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What determines the Czech land market prices? Some regional findings.[1]

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Abstract

The paper deals with the analysis of market land prices that were collected from land purchased contracts in the Czech Republic. Regression model was used to identify determinants explaining variability of market prices between 2008 and 2009. It was found out that type of plantation, region, type of buyers, plot size, distance to regional city or number of parcels play significant role. These factors explain more than a half of variance in land price. Quality of land that was expressed through administrative price has significant effect on market price. Yet, such effect became less import in regions nearby cities (e.g. Prague and Olomouc), where the market land price is significantly influenced by the distance to the district city. Land reform, however has not been confirmed to stimulate higher prices for sellers. It is reasonable to expect that part of the remaining variation could still be accounted for by non-random variables.

Key words

Land, market price, administrative price, regression model, region.

Anotace

Příspěvek se zabývá analýzou tržních cen zemědělské půdy ve vybraných pěti okresech ČR. S využitím regresního modelu vysvětlujeme relevantní determinanty tržních cen získaných z kupních smluv v letech 2008-2009. Kromě faktorů jako je druh pozemku nebo kvalita hraje významnou roli v ceně také okres, charakter nabyvatele – zda-li se jedná o zemědělský nebo nezemědělský subjekt, obchodovaná výměra, vzdálenost pozemků do okresního města a částečně také počet převáděných parcel. Tyto faktory vysvětlují více než polovinu variability tržní ceny. Jednoznačně úřední cena půdy je ve většině regionů důležitým vodítkem pro stanovení výsledné ceny. Nicméně tento faktor je významně oslaben v regionech přilehlých k městským aglomeracím (např. Praha-východ a Olomouc), kde je cena silně ovlivněna vzdáleností do okresního města. Naopak nebylo potvrzeno, že by provedená pozemková úprava v katastrálním území ve větším rozsahu působila na kupní ceny půdy. I přes vysoký počet zkoumaných proměnných je reálné předpokládat, že stále část nevysvětlované variability je vysvětlována nenáhodným faktorem.

Klíčová slova

Zemědělská půda, tržní cena, úřední cena, regresní model, region.

Introduction

From the human perspective land is highly valuable because it provides a wide range of benefits to individuals and society at present and in future (Goverment office for Science, 2010). Land is traded like other goods, and must therefore have a price expressed in money (Němec, 2004). In the Czech Republic in the early 90´, an official (administrative) price of land has been introduced for defined purposes - determination of property taxes, transfer, exchange of land within the landscaping, etc. (Vrbová and Němec, 2004). Official price in fact replaced non-existent market price (Němec and Kučera, 2007). Administrative price is based on precisely specified factors, which are primarily based on the production potential of soil. In connection with the development of trade

[1] Results were gained in the framework of research tematic task for Ministry of Agriculture „Development of Market Land Prices and identification of factors influencing the development of Land Prices in conditions of the Cech Republic".

in agricultural land is reasonable to believe that objectivity of market price has increased. The question remains, to what extent the impact of administrative price is reflected in the market price after 20 years it was introduced.

Knowledge about the right price of land is also important in the economy of enterprises because of external financing. Land value (and buildings) significantly influences the viability of agriculture (Tsoodle and Golden, 2003) because the property including land can be used as a mortgage for a loan and thus indirectly determines how much farms can borrow. In relation with the stabilization of conditions in the agricultural enterprises on land, there has been gradually increasing the amount of own land at the expense of leasehold land. It is expected that this trend will continue at this rate in the long term. The value of the land will therefore increase in the total value of agricultural firms holdings. Currently, the share of the value of own land and permanent crops in total assets is of 10%.

Literature basically distinguishes four main components contributing to land value (Tsoodle and Golden, 2003): productivity component, the consumptive component, the speculative and transactional component. The productivity component proceeds from the ability of land to generate the income (profit), which is given on one hand by the intensity of crop growing, and on the other hand by supports, taxes and technological change.

Land productivity component is given by the expected yields from the land use, which is discounted by interest rate. Land price as a function of rent effects modelled Chavas and Shumway (1981). Consumptive component includes personal preferences of the business participants (so called intrinsic value) while sometimes there is no relevant economic reasoning behind, even though they can significantly influence the sale price or purchase price of transactions respectively. An example might be a very positive emotional relation of a purchaser to a plot (e.g. in the past the property was owned by ancestors). Similarly the sale of land could be affected by the owner‘s attempt to get rid of an unwanted property at any price according to his emotional feelings. Pope a Goodwin (1984) reported that owners buy land due to their emotional relation to the countryside. Income, population density, the rate of urbanization and characteristics concerning placement of plot are general factors influencing the perception of land value.

Speculative „component“ of land value is resulting from the expectations of buyers, that the price of land will show the expected future trend. This trend is given by the development in various aspects as commodity prices, business profitability, interest rates, inflation, the exchange rate, etc. The transaction component includes factors specific to the particular person – buyer or seller, as well as the nature of sale (its financing, a forced sale, a sale among relatives, etc.). Land price could be also influenced by environmental factors as modelled Bastian et al. (2002).

Střeleček et al. (2009) dealt with the factors that affect the agricultural land prices in the Czech Republic. The four most decisive factors were: the size of municipality, the size of a plot, distance to the edge of the collateral property and land access. Presented factors explain the variability of the market land price from 32 %. Latruffe et al. (2008) investigate impacts of the government support and others factors on the land price in the Czech Republic. They found out that the population density and the average crop yield had no significant influence on the prices, while the interest rate and the support payments had a positive effect and the average plot had a negative impact. The negative impact of the average plot size confirms that smaller plots are more expensive than larger plots. As for support authors conclude that the elasticity of land price with respect to payments based on output is 4%. Elasticity of the payments based on farm income is of similar extent – 6%. As for direct payments they had no effect on land prices. With regard to Slovakian conditions Buday and Bradáčová (2010) found out as the most significant factors the location of a plot, purpose of land use, the size of land and the amount of support. Other factors emerged in the survey as: land fragmentation, the common undivided ownership, the arrival of foreign investors, soil quality, land drainage, the possibility of irrigation or watering and social background of the landowner. A similar approach followed Tsoodle and Golden (2003) who found out, how the selected characteristics were manifested via market land prices in 8 counties in Kansas State (USA)[2]. Among the statistically relevant determinants was the size of traded land with a negative effect. Yet there was a growth of unit price on plots larger than 130 ha. As expected, irrigated soil increases land price, however grazing decreases. Other important features with negative influence on the price (lower) were as follows: transactions taking place on the „open[3]„ market, contracts between relatives or any business in a forced way (execution). The study also dealt with possible distinctions (elasticity of

[2] Analysis included 67,000 sales between 1986 and 1999.

