***	0.976***
Observations	107	107	384	385
R^2	0.76	0.804	0.844	0.814
Adj. R^2	0.729	0.781	0.833	0.803
F Statistic	24.775***	35.370***	81.123***	72.219***

Note: *p<0.1; **p<0.05; ***p<0.01

Source: Own calculations based on DESTATIS, ISTAT, INEA

REFERENCES

Choumert, J. and Phélinas, P. (2015). Determinants of agricultural land values in Argentina. *Ecological Economics* 110(C), pp. 134-140.

Ciaian, P., Kancs, D. and Swinnen, J. F. (2010). EU Land Markets and the Common Agricultural Policy. Brussels: Centre for European Policy Studies.

Destatis – German Federal Bureau of Statistics, different years.

Devadoss, S. and Manchu, V. (2007). A comprehensive analysis of farmland value determination: a county-level analysis. *Applied Economics,* Volume 39, pp. 2323-2330.

Drescher, K. and McNamara, K. (2000). Bestimmungsfaktoren für Bodenpreise auf unterschiedlich regulierten Märkten. Ein Vergleich zwischen der Bundesrepublik Deutschland und Minnesota. *Agrarwirtschaft* 49(6), pp. 234-243.

Feichtinger, P. and Salhofer, K. (2013). What do we know about the influence of agricultural support on agricultural land prices? A summary of results. Centre for european policy studies, pp. 14-27.

Huang, H., Miller, G.Y., Sherrick, B.J. and Gòmez, M. I. (2006). Factors Influencing Illinois Farmland Values. *American Journal of Agricultural Economics* 88(2), pp. 458-470.

Hüttel, S., Odening, M., Kataria, K. and Balmann, A. (2013). Price Formation on Land Market Auctions in East Germany - An Empirical Analysis. *German Journal of Agricultural Economics* 62(2).

INEA – National Institute of Agricutural Economics, Italy, different years.

ISTAT – Italian national statistical institute, different years.

Sklenicka, P., Molnarova K., Pixova K.C. and Salek, M.E. (2013). Factors affecting farmland prices in the Czech Republic. *Land Use Policy,* Volume 30, pp. 130-136.