

SELECTED ISSUES OF THE PRICES OF AGRICULTURAL LAND – THE CASE OF SLOVAKIA

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Abstract: *The aim of the paper is to identify the most significant factors affecting the prices of agricultural land through the econometric model applied on data from the Register of Offers of Agricultural Land. Based on the data collected during 30 months, it was proved that the most significant factors are the offered plot area, the proportion of the offered area on the total area of the land plot, the administrative price of agricultural land and the distance of the offered plot from a district city. All these factors have the positive effect on the land price. According to the regional comparison, the highest land prices are recorded in the tourist regions with the international significance.*

Key words: *agricultural land, land price, land size, land plot, regional differences of land prices*

1. INTRODUCTION

Many publications and scientific papers have analysed the dependence of land market prices on various factors, such as political, economic, legal, geographic, environmental and social ones. It was found out that land market prices are influenced by technical infrastructure, location of the land plot, distance of the land plots from the town, possibility for the transformation of the land plot to the building plot, land productivity, prices of agricultural products, inflation, economic uncertainty, large scale of agricultural enterprises, subvention, taxes and interest rates [27]. The land productivity and population density caused an increase in land prices; a smaller area of land plot, rural character of the region and the high distance from town caused a decrease in land prices [18]. However, it was found that the agricultural land plots smaller than 1 hectare were sold for prices 7.5 times higher than the land plots larger than five hectares [21]. Some authors confirmed the negative influence of nuclear equipment on land prices [15], extreme land fragmentation, unfinished land consolidation and restitution, problems of land with non-identifiable landowners, tax and frequent changes in legal regulations [26]. The positive correlation was proved between land prices and net farm income returns on wheat, total population and access to credit; and negative correlation between land prices and property tax, interest rate and share of debts on the property [11]. Many authors tested the influence of subvention on land prices [14], [16], [19], [29], [30]. According to [24], land prices are influenced by land quality, structural changes and opportunities to use the land for non-agricultural activities. [5] argued that foreign investors on the Slovak agricultural land market have an important influence on the land prices.

In Slovakia, there is only very difficult to receive the information on the market prices of the agricultural land. There is no institution which would have a duty to record the market

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prices of agricultural land similar to the institutions in other EU countries [1], [5], [6]. Nowadays, the only relevant source of information on the agricultural land prices is the Register of Offers of Agricultural Land (hereinafter referred to as the Register of Offers), which was created by Act no. 140/2014 Coll. on Acquisition of Ownership to Agricultural Land. Since June 1, 2014, all landowners (with the exception of cases defined by the legal regulation) have an obligation to publish the offer for the transfer of ownership of agricultural land, including the price required for agricultural land, via the Register of Offers. It is necessary to stress that landowner is obliged to register his/her offer for the sale of agricultural land via the Register of Offers only in the case when there is no potential acquirer in the cadastre where the offered land is placed [12]. However, the prices published in the Register of Offers cannot be considered as the market prices since they represent just the supply side of the land market equation [13]. Apart from that, it is not certain whether the potential acquirer will be found and moreover, it is not sure whether he/she will be willing to accept the price requested by landowner. For the purpose of this paper, these prices will be referred to as offered land prices and the prices according to the Tax Act⁴ and according to CSEU⁵ will be referred as the administrative prices. This paper analyses the offered prices in the individual regions of Slovakia with the objective of defining the factors that influence land valuation by land owners and comparison these factors with the factors influencing the land market prices like describing in the above mentioned references.

2. MATERIALS AND METHODS

The paper attempts to estimate the impact of selected factors on the price of agricultural land in the period after the end of the moratorium on the purchase of agricultural land by foreigners, i.e. from June 1, 2014 to November 30, 2016. The panel data was collected through the Register of Offers of Agricultural Land. A total of 17,406 observations were available to create a model.

To verify the assumption that the offer price of agricultural land is mostly influenced by the localization of agricultural land, as claimed by [1], [4], [10], [17], [20], [22], [28], this econometric model was prepared:

$$y_i = \beta_0 + \sum \beta_j x_{ij} + u_i \quad (1)$$

The variables entering the model are described in Table 1.

⁴ Act no. 582/2004 Coll. on Local Taxes and Local Fee for Municipal Waste and Minor Construction Waste, as amended.