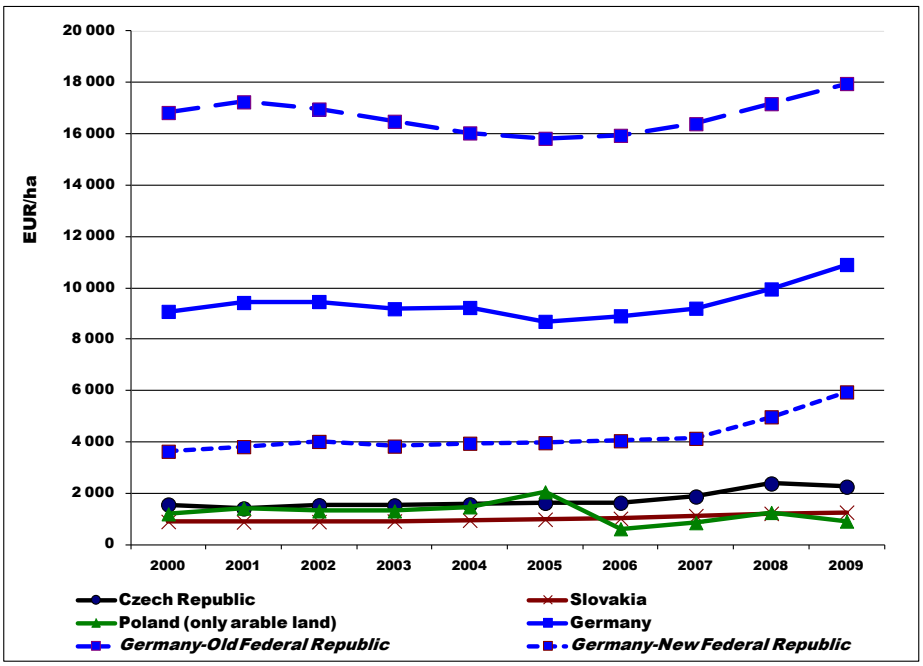
[3] This is likely related to process of contract conclusion, when seller is advertising publicly about intended sales. In contrast to a situation when two parties agree on the terms and conclude a contract without prior advertising.

variables) among the surveyed districts in Kansas State. Their findings show that the land market is localized, so that the influence of individual factors varies significantly across the surveyed districts. Authors attribute these differences to fact that there exist different plans for land use outside of agriculture in some parts and „distort“ to some extent, the market for agricultural land. According to Chicione (1981) the average per acre farmland price in surroundings of cities decreased as the parcel size increased, reflecting lower transactions costs for both the buyer and the seller.

Because agricultural land is also an investment opportunity, overall investment environment significantly affects the price of land. For example, recently in connection with the economic crisis the price of agricultural land in Germany (Agrarheute 2011) has significantly increased, because land started to represent safe investment in the environment of an unstable market, and there is no concern about the significant price fall.

The graph 1 shows the comparison of land prices in the Czech Republic (CR) and the neighbouring selected EU countries (Slovakia, Poland and Germany). In the last decade the figure does not show any significant convergence of prices of agricultural land in neighbouring countries and the CR. While in Germany there is evident a significant increase of prices, both in the new and old federal states in recent years (2008 – 2010). For example, annual change in land prices in 2010 showed the increase even by 25% compared to prices of 2009 in the new federal states (AGRARHEUTE 2011). There was a further significant price growth of agricultural land amounting to 8.7%. The situation may correspond with the economic crisis; in case of the CR and Poland it has led to reduced willingness to invest including the land, while in Germany the crisis could cause the conviction that the land is better (more secure) investment compared to other options. It has stimulated an increase in prices of agricultural land. Land prices in selected countries in the years 2000 – 2009 are shown in Graph 1.

Assigning the right administrative (unbiased) prices to agricultural land is currently hot topic in the Czech Republic that raise up several questions: (1) what factors influenced the formation of market prices of agricultural land in the Czech Republic between 2008 and 2009, (2) how important factor is the administrative price of agricultural land in the final market price, (3) what are the differences in the land prices among the Czech Republic and selected EU countries. To answer these questions at first the comparison of time series of land prices development is presented and then the application of a regression model that explains market price of land in CR is shown. The following section discusses the issue of market prices of land and to what extent specific determinants influence the price.



Source: Eurostat, Statistisches Bundesamt (Germany).

Grapg 1: Land market prices in period 2000 - 2009 for the Czech Republic, Slovakia, Poland and Germany.

Materials and Methods

Data on land market prices were collected from individual purchase contracts registered by Czech Statistical Office (CZSO) from 5 districts – Havlíčkův Brod, Klatovy, Olomouc, Praha-východ and Znojmo. These regions were designed so they could preferably represent the different conditions of local markets for agricultural land – suburban or remote region resp., the region with more or less fertile soils, with a different representation in each type of parcels, with different farm structure and distance to frontiers with other EU countries, with different levels of economic development and different pressures on agricultural land use, etc. Data on geographical location enabled to calculate the distance to centre of municipality and district towns. Socio-economic data were processed for each cadastral unit and/or on municipality level. These data come primarily from publicly accessible databases as follows: the Czech Statistical Office concerning socio-economic situation in each municipality, the Central Land Office on the status and implementation of land consolidation, the database of users and recipients of agricultural supports in the LPIS for determining the number of users in each cadastral areas.

