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Valuation of Public Goods in Agricultural Landscape: The Case of Slovakia

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Abstract

For decades economists have devoted attention to issues of valuing public goods. However, such studies do not exist in case of Slovak economy. In this paper we aim to evaluate willingness to pay (WTP) for agricultural landscape in Slovakia by using the Contingent valuation method. Our research objectives prioritises how the public values agricultural landscape held by small and large farms Majority of Slovak farms are identified large in size compared to the EU28. As shown by our results the WTP for landscape offered by large farms is 23.88 Euros per individual per calendar year. These results provide important insights for decision makers, policy makers and social scientists.

Keywords: Public goods; Landscape; Contingent valuation method; Willingness to pay

Introduction

Market failure has enthused many administrations to design support programmes which aim to improve the provision of agricultural public goods. Several countries, particularly developed ones, implement policies which support farmers in maintaining rural environment, landscape and other societal benefits. In the EU context, since the 1990s there has been a significant shift in the emphasis of the Common Agricultural Policy (CAP) in this direction. Instead of supporting commodity prices, the policy reforms have been redirected to integrate environmental aspects into the agricultural support programmes. Different measures have been introduced (e.g. cross-compliance, agri-environmental schemes; less favoured area payments, Natura-2000) in order to give incentives to farmers to reduce farming practices which may have a negative impact on nature and landscape conservation. The recent European Commission communication on the future CAP, "The CAP towards 2020", aims to further strengthen and enhance these environmental objectives of the CAP (European Commission).

Landscape is one of the key public goods produced by agriculture. Farmers, by being involved in the production of traditional commodities, confer benefits on society by maintaining and creating rural landscapes through a combination of activities covering land use decisions, crop composition, and farming practices. Agricultural landscape is a complex good. The European Landscape Convention defines landscape as "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors" (Council of Europe-2000). Agricultural landscape is the visible outcome of the interaction between agriculture, natural resources and the environment, and encompasses amenity, cultural and other societal values. According to the OECD [1], landscape can be considered as consisting of three key elements (i) landscape structures or appearance: including environmental features (e.g. flora, fauna, habitats and ecosystems), land use types (e.g. crop types and systems cultivation), and man-made objects or cultural features (e.g. hedges, farm buildings); (ii) landscape functions: such as places to live, work, visit, and provide various environmental services; and (iii) landscape values: concerning the costs for farmers of maintaining landscapes and the value society places on agricultural landscape, such as recreational and cultural values. The value of the landscape is determined by different components, such as: biological diversity (e.g. genetic species and ecosystem diversity, agro biodiversity); cultural and historical components (e.g. management of the natural landscape, buildings, traditions, handicrafts, stories and music), amenity value of the landscape (aesthetic value,); recreation and access (e.g. outdoor recreation, skiing, biking, camping) and scientific and education interests (e.g. from archaeology, history and geography to plant and animal ecology, economy and architecture).

In last few decades there has been a great deal of research attempting to value (to place a price on) agricultural landscape [2,3]. As landscape is a non-traded good its monetary value cannot be observed and thus is not available from traditional statistical sources. The literature therefore most often applies a stated preference (SP) approach by using survey-based methods to uncover consumers' willingness to pay (WTP) for landscape. The vast majority of these studies find that society positively values agricultural landscape. However, an important shortcoming of these studies is that nearly all studies on landscape valuations are concerned with valuing specific landscape in a particular location and this study focuses on Slovak republic therefore the results are comparable.

Objectives and Methods

The main objective of the paper is: Appraisement of economic value of agriculture landscape by willingness to pay (WTP) method in Slovakia. Specifically we aim to evaluate the landscape held by small and large farms in Slovakia and their value to respondents. How much respondents are willing to pay for agriculture landscape and countryside and which farms have higher preferences small or large.

The contingent valuation method (CVM) is widely used to measure the value of environmental public goods. The CVM uses surveys questions to elicit people's preferences for public goods by finding out what they would be willing to pay for them. It presents consumers with hypothetical opportunities to buy public goods, thus circumventing the absence of real market for them. The method is thus aimed to eliciting their willingness to pay (WTP). Respondents to CV surveys may also

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be asked what level of compensation they would be willing to accept for a loss.

During the personal interview conducted face to face, respondents are presented with materials, which consist of three parts:

1. A detailed description of the goods being valued and the hypothetical circumstance under which it is made available to the respondent. The researcher constructs a model market in considerable detail which is communicated to the respondent in the form of a scenario that is read by the interviewer during the course of the interview. The market is designed to be as plausible as possible. It describes the goods to be valued, the baseline level of provision, the structure under which the good is to be provided, the range of available substitutes, and the method of payment. In order to trace out a demand curve for the good, respondents are usually asked to value several levels of provision.
2. *Questions which elicit the respondents' willingness to pay for the goods being valued.* These questions are designed to facilitate the valuations process without themselves biasing the respondent's WTP amounts.
3. *Questions about respondents' characteristics (for example, age, income, occupation etc...), their preferences relevant to the goods being valued, and their use of the goods.* This information, some of which is usually elicited preceding and some following reading of the scenario, is used in regression equations to estimate a valuation function for the good. Successful estimations using variables which theory identifies as predictive of people's willingness to pay are partial evidence for reliability and validity.