⁵ Credit soil-ecological units (CSEU - in Slovakia referred to as BPEJ) as the classification and identification figure for the quality and value of production-ecological potential of agricultural land in the soil habitat.

y_i	dependent variable	offer price			
β_0	constant				
β_1	estimated parameter of independent variable				
u_i	random error				
x_i	independent variable	x_{1i}	sold area in m^2	assumption: higher the area sold causes the higher unit offer price	
		x_{2i}	coefficient of the proportion of the land area sold to the total area of land ⁶	assumption: higher the coefficient of the proportion of the land area sold to the total land area causes the higher unit offer price	
		x_{3i}	administrative price according to the Tax Act in $\text{€}/m^2$	assumption: higher price in accordance with the Tax Act will cause the higher unit offer price	
		x_{4i}	administrative price according to the CSEU in $\text{€}/m^2$	assumption: higher price according to the CSEU causes the higher unit offer price	
		x_{5i}	distance of land from the district city in km	assumption: higher distance of land from the district city causes a decrease in unit offer price	
		x_{6i}	distance of land from the county seat in km	assumption: higher distance of land from the county seat causes a decrease in unit offer price	
		x_{7i}	type of land	assumption: the unit offer price of arable land is higher than the offer price per unit of permanent grassland	a qualitative dummy variable shall take two values, as in other types of land it is possible to set the price according to the Tax Act and the cost by CSEU: 0 = arable land; 1 = permanent grass.
		x_{8i}	plot of register	assumption: the offer price per unit area of the plot of register C is higher than the offer price per unit of the plot of register E	a qualitative dummy variable shall take two values: 0 = plot of register C (plot registered in the cadastral register, where the boundaries are visible on the ground and shown on the cadastral map); 1 = plot of register E (plot registered in the cadastral register, where the boundaries are not visible on the ground).
		x_{9i}, x_{10i}, x_{11i}	tourist region	assumption: the unit offer price in the tourist regions of international significance is higher than in other tourist regions	a qualitative dummy variable is based on the Regionalization of Tourism in Slovakia ⁷ , the dummy variable is coded as follows: x_{9i} = region of national significance (regions of Turec, Orava, Košice, Šariš, Stredné Považie); x_{10i} = region of supra-regional significance (regions of Podunajsko, Dolné Považie, Nitra, Gemer, Horná Nitra, Pohronie, Spiš); x_{11i} = region of regional significance (regions of Záhorie, Ipel', Horný Zemplín, Dolný Zemplín); in case the $x_{9i} - x_{11i}$ take zero values the price is modelled for the region with international significance (Bratislava, Liptov, Horehronie, Tatry, Severné Považie).
i	1 ...N; N = 17 090 (number of sale offers of agricultural land)				
j	1 ...J; J = 11 (number of independent variables entering the model)				

Table 1: Variables entering the econometric model

Source: own processing.

⁶ The coefficient is calculated as the share of the land area sold on the total area of land.

⁷ Document was drawn up by the Institute of Tourism, Ltd., for the Ministry of Economy of the Slovak Republic, with the aim of defining regions for tourism.

The parameters of linear regression models and the models of linear parameters were estimated using the statistical software STATA, which carried out the econometric verification of the model. Heteroscedasticity was tested by the White heteroscedasticity test [31] and the Breusch Pagan-test [3]. Multicollinearity was diagnosed by the inflation factor of variance (VIF⁸). Specification suitability of the model was tested using the Ramsey RESET test [25]. If there is heteroscedasticity in the econometric model, robust parameter estimation will be done for the dependent variable [8], which is not sensitive to small variations in the measurement and the composition of the group and thus takes into account heteroscedasticity in estimating model parameters.

3. FACTORS INFLUENCING THE PRICE OF AGRICULTURAL LAND

Table 2 shows the descriptive characteristics of the quantitative independent variables. Only the observations with the maximum offer price 1.25 €/m² (upper limit was set based on exploratory analysis) we included in the model.

<i>quantitative variable</i>	<i>N</i>	<i>mean</i>	<i>min</i>	<i>max</i>	<i>p 50</i>	<i>sd</i>
<i>sold area</i>	13,969	4,269.18	0.06	2,000,000.00	719.33	31,835.35
<i>coefficient of proportion of area sold</i>	13,969	0.34	0.00	1.00	0.17	0.37
<i>price according to Tax Act</i>	13,969	0.29	0.00	1.16	0.26	0.26
<i>price according to CSEU</i>	13,969	0.11	0.00	0.70	0.09	0.08
<i>distance from district city</i>	13,969	17.19	0.00	65.60	16.53	9.79
<i>distance from county seat</i>	13,969	62.97	0.00	145.05	59.16	35.16

Table 2: Descriptive characteristics of quantitative independent variables entering the model

Source: own processing, STATA.