2.1 The model of land prices formation

Variables selected for regression models can be classified according to its character as a „contract specific" (reflecting the individual nature of the contract or contractual parties, such as whether the acquirer originates in farming or not, soil quality), local (characterizing local conditions, population density or distance to the municipality) and socio-economic (characterized by social and economic nature of the region as a migration change or unemployment). The total number of observations included in the model was 306.

The dependent variable and the most independent variables are in log forms (so-called „double log model")[4] and thus the log coefficients can be interpreted as the elasticities of variables with regard to the following general exponential form of the model (1),

$$y_i = \beta_0 * x_{1i}^{\beta_1} * x_{2i}^{\beta_2} * \ldots * x_{n}^{\beta_n} \quad (1)$$

where y_i is the endogenous variable, x_{ni} are independent variables and β_n are parameters of elasticity. After its linear transformation it is possible to find the following equation (2),

$$\ln(y_i) = \beta_0 + \beta_1 \ln(x_{1i}) + \beta_2 \ln(x_{2i}) + \ldots + \beta_n \ln(x_{ni}) \quad (2)$$

Specific version of the model (3) is enlarged by dummy variables which were not transformed into logarithmic form[5]. The analysis for detection of any multicolinearity[6] was performed and presence of multicolinearity by a VIF test (Variance Inflation Factor) was tested, the final model was specified as follows:

$$\ln(UnitPrice_i) = \beta_0 + \beta_1 Culture_i + \beta_2 \ln(Area_i) + \beta_3 \ln(NrParc_i) + \beta_4 Year_i + \beta_5 \ln(ALP09_i) + \beta_6 districtOC_i + \beta_7 districtPV_i + \beta_8 TransPP_i + \beta_9 TransFarm_i + \beta_{10} FutUsage_i + \beta_{11} CLR_i + \beta_{12} \ln(DistWeiMun_i) + \beta_{13} \ln(DistWeiDistr_i) + \beta_{14} \ln(NrFarms_i) + \beta_{15} \ln(PopDensity_i) + \beta_{16} ShareTI_i + \beta_{17} ShareEAI_i + \beta_{18} Unemloy_i + \beta_{19} \ln(lnhab_i) + u_i \quad (3)$$

where $ln(UnitPrice_i)$ is the logarithm of market land price in CZK/m^2 of the *i*-th contract (i = 1-N) in 2008 and 2009 gained from contracts between sellers and purchasers; dummy variable *Culture* indicates the type of property being sold: (0) represents the arable land and (1) permanent grassland, with arable land the market price should increase; $Area_i$ is logarithm of total area of traded land with expected positive relation to the price with regard to higher efficiency of larger agricultural land management and lower management costs associated with ownership; $NrParc_i$ means logarithm of the number of parcels included in sales, where the growth in the number of plots should reduce the price; *Year* is dummy variable (2009 = 1), $ALP09_i$ is logarithm of official (administrative) land price in CZK/m^2 in 2009 in a cadastral unit assuming the higher administrative prices will stimulate the growth of market land price; regional variables *districtOC* and *districtPV* mean affiliation of a parcel with district Olomouc resp. Praha-východ, and these are expected to contribute to the growing prices in both districts in relation to other districts; variables *TransPP* and *TransFarm* are dummy variables indicating the type of transfer between the seller and the buyer, so the first one represents transactions realized between physical persons, the second between physical persons and agricultural companies or agricultural cooperatives, respectively. The combination of these two dummy variables build an unstated last-group of transfers between physical persons and non-agricultural entities or if need be the seller or the buyer is other than a physical person and where it is assumed that the transfer between entities with no entrepreneurial activities in agriculture will increase the land price; *FutUsage* is dummy

[4] This type of functional relation is often used in analogous regression models.

[5] To interpret, it is necessary to put the values of these estimated coefficients off logarithm and subtract 1 from the gained value.

[6] Test of analysis of paired correlation coefficients proved the strong and statistically provable dependence among variables – total increase, inherent increase and migration increase of inhabitants in the municipality. These variables were excluded. By next variables were not indicated any strong dependences (though significant), which would ultimately lead to inaccurate estimates of spreads of parameters

variable explaining future use of agriculture land, where (0) means unlikely non-agricultural use and (1) represents the second lowest level of probable non-agricultural use with expected positive influence to market land price[7]; $DistWeiMun_i$ and *DistWeiDistr* are weighted distances (in km) of parcels to the centre of relevant municipality (regional city), with negative effect on the price due to higher transport costs. $NrFarms_i$ means the logarithm of the total number of farms in the relevant cadastral region, with the growing number of farmers should increase the competitiveness on the land market and so cause the growing price. $PopDensity_i$ represents the logarithm of population density per 1 km^2 in municipality, where is expected positive price effect with regard to higher demand for land for non-agricultural use with its indirect influence on the land price for agricultural use. $ShareTI_i$ indicates the overall increase in population between 1994 and 2009 composed of migration and birth population increase relatively to the number of dwellers of the village, and it indicates to a certain extent of location attractiveness, where a positive relationship to the price of land is expected. $ShareEAI_i$ represents the share of economically active inhabitants on the total population, where is expected a positive relationship to the price of land. $Unemploy_i$ expresses the rate of unemployment in the village with the expected negative impact on the price, $Inhab_i$ represents the size of the municipality with a positive influence on the price.

2.2 Estimates of Models

Models were estimated by statistical software SPSS.16 using the method of the least squares estimation (Ordinary Least Squares) and the Backwards estimation method, which suggests the inclusion of all potential explanatory variables and excludes those that contribute least to explain the total variance. The final estimate was elected the estimation of the model, which reached the highest value of an adjusted R^2, this one that can explain in the best way the course of the dependence of sold land price on explanatory variables with regard to their total number. At first the model was estimated for all 306 observations and with regard to the fact that the market for agricultural land is to a large extend also influenced by specific conditions, in the second step even regional models of market price formation introduced by individual districts have been estimated. Therefore, the system was chosen with the gradual withdrawal of variables in their own estimation.