The aim of the questionnaire is to find out value of the agricultural land to the public. Maintenance of agricultural land is carried out mainly by farms (family farms, cooperatives, or large agricultural farms). Slovak agriculture is characterized by large enterprises (cooperatives) to cultivate large areas of farmland. The total agricultural land in Slovakia is around 2 million hectares.

Questionnaire consists of 23 questions which are divided into 4 parts. The first question is focused to find out the priority of respondents, to which areas the Government should spend money from the state budget. Interviewees must sort the list of the following areas, health, education, agriculture and rural development, prevention of criminals, environmental protection, art and infrastructure according to their preference that should be the most subsidized by the state.

The subsequent part of this paper contains 4 questions which refer to opinion on the agriculture and rural development in general. In these questions, respondents must choose one of five options which are as follows: strongly disagree, disagree, strongly agree, agree, and do not know.

The further section evaluates the agricultural land. Section contains 5 questions.

The aim of the questionnaire is to valuate agricultural land which includes the following elements:

- Scenic value of agricultural land
- Preservation of agricultural land for future generations.

Theoretical Model

In this paper, it is shown that it is possible to consistently estimate mean WTP by using ordinary least squares (OLS), which do not need to specify the probability distribution of WTP. The estimation model proposed in this paper does not risk making specification errors. Moreover the linear projection is very simple and easy to handle.

Let y=1 (resp. y=0) if a respondent says "yes" (resp. "no") to each bid t and $S(t)\equiv Pr(WTP\geq t)$ *be a survival function of WTP. We define* $S(0)\equiv 1$, $S(B)\equiv 0$, *and WTP is continuously distributed* in [0,B]. In this setting, $E(y \mid t)=Pr(y=1 \mid t)=Pr(WTP\geq)=S(t)$ because y is a Bernoulli random variable. Using this relation, mean WTP can be calculated as,

$$E(WTP)=\int_0^B S(t)\,dt=\int_0^B E(y|t)\,dt. \quad (1)$$

We consider the following linear projection.

$$\frac{1}{f(t)}y=x'\beta+v, E(v)=0, E(xv)=0 \quad (2)$$

where β is the projection parameter vector $(\beta_0, \beta_1)'$, v is the projection error, and $f(t)$ is the density of bid t. Suppose t is distributed in $[0,B]$ and $f(t)\neq 0$ in this area. This assumption is acceptable because the distribution of a bid can be controlled. Because $E(y \mid t)=x'\beta f(t)+E(v \mid t) f(t)$ by eqn. (2), E(WTP) is calculated by eqn. (1) as the following:

$$E(WTP)=\int_0^B x'\beta f(t)\,dt+\int_0^B E(v|t) f(t)\,dt=\int_0^B x'\beta f(t)\,dt \quad (3)$$

By changing β in eqn. (3) to $\hat{\beta}$ which is a estimator by regressing $\frac{1}{f(t)}y$ on x, we can estimate $E(WTP)$ as the following:

$$\hat{E}(WTP)=\int_0^B x'\hat{\beta} f(t)\,dt \quad (4)$$

Where $\hat{\beta}$ is a OLS estimator by regression $\frac{1}{f(t)}y$ on x;

$$\beta=\left(n^{-1}\sum_{i=1}^{n}x_i x_i'\right)^{-1}\left(n^{-1}\sum_{i=1}^{n}x_i\frac{y_i}{f(t_i)}\right)$$

Index I shows an observation I and n is the total number of a sample. Because $\hat{\beta}$ is a consistent estimator of β[4], $\hat{E}(WTP)$ is also a consistent estimator. Generally, we cannot calculate (4) as closed form, so we have to calculate eqn. (4) numerically to get $\hat{E}(WTP)$.

In this simulations, the non-negative dependant variable y_i is generated so that $Pr(y_i=0)$ is substantial and $E(y_i / x_i)=exp(x_i\beta)$

where x_i is vector of regressors. In particular, y_i is generated as a finite mixture model of the form:

$$y_i=\sum_{j=1}^{m_i}z_{ij}$$

where $m_i \geq 0$ is the number of components of the mixture, and z_{ij} is a continuous random variable with support in R^+ and distributed independently of m_i.

Besides being computationally convenient, this data generation scheme has a natural interpretation in the context of trade data. Indeed, m_i can be understood as the number of respondents z_{ij} and the answers by amount of money willing to pay by inhabitants j.

It is possible to conclude that: $E(y_i/x_i)=E(m_i/x_i)\,E(z_{ij}/x_i)$.

Therefore, if $E(z_{ij}/x_i)=exp(x_i'\delta)$ and $E(z_{ij}/x_i)=exp(x_i'\delta)$, we have that $E(y_i/x_i)=exp(x_i'\beta)$.