* N = Number; mean = average; min = minimum; max = maximum; p 50 = median; sd = standard deviation.

Out of all the variables that entered the model these were not statistically significant: price according to the Tax Act, price according to the CSEU, distance of land from the county seat and type of land. For that reason the variable price according to the Tax Act and the price according to the CSEU were transformed into a functional form of hyperbole⁹. For the purposes of transformation we excluded those observations from the model where the price according to the Tax Act and the price according to the CSEU equalled 0 €/m². Based on the exploratory analysis, the offer price at the upper limit was set at 1.25 €/m². Observations that exceeded the above mentioned limit were excluded. The total number of offers for sale of agricultural land that entered the model was 13,969. An econometric model constructed in this matter explains 24.53 % of the total variability of the explained variable. Based on the results of the model all independent variables entering the model are statistically significant. However, between two variables (price according to the Tax Act and price according to the CSEU), multicollinearity was diagnosed through VIF.

⁸ $VIF_1 = \frac{1}{1-R_1^2}$

⁹ transformed price according to law = $\frac{1}{\text{price according to the Tax Act}}$;
transformed price according to CSEU = $\frac{1}{\text{price according to CSEU}}$.

Practice has proven that the price according to the Tax Act is based on the price according to the CSEU. For this reason, a regression analysis was performed, which would confirm this relationship. The results presented in Figure 1 show that the price according to the Tax Act is actually based on price according to the CSEU.

Source	SS	df	MS	Number of obs = 13969		
Model	825.198979	1	825.198979	F(1, 13967) =	.	
Residual	91.5760196	13967	.006556599	Prob > F =	0.0000	
				R-squared =	0.9001	
				Adj R-squared =	0.9001	
Total	916.774998	13968	.065633949	Root MSE =	.08097	

price_according_to_ta~t	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
price_according_to_cseu	3.101089	.0087413	354.76	0.000	3.083955	3.118223
_cons	-.0494087	.0011831	-41.76	0.000	-.0517278	-.0470896

Figure 1: Regression analysis for the dependent variable price according to the Tax Act

Source: own processing, STATA.

In order to overcome multicollinearity a variable price according to the Tax Act was excluded from the econometric model only remaining a variable price according to the CSEU on which the price under the Tax Act is based. The results of the constructed model taking into account robust parameter estimates are presented in Figure 2.

Linear regression		Number of obs = 13969				
		F(10, 13958) = 374.95				
		Prob > F = 0.0000				
		R-squared = 0.2448				
		Root MSE = .19013				

offer_price	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
sold_area	3.65e-07	1.60e-07	2.27	0.023	5.04e-08	6.79e-07
coefficient_of_proportion_of_are	.0949639	.0053519	17.74	0.000	.0844734	.1054544
price_according_to_cseu	.7830933	.0338345	23.14	0.000	.7167732	.8494135
distance_from_district_city	.0010559	.0002095	5.04	0.000	.0006453	.0014666
distance_from_county_seat	-.0006999	.0000537	-13.02	0.000	-.0008053	-.0005946
type_of_land	.0199363	.0036056	5.53	0.000	.0128688	.0270038
plot_of_register	-.0741542	.006209	-11.94	0.000	-.0863247	-.0619837
region_of_national_significance	-.120841	.0096574	-12.51	0.000	-.1397709	-.1019111
region_of_supraregional_signific	-.0363239	.0091513	-3.97	0.000	-.0542617	-.018386
region_of_regional_significance	-.1355155	.0084023	-16.13	0.000	-.151985	-.1190459
_cons	.3664359	.0116025	31.58	0.000	.3436934	.3891783

Figure 2: The model takes into account robust parameter estimates for the dependent variable offer price

Source: own processing, STATA.

All variables entering the constructed econometric model are statistically significant.

Sold area (x_{1i}) - variable is statistically significant and has it increases the offer price of agricultural land.

Coefficient of the proportion of the area sold (x_{2i}) - variable is statistically significant and it increases the offer price of agricultural land.

Price according to the CSEU (x_{4i}) - variable is statistically significant and it increases the offer price of agricultural land.

Distance from a district city (x_{5i}) - variable is statistically significant and it increases the offer price of agricultural land.

Distance from the county seat (x_{6i}) - variable is statistically significant and it decreases the offer price of agricultural land.