[7] Original purpose of collecting data was to identify market prices of agricultural land primarily for agricultural use, so in the pre-selection the individual plots in a particular exchange were classified according to the degree of possible future non-agricultural use on a scale of 1 to 5 and with the help of graphic previews in cadastral pictures of LIPS and criteria which took into account the distance of land to the village, the presence of land in an urban area, the degree of built-up area, proximity to roads and paths etc. Where (1) assumes a presumable future agricultural use, and (5) most likely non-agricultural use. Prices were collected only for the scale of future land use classified as 1 and 2, i.e. with high probability to remain in agricultural use. Dummy variable with value (1) in this model therefore represents those sales that were in the origin five-point scale labelled (2).

Results and discussion

The price of agricultural land in the analyzed sample for the years 2008 and 2009 ranges between 1.07 and 48.48 CZK/m^2 at the average price of CZK 8.92 CZK/m^2 (Table 1). Significantly the highest average price was observed in the district Praha-východ, which reached 17.50 CZK/m^2. The price is positively influenced by the proximity of the capital city Praha and represents more than double of the average land price in the whole sample. The price of land in all other surveyed districts is below the average of the sample. Very low price of land has been detected mainly in district Havlíčkův Brod even 4.89 CZK/m^2.

Higher variability of the price was observed also in the classification of contracts according to the type of transfer between sellers and buyers. In the analysis transfers are divided into three groups as follows: (1) in the first group are transfers between physical persons representing 60% of all transfers with the price very close to average; (2) in the second the seller is the physical person and the buyer is agricultural enterprise, which constitutes 23% of all transfers for which the price is on average the lowest (6.20 CZK/m^2) and in the last group is formed mainly by other transfers between physical persons and legal entities with other than agricultural focus, or alternatively the sellers not physical persons but municipalities, non-agricultural enterprises (3), while in this group achieved the highest average price of 11.68 CZK/m^2 of the land.

According to the declared two types of the sold land in the whole survey sample, definitely exceeds the average price of arable land 9.48 CZK/m^2 which is higher than the average price of grassland 5.70 CZK/m^2. The conducted analysis of variance considers the difference in the price between these two types of land statistically significant at the 5% level. Sales of permanent grassland are represented in the sample survey by 15%.

From the time perspective the price rose from the average of 8.23 CZK/m^2 in 2008 to 9.86 CZK/m^2 in 2009. This difference between the monitored years is statistically significant at the 10% level

Variables	Type	description (units)	Interval Max–Min	Min	Max	average	Std. deviation
Dependent variable							
Unit Price	continuous	Unit price (CZK/m2)	47.41	1.07	48.48	8.92	7.67
Explanatory variables							
CULTURE	discrete	0 = arable land.; 1 = grass land	1	0	1	0.15	0.355
AREA	continuous	Area of sold plots (m2)	231 260	2 133	233 393	25 143,80	31 914,50
NrPARC	discrete	Number of sold parcels	12	1	13	2.02	1.666
YEAR	discrete	0 = 2008; 1 = 2009	1	0	1	0.42	0.495
ALP09	continuous	Administrative land price in 2009 (CZK/m2)	15.1	1.31	16.41	8.29	3.95
TRANSPP	discrete	0 = remaining types of transfers; 1 = transfers between physical persons	1	0	1	0.59	0.493
TRANSFARM	discrete	0 = remaining types of transfers; 1 = transfers between physical person and agricultural company or cooperative	1	0	1	0.23	0.419
FUTUSAGE	discrete	0 = preclusive agricultural usage in future; 1 = potential non-agricultural usage in respect to relative proximity of roads or urban area	1	0	1	0.05	0.223
CLR	discrete	0 = non-realised complex land reform in cadastre area; 1 = realised CLR	1	0	1	0,25	0.433
DistWeiMun	continuous	Weighted distance among sold parcels in cadastral area and community centre (km)	23.38	0.82	24.2	7.75	4.34
DistWeiDistr	continuous	Weighted distance among sold parcels in cadastral area and district city (km)	28.5	2.5	31	16.06	7.53
NrFARMS	discrete	Total number of farms farming in cadastral area	36	1	37	10.26	6.54
NrFARMS_km2	continuous	number of farms farming in cadastral area per km2	5.74	0.52	6.26	2.25	1.39
POPDEN	continuous	Population density (number of inhab./km2)	965.48	5.86	971.34	109.94	144.87
SHAREMI	continuous	Share of population from migration increase between 1994 and 2009 in total population (%)	88.03	-30.77	57.26	7.83	12.36
SHARENI	continuous	Share of population from natural increase between 1994 and 2009 in total population (%)	36.39	-25.53	10.86	-2.03	6.09
SHARETI	continuous	Share of total population increase between 1994 and 2009 in total population (%)	100.28	-37.23	63.05	5.79	14.16
SHAREEAI	continuous	Share of economically active inhabitants in total number of inhabitants	41.68	18.9	60.58	46.52	56
UNEMPLOY	continuous	Unemployment rate in municipality where the land is sold	22.7	0	22.7	7.92	4.17
INHAB	continuous	Number of inhabitants	100 332	41	100 373	2 931.45	9 321.72

Source: Own calculation, the Czech Statistical Office, the Czech Office for Surveying and Mapping.

Table 1: Summary statistics of variables in the analysed sample of sold farmland.

of significance. But from two-years time series is not possible to judge whether it is a long-term trend. In the Table 1 worth mentioning the other characteristics of the sample as the average total acreage of the transferred land in a single sale, which is 2.51 hectares and ranges from 0.21 to 23.3 ha with the average number 2.02 transferred plots and the maximum number of 13 plots.

In this section follows the analysis of the individual factors influence on the agricultural land sales price. The results of the regression model comprehensively confirmed (Table 1) for all cases in the five districts that the selected variables have the ability to explain the variance in the dependent variable (F-test results) and the model is statistically significant at 1% level. The value of the

coefficient of determination ($R^2 = 0.54$) indicates that more than half of the variance is explained by the proposed model. From comparison with other similarly oriented studies (Tsoodle et al., 2003; Střeleček et al., 2009; Latruffe et al., 2008) this is a sufficiently high value, because R2 usually reaches values ranging from 0.3 to 0.4. In the following table are presented parameters of the explanatory variables and their statistical relevance entering into the model in the division into three groups (contract-specific, local factors and socio-economic factors).

From the original 24 explanatory variables from the final model the following variables were excluded because of their non-significant contribution in explaining of the total variance. They are dummy variable *YEAR* representing the change in time, that in case of the impact on the price in the interaction of other factors is not so significant year by year; dummy variable *BudUzit* indicating a possible higher rate of non-agricultural use is an insignificant factor due to the low 5% representation in the total sales sample; next dummy variable *CLR* represented in 25% of sales indicating a possible realization of complex land reform; variable NrFarms_km^2 is a number of users of agricultural land per km^2, because the total number of users in absolute terms better reflects the potential dependence; regional dummy variables representing two districts Klatovy and Havlíčkův Brod due to their mutual non-significant difference in the average selling price and in relation to the Znojmo district, which was as dummy variable not viewed, and was created by a combination of the previous 4 regional dummy variables.

Furthermore, most socio-economic variables based on changes in population between years 1994 and 2009, the share of economically active population and unemployment rate, which variability partly explain the regional dummy variables for two districts Praha-východ and Olomouc. Some of the discarded variables in the overall model are significant but in selected regional (district) models, as described below.

According to results presented in Table 2, the type of traded land reduces price because the price of grassland (*Culture = 1*) is lower by 20% compared to the arable land, which is consistent with the general assumption. Another provable finding is

Model for 5 districts	Parameters	St.D.	test statistics (t)	p-value	Collinearity statistics	
					Tolerance	VIF
(constant)	**1.188**	0.434	2.735	**0.007**	-	-
Contract characteristics						
Culture	**-0.204**	0.090	-2.535	**0.012**	0.751	1.332
LnArea	**0.063**	0.036	1.724	**0.086**	0.729	1.372
LnNrParc	-0.076	0.049	-1.570	0.117	0.878	1.139
LnALP09	**0.400**	0.064	6.240	**0.000**	0.581	1.720
TransPP	**-0.255**	0.077	-3.820	**0.000**	0.531	1.884
TransFarm	**-0.386**	0.093	-5.268	**0.000**	0.509	1.964
Local factors						
DistrictOC	**0.164**	0.074	2.049	**0.041**	0.691	1.447
DistrictPV	**1.977**	0.101	10.823	**0.000**	0.531	1.884
LnDistWeiMun	0.070	0.051	1.361	*0.175*	0.745	1.342
LnDistWeiDistr	**-0.280**	0.059	-4.738	**0.000**	0.682	1.466
LnNrFarm	-0.074	0.049	-1.494	*0.136*	0.776	1.289
Socio-economic factor						
LnPopDens	0.055	0.044	1.265	*0.207*	0.546	1.831
R2	0.546					
adjusted R2	0.527					
F - value	29.357					
Model significance	0.000					

Source: Own calculation.

Table 2: Impacts of factors influencing unit market land prices.

the size of traded parcels presented by variable *Area* when with their growth the price is rising. The results show that the unit price of the two hectares of land is about 6% higher than the unit price of the one ha agricultural land with the same remaining parameters. The authors Střeleček et al. (2009) came to the same direction of effect and conclusion that there is a smaller influence of the size of traded land to the realized price of land. In contrast, with the growth of the number of parcels included in the contract, their price decreases, which is probably related to greater fragmentation of land, even though in the case of the number of traded parcels conclusion has a less statistical significance (0.117). The model also clearly showed that the administrative price (*ALP09*) has had a positive and relatively strong influence on the final market price; the factor of the official land price should be understood as the quality of traded land because *de facto* it in itself reflects qualitative soil parameters, such as skeleton, grain size, slanting, slope and soil type. If the „normative" quality of land increases by 1.00 CZK/m^2, then the final selling price would be increased by 0.40 CZK/m^2. Although the quality measured by administrative price is an important factor in the market price, but not the most.

An interesting finding is the fact, how the character of the seller and buyer manifested at the market price. Purchasers as a physical person and/ or agricultural company or cooperative have a „potential" to reduce the price in comparison to a situation where the purchaser is a non-agricultural enterprise. When the transfers realised between physical persons (*TransPP=1*) then the reduction is in the range of 26%, which may be partly influenced by the family relationship between seller and buyer[8]. If the purchaser is an agricultural company or cooperative (*TransFarm=1*) then the price of sold land is even of 39% lower compared to other legal enterprise. This difference is illustrated even more markedly on the ratio of market price to the official land price in the given cadastre that reflects differences in quality of land. For transfers, when the purchaser is an agricultural company or cooperative this ratio reaches values of 0.73, at the transfer between physical persons the ratio is already 1.25 and the last group of market price takes almost double value of the official price (1.85). This finding confirmed the fact that both the agricultural companies or cooperatives and physical persons tend to focus more on rather long-term agricultural investment into land contrary to non-agricultural investors with different motives and expectations about the return from the land.

[8] Tsoodle and Golden (2003) pointed out that transactions between related parties resulted in a 43% discount on the per acre sales prices.

The geographical proximity of land is a well known factor that significantly determines property prices, including agricultural land. The results show that the land in both districts Olomouc and Praha-východ has definitely higher value by 16% and 198% respectively than the land in the remaining monitored districts (Klatovy, Havlíčkův Brod and Znojmo - this group as such represents soil quality a slightly below the average compare to the whole survey sample). This finding adds another factor – the average weighted distance of land from the district town (*DistWeiDistr)* – which has a negative impact as expected: whereby farther parcels are from the district town, thus the lower is the agreed price. For example, when the average distance of sold plots increases from 16 km by 10% up to almost 18 km, as a result of this change the market price ceteris paribus decreases by 2.8%. Regarding the distance to the municipality (*DistWeiMun*), there is already a slight positive dependence, which however can not be considered statistically significant. Moreover, due to the nature of plots selected in the sample, where are not reflected plots in the urban area of the village then the distance factor to the village centre does not already play a significant role. This is also an explanation of why we come to a different conclusion than the results of authors Střeleček et al. (2009), where the size of the municipality and the distance to the village belong to two the most important factors with the greatest impact on the price of land.