Type of land (x_{7i}) - variable is statistically significant and it increases the offer price of agricultural land.

Register (x_{8i}) - variable is statistically significant and it decreases the offer price of agricultural land.

Region of national significance (x_{9i}) - variable is statistically significant and it decreases the offer price of agricultural land.

Region of supra-regional significance (x_{10i}) - variable is statistically significant and it decreases the offer price of agricultural land.

Region of regional significance (x_{11i}) - variable is statistically significant and it decreases the offer price of agricultural land.

The constructed model showed that the increase of the offer price of agricultural land is significantly impacted by the acreage of the sold agricultural land, coefficient of proportion of sold land area to the total area of the land, price according to the CSEU, distance from a district city and the land type. The assumptions set out in the paper were confirmed, namely that the offered acreage, coefficient of proportion of sold land area to the total area of the land and the price according to the CSEU have the effect of increasing the unit offer price of agricultural land. The first two factors show that in practice it really depends on the size of the area of the agricultural land sold and whether the whole plot or only a co-ownership is sold. Due to high fragmentation of land ownership small plots with a lot of co-ownership units are typical for Slovakia. It has also been clearly demonstrated that with the increasing distance from a district city, the offer price per unit of agricultural land increases.

Multicollinearity was diagnosed by VIF, while based on the results of the tests it can be concluded that there is not multicollinearity between the independent variables. Based on the values of the Breusch-Pagan test and the White test it is clear that there is heteroscedasticity in the model and therefore one of the assumptions of the econometric model is violated. One of the reasons for the existence of heteroscedasticity may be a defective specification of the model consisting in the omission of some relevant independent variable. A test of the defective specification of the econometric model was implemented using the Ramsey RESET test. The test results show that the model is lacking a statistically significant variable.

In both models used in the work the presence of heteroscedasticity was identified based on the used tests suggesting that the models need to be modified with other statistically significant variables that affect the price of agricultural land. Based on the knowledge acquired both in theory as well as practice, it can be assumed that the variable that the model lacks is the subjectivity of the seller. The subjectivity as a cause of inaccuracies in the results of econometric models for determining the factors affecting the price of agricultural land is also reported by other authors [2], [7], [9], [17], [20], [22] and [23]. The subjectivity and therefore the decision of the individual at what price he/she wants to sell the agricultural

land may be a matter of fact largely influenced by whether he/she needs or does not need the funds, whether or not there is an emotional relationship to the sold land, or whether the land is sold to a close relative or a stranger, but also personality traits of an individual (e.g. a speculative sale). A correctness of the assumption of subjectivity as the missing factor affecting the price of agricultural land is also confirmed by the fact that the model was applied to data from the Register and therefore the offer price of agricultural land. The offer price only reflects one aspect of the market mechanism. Because of the fact that the Act no. 140/2014 Coll. did not give the buyer the opportunity to negotiate the price of the land, the seller has the option to set the price that suits him.

4. CONCLUSION

The application of the econometric model on data from the Register of Offers of Agricultural Land proved that the price of agricultural land is affected by several factors. Based on the data collected during 30 months, it was proved that the most significant factors are the offered plot area, the proportion of the offered area on the total area of the land plot, the administrative price of agricultural land and the distance of the offered plot from a district city. All these factors have the positive effect on the land price and therefore increase the offered price of agricultural land. The above mentioned studies were not unified if the large offered plot area increase [18] or decrease [21] the land market prices. According to our study, the offered plot area confirms the positive effect on the land price offered by the landowner. Very questionable is the distance of the offered plot from a district city with the positive effect on the land price while the distance of the offered plot from a county seat brought a negative effect on the land price. According to the previous studies the high distance from town caused a decrease in land prices [18]; the price of agricultural land near urban centres might be influenced by factors unrelated to agricultural value, such as access to schooling or sources of employment for farmers' children, or access to urban amenities; moreover, such land might command a higher price due to the expectation that land would be re-zoned as building land [27]. The negative effect of the distance of the offered plot from a county seat confirms the previous study also for the offered land prices. The positive effect of the distance of the offered plot from a district city can be caused by the relative small distances of all land plots from the district city and other factors play more important role on the offered land price. The model proved that the location of agricultural land plays an important role in the formation of agricultural land prices in Slovakia. According to the regional comparison, the highest land prices are recorded in the tourism regions with the international importance. We can conclude that the landowner creating the offered land price consider the similar factors which influence the land market prices.

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