The number of users of agricultural land in the cadastral area (*NrFarms*) also negatively affects the explained market price, i.e. the more farmers cultivated land in the same cadastral area, the lower land price is trading. This relationship is opposite to the default assumption, because a higher number of users gives an opportunity to rent advantageously the purchased land. It is also necessary to prove this relationship further in the longer term even with the regard to its lower statistical significance and its important regional specificity – it depends not only on the number of users, but also on the acreage of land, which is cultivated by individual users. Likewise, it is necessary to proceed also in the case of the variables representing population density, despite the evidence of a positive effect (more densely populated locality „raise" prices of agricultural land) is no longer statistically significant.

According to analysis of nationwide basic model was found out that the spatial location of the land has a significant impact on the market value of the land. For this reason, in the next section we look at the inter-regional differences. In order to investigate the influence of individual factors on the five local

markets were created and tested on the regional models for the above mentioned five districts. Diversity of local markets is already apparent from the basic description statistics set out in Table 3.

Statistically significant differences at the 1% level of significance are not only in the case of dependent variable as the unit market price, but in many other explanatory variables and it is possible to expect substantial differences in conditions and individual factors that could explain the varying degree of influence on the market prices at the regional level. In terms of price level for district Praha-východ shows the highest price level as expected with the average price 17.5 CZK/m^2 followed by district Olomouc 9.2 CZK/m^2, next Znojmo 7.24 CZK/m^2, Klatovy 5.2 CZK/m^2 and the lowest price of 4.9 CZK/m^2 in the district Havlíčkův Brod. In a more detailed analysis of the correspondence of the average real prices of traded parcels by using Schéffe test, which is suitable for selections which do not have the same range, district Praha-východ created an isolated group with the highest price, the second group consists of two districts Olomouc and Znojmo and third one of the other districts Znojmo, Klatovy and Havlíčkův Brod is a group with the

Variables		Havlíčkův Brod	Klatovy	Olomouc	Praha-východ	Znojmo	Total for 5 districts	ANOVA (F-value; sign.)
No. of observations		28	56	84	52	86	306	
UnitPrice	Average	4,89	5,21	9,16	17,5	7,24	8,92	31,625
	Std. deviation	1,89	3,21	6,9	10,51	5,28	7,67	0
Culture	Average	0,32	0,29	0,15	0,12	0,01	0,15	7,699
	Std. deviation	0,48	0,46	0,36	0,32	0,11	0,36	0
Area	Average	12 230	21 255	31 918	17 049	30 158	25 144	3,802
	Std. deviation	11 213	40 269	31 741	25 848	31 704	31 915	0,005
NrParc	Average	1,6	2,1	2,1	1,7	2,2	2,02	1,222
	Std. deviation	1,4	1,7	1,7	1,1	1,9	1,67	0,301
ALP09	Average	5,2	3,7	10,2	7,7	10,8	8,3	72,33
	Std. deviation	1,9	1,1	4,2	2,4	2,4	4	0
TransPP	Average	0,64	0,66	0,58	0,58	0,53	0,59	0,646
	Std. deviation	0,49	0,48	0,5	0,5	0,5	0,49	0,63
TransFarm	Average	0,14	0,2	0,27	0,06	0,33	0,23	4,098
	Std. deviation	0,36	0,4	0,45	0,24	0,47	0,42	0,003
CLR	Average	0,32	0,2	0,19	0,23	0,33	0,25	1,492
	Std. deviation	0,48	0,4	0,4	0,43	0,47	0,43	0,204
DistWeiMun	Average	6,2	7,6	9	4,7	8,9	7,7	12,089
	Std. deviation	4,4	3,9	3,8	2,1	5	4,3	0
DistWeiDistr	Average	17,5	11	14,7	22,7	16,2	16,1	22,471
	Std. deviation	7,3	5,9	7,7	2,6	7,5	7,5	0
NrFarm	Average	7,3	6,2	8	15,5	12,9	10,3	28,327
	Std. deviation	3,7	3,1	4,1	10,1	4,8	6,5	0
PopDens	Average	77,2	67,2	122,6	211,3	74,8	109,9	10,549
	Std. deviation	74,6	80,4	141,3	239,8	78,1	144,9	0
ShareTI	Average	-2,5	0,2	9,1	17,7	1,7	5,8	21,225
	Std. deviation	13,2	10,7	13,1	14,6	11,7	14,2	0
ShareEAI	Average	46,7	47,2	46,8	42,6	48,1	46,5	9,111
	Std. deviation	3,8	5	5,9	6,5	4,5	5,6	0
Unemploy	Average	7,8	6,6	8,7	3,5	10,7	7,9	40,947
	Std. deviation	3	3,1	4,8	1,8	2,7	4,2	0
Inhab	Average	2 762	3 347	3 797	3 204	1 706	2 931	0,591
	Std. deviation	4 859	6 880	15 194	5 542	5 233	9 322	0,67

Source: Own calculation, the Czech Statistical Office, the Czech Office for Surveying and Mapping.

Table 3: Summary statistics for variables incoming into 5 regional models

lowest price. This grouping, among other things also explains why in the overall regional model regional variables were significant from districts Praha-východ and Olomouc, whose average prices were statistically significantly different from the remaining districts.

From the given parameters of the explanatory variables listed in Table 4 show that at the regional level the individual factors with a different intensity have some effect and in some cases are changing the direction of their effect on the purchasing land price. From the total of 17 explanatory variables entered into the overall model only 12 variables and 8 of them had an impact which was significant at 10% level. The total number of variables in the regional models was reduced by 2 regional dummy variables, where 12 of them were significant at least of 10% significance level and at least in one of the regional models. On the contrary, the influence of the following explanatory variables became evident at local markets: the number of plots (*NrParc*), conducted complex land reforms (*CLR*), weighted distance to the centre of the municipality (*DistWeiMun*), number of users of soil occurring in the one cadastral area (*NrFarms*), the share of economically active inhabitants (*ShareEAI*) and finally unemployment rate (*Unemploy*).

The most important variable representing the type of transfer between physical persons in the regional model, which in the overall model reduces the price by a quarter compared to other types of transfers, but in three districts decreases the price (Olomouc, Praha-východ and Znojmo) and in district Klatovy increases the price due to the fact that in this district transfers between individuals represent the share of 2/3 of total transfers with a minimum share of other types of transfers and the ratio of market price to the official price (1.7) is by the most common type of transfer also the highest. Another the most frequent significant variable is type of land (*Culture*), when the price of permanent grassland is in three cases significantly reduced by this factor compared to arable land and it is in the range from 25 to 40%. In the contrary the double

	Model for 5 districts	District HB	District KT	District OC	District PV	District ZN
Number of sales	306	28	56	84	52	86
(constant)	1.188***	0,28	−2.903***	4.067***	7.302***	1.783**
Culture	−0.204**	−0.257**	−0.170	−0.370**	−0.400**	-
LnArea	0.063*	−0.194*	0,137	-	-	-
LnNrParc	−0.076	0.593***	-	-	-	−0.099
Year	-	-	−0.171	-	-	-
LnALP09	0.400***	0.369	0.764***	0.349**	-	0.465*
DistrictOC	0.164**	X	X	X	X	X
DistrictPV	1.977***	X	X	X	X	X
TransPP	−0.255***	-	0.343*	−0.472***	−0.262**	−0.398***
TransFarm	−0.386***	−0.456***	0,384	−0.494***	-	−0.457***
CLR	-	0.737*	-	-	-	-
LnDistWeiMun	0,07	0,219	0.497***	-	-	-
LnDistWeiDistr	−0.280***	-	−0.253	−0.583***	−1.315**	−0.346**
LnNrFarm	−0.074	0.343***	-	-	−0.187*	−0.137
LnPopDens	0.055	-	-	-	-	0.118
ShareTI	-	0.009	-	-	-	−0.007
ShareEAI	-	0.037**	0.035**	-	-	-
Unemploy	-	−0.050*	-	-	0.061	0.024
LnInhab	-	-	-	−0.099*	-	-
R^2	0.546	0.809	0.458	0.534	0.405	0.464
adjusted R^2	0.527	0.678	0.352	0.498	0.341	0.4
F - value	29.36	6.170	4.321	14.700	6.269	5.919
Model significance	0	0.001	0	0	0	0

Note: HB – Havlíčkův Brod, KT – Klatovy, OC – Olomouc, PV – Praha-východ, ZN – Znojmo; *** significant at 1% level, ** significant at 5% level, * significant at 10% level

Source: Own calculation.

Table 4: Impacts of factors influencing market land prices in 5 different regions.

improvement in the quality of traded land (*ALP09*) contributes to a clear increase in price by 35 – 76%. In the same way in models often occurs even the type of transfer between the physical persons and agricultural companies or cooperatives which reduces the price by 45 – 50%. Similarly when the distance to district town (*DistWeiDistr*) is increased twice then the price is reduced by 35 – 131%. Other variables are significant in the case of two or one district.

In the district Havlíčkův Brod the price of land is unusually the most affected by the implementation of the complex land reform because the resulting price increases by 74% against the cadastre where it has not been yet implemented. A higher price can be justified by the fact that such land, to which has been secured a better accessibility to parcel and the whole property has been unified, and it gives better possibilities to use this land in its renting or sell. The occurrence of land reforms (*CLR*) is significant only in the case of this district, which is however characterized by the second lowest proportion of transfers when the purchaser is an agricultural company and/or cooperatives (*TransFarm*) and the occurrence of landscaping management more significantly affects the price if the owners are at the same time investors, who are not immediate users of this land. In contrast, surprisingly in this district did not show a significantly positive impact of the quality of traded land, probably due to the lowest average price achieved in this district. Another important factor is the number of transferred parcels (*NrParc*) that by the increase from two to four plots with a constant size leads towards an increase of the price by up to 60%. In this case, the purchase of several small plots was conducted for the purpose of land consolidation. These transactions are characterized by a higher purchase price. Moreover this conclusion is also confirmed by the negative and significant elasticity of acreage of land. At the same time the size of the total acreage of transferred parcels is half portion compare to the overall average selection. Another significant shift in price is given by the fact, that agricultural land is purchasing an agricultural company or cooperative (*TransFarm*). In this case the price is lower by 45% compared to other transfers, and thus also to transfers between physical persons. By the increase of the number of users is also increasing the selling price in accordance with the assumption, because a growing number of users enables to rent land under more favourable economic conditions. In the district Havlíčkův Brod was not shown any significant effect of distance to the district town. Instead of that the socio-economic characteristics had indeed marginal but statistically significant effect, which are represented by the share of economically active population to a total population (*ShareEAI*) with a positive impact on the price and the unemployment rate (*Unemploy*) with a negative influence.

In the district Klatovy is most evident effect of a soil quality expressed by administrative land price even though the average ratio of market and official prices from all districts is the second highest after Praha-východ. This strong dependence has probably been achieved through systematic maintenance of this ratio to its average value of 1.5, with regard to the second lowest achieved market price. Only in this district was confirmed the positive impact of the transfer type between physical persons on the price increasing. It was not indicated a positive affect by the type of transfer, when purchaser was the agricultural company or cooperative (*TransFarm*) due to the low representation of other types of transfers. There is also weakened the influence of the distance to the district town (*DistWeiDistr*), where the average distance is the lowest in this district. But quite surprisingly, the price significantly increases with increasing distance from the centre of the municipality (*DistWeiMun*).

The model for the district Olomouc has the highest significance with respect to the highest number of sales. In this district, which is affected by the presence of the regional city, is the most important factor the distance to the town. The shortening by 10% of distance leads to an increase of price by 6% *ceteris paribus*. Significant influence of the distance reduces the incidence of soil quality at the price. Type of transfer, the purchaser is a physical person (*TransPP*) or an agricultural firm (*TransFarm*), nevertheless the price strongly maintains significantly lower value by almost a half.

The smallest proportion of the variance explanation of the selling price on explanatory variables succeeded in clarification by the data available in the district Praha-východ. Here the distance to capital city is absolutely the most prevalent factor which completely suppressed the influence of soil quality. This is only partly reflected in the dummy variable indicating the type of land belonging to permanent grassland. It is also because the more significant representation of permanent grass is a primarily in the peripheral parts of the southern district, already fairly far from the capital city. Here agricultural companies and cooperatives also buy agricultural land at the highest price (21 CZK/m^2) even when the ratio of market price to administrative price for these purchasers is the lowest (2.1), compared with physical persons ratio 2.2 and other purchasers of 2.6.

In the district Znojmo is traded only 1% of land with the culture of TTP, therefore the type of land lost significant influence in explaining prices here. The most significantly is the price influenced by the type of transfer and also by the distance to district town. Soil quality has a relatively strong impact but its significance decreased up to 10% of significance level.

Conclusion

The comparison of statistical data on the development of market prices of agricultural land in the Czech Republic with neighbouring states shows between 2008 and 2009 that in our country has not been recorded any significant price growth. A similar situation stands for neighbouring Poland and Slovakia, whereas in Germany, land prices have been growing, and particularly significantly in the new federal states. Accordingly, even in the analysis of the survey sample of the market prices of agricultural land transfers from the five districts of the Czech Republic between the years 2008 and 2009 did not have any significant impact the factor of the year within the transaction.

Which value the society attaches to agricultural land depends on many factors - from the quality across the extent, location and the subjective factors to a certain degree without economic considerations. This contribution is based on the assumption that it is possible to statistically quantify the general factors that determine a relatively high variability in market prices (i.e. that the final price is not only a randomly determined variable). These determinants include the so-called contract-specific factors, such as the current type of land, soil quality, acreage of land included in the contract, but also the character of the buyer. It was confirmed that physical persons pay by a quarter lower price for the purchase of agricultural land, compare to other legal persons and to agricultural companies and cooperatives even by nearly half, with regard that part of this reduction is influenced by the different expectations of each individual investor about a future generated income from land but also due to information asymmetry between buyer and seller and a monopson position of farms on the local markets. The administratively determined price of land (which is based on soil quality) for cadastral area has the most significant impact on the final contract price and that is an equally important finding. For this there are two arguments: the quality expressed by the administrative price is generally accepted by contracting parties and thus „transferred“ into the contract, the second argument may be the fact that the contracting parties at the beginning of contractual relationship have no specific idea about the price and administrative price is the primary indicator which the parties ‚rely‘ on. The second argument, however, can not be mentioned in districts around the capital city (which is probably also valid in other regional cities), where the proximity to a big agglomeration in terms of distance to the district or regional city in these two cases, clearly dominates above the other determinant factors of market prices of agricultural land. In the case of remote rural regions with dispersed settlement structure the distance to the nearest district town becomes insignificant, but on the other hand the price affects other socioeconomic factors such as the percentage of economically active population and unemployment rate, although with a considerably minor influence.

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References

[1] AGRARHEUTE (2011): Deutlich höhere Preise für Agrarland gezahlt. Wirtschaft 17.8.2011. Available in German: http://www.agrarheute.com/agrarland

[2] Bastian, C. T., McLeod, D. M., Germino, M.J., Reiners, W.A, Blasko B.J. (2002): Environmental amenities and agricultural land values: a hedonic model using geographic information systems data. Ecological Economics. 40(3): 337-349.

[3] Buday Š., Bradáčová K. (2010): Úloha a impulzy trhu s pôdou v rozvoji vidieckej ekonomiky a jeho ďalšie smerovanie. VÚEPP Bratislava. ISBN 978-80-8058-539-6 (in Slovak).

[4] Goverment office for Science (2010): Land Use Futures: Making the most of land in the 21st century. Foresight Land Use Futures Project, Final Project Report, London.

[5] Halvorsen R., Palmquist R. (1980): The Interpretation of Dummy Variables in Semilogarithmic Equations. The American Economic Review. 70 (3).

[6] Chavas, J. P., Shumway, C. R. (1982): A pooled time series cross selection analysis of land prices. Western Journal of Agricultural Economics. 07 (01)

[7] Chicoine, D.L. (1981): Farmland values at the urban fringe: An analysis of sale prices. Land Economics. 57(3):353-362

[8] MZe (2010): Zpráva o stavu zemědělství v ČR za rok 2009. Ministerstvo zemědělství. Praha. ISBN 978-80.7084-940-8. (in Czech)

[9] Němec J. (2004): Pozemkové právo a trh půdy v České republice, VÚZE Praha. ISBN 80-86671-12-7 (in Czech)

[10] Němec, J. and Kučera J. (2007): Land market development after the accession to the EU, Agricultural Economics - Czech, Praha, 53 (04), p. 154–160. (http://www.agriculturejournals.cz/public Files/00172.pdf)

[11] Latruffe L., Doucha, T., Le Mouël, Ch., Medonos, T., Voltr, V. (2008): Capitalisation of the government support in agricultural land prices in the Czech Republic, Agricultural Economics - Czech, Praha, 54 (10), p. 451–460. (http://journals.uzpi.cz:8050/web/_generovani/agr_econ _2008.htm)

[12] Poppe Adwin C., Goodwin H.L. Jr. (1984): Impacts of Consumptive Demand on Rural Land Values. American Journal of Agricultural Economics. Vol. 66 (5), p. 750

[13] Střeleček F., Zdeněk R., Lossosová J. (2009): Faktory ovlivňující cenu půdy v České republice. In Zborník recenzovaných prác z medzinárodnej vedeckej konferencie "Aktuálne problémy finančného manažmentu v konkurenčnom a krízovom podnikateľskom prostredí agropotravinárskych podnikov". Slovenská poľnohospodárska univerzita v Nitre. s. 126 – 129. ISBN 978-80-552-0312-6. (in Slovak).

[14] Tsoodle L., Golden B. (2003): Determinants of Kansas Agricultural Land Values, Agricultural Economics Association Anual Meeting, Alabama, Feb. 1 – 5.

[15] Vrbová, E., Němec. J. (2004): Land market development in the Czech Republic. Agricultural Economics, 51 (5), 216-220.