Draws of z_{ij} can be obtained from any continuous distribution with support in R^+, like the gamma, lognormal or exponential distributions. However, due to its additively, the gamma distribution is particularly suited for simulations and it is used here.

Determinants of the Stated Willingness-to-pay

Variables we expect to determine the stated willingness-to-pay includes: the respondent's income, the frequency of visiting the environmental goods, environmentally and spatially-related preferences expressed by the respondent and the respondent's attitude to environmental goods, respondent's age, gender, education and employment (Table 1).

The model is specified as follows:

$$WTP=\beta_0+\beta_1 age+\beta_2 gender+\beta_3 education+\beta_4 income+\beta_5 employment+\beta_6 place+\beta 7 familysize+\varepsilon_i.$$

The dependent variable shows the questionnaire participants desire to pay money to secure the existing large size farmlands. Non economics variable as mentioned in the equation are discussed. The model specification was based on similar studies in accordance to compare results [4]. Participants were categorised into six segments. The age categories are 18-29, 30-39, 40-49, 50-5, 60-69 and above 70. The education of the respondents were divided into 5 categories. Namely, without education, elementary education, secondary education, vocational training and university education. The incomes of participants were categorised using their average income levels and further each category of earnings used the centre point of their earnings. With respect to their type of employment the participants were firstly put in to two groups. First, group of participants who are employed wither full or part time. Secondly, the participants who are unemployed due to many reasons in nature such as health issues, retirees, studying in fulltime education [5]. Binaries were used with respect to the areas of participants' living. People who lived in towns and cities were binary 1 whereas people who lived in village rural area as 0.

The questionnaire survey was taken in the cities of Nitra and Topolcany and in surrounding villages. The interviews were taken in two stages and all together were interviewed 406 respondents. In the first stage 202 people answered the questionnaire and in the second stage it was 204 people who answered the questionnaire.

Results

In the first part of the interview respondents were asked hypothetical question. They were supposed to assume that agriculture will stop existing and how it can affect certain areas in agricultural landscape (Table 2).

Majority of respondents (53%) agree with the statement that *countryside would be less attractive*. Another 16% of respondents strongly agree with the above statement. Only 5% of respondents strongly disagree that countryside would be less attractive and 18% disagree with this statement. Another question considers that *rural economy would suffer*. With this statement again most of the respondents agree 47% and strongly agree 39%. Just 1% of respondents strongly disagree and 7% agree. Even in third part most of the respondents agree 47% that *rural population would suffer* plus 35% strongly agree [6]. Again low percentage of respondent strongly disagree 2% and disagree 9%. Respondents were not so sure about *less visits to the countryside*. Even though again most respondents agreed 31% only 14% strongly agree but 26% of respondents disagreed with this possibility and 25% didn't know. In next part first time appeared higher percentages of respondents who disagree 43% and 18% strongly disagree that *environmental quality will improve*. Lower percentage or people agreed 12% and 8% strongly agreed, plus 20% don't know about environmental part [7]. The last section of this hypothetical question considered that *conditions of wildlife will improve*. But in this case respondents were bit confused and that is why most of them 31% answered don't know.

Regarding the willingness to pay for the large farms, participants were willing to pay 23.88 euro/per person/per year. Most of the respondents 70% were not willing to pay anything for agriculture landscape. 28% of respondents were willing to pay 12-240 euro/per person/per year. The smallest amount of respondents only 2% was willing to pay more than 240 euro/per person/per year.

Variable	Description	Units	Obs	Mean	Std. Dev.	Min	Max
Big farms	WTP for large farms	Euros	406	1.633	6.317	0	50
Small farms	WTP for small farms	Euros	406	1.542	6.947	0	80
Income	Monthly income	Euros	406	545.824	364.303	50	1950
Education	Educational level; 5 categories	categories	406	4.121	0.839	1	5
Family size	Number of family members	individuals	406	3.65	1.36	1	7
Age	Respondent's age; 6 age cohorts	categories	406	2.872	1.4	1	6
Employment	Respondent's working status; 1 if working and 0 otherwise	dummy	406	0.7	0.459	0	1
Place	1 if urban household and 0 otherwise	dummy	406	0.468	0.5	0	1

Source: Questionnaire survey (2016), author's calculations.

Table 1: Summary statistics.

	Country would be less attractive	Rural economy suffers	The rural population suffers	Fewer people visit the countryside	Environmental quality will improve	Conditions for wildlife will improve
Strongly disagree	5%	1%	2%	4%	18%	14%
Disagree	18%	7%	9%	26%	43%	27%
Agree	53%	47%	47%	31%	12%	19%
Strongly agree	16%	39%	35%	14%	8%	9%
Dont know	9%	6%	6%	25%	20%	31%

Source: Questionnaire survey (2015), author's calculations

Table 2: Distribution of respondents according the answers.

	OLS		Poisson		Negative bin. Reg.	
Variable	**Coef.**	**Std. Err.**	**Coef.**	**Std. Err.**	**Coef.**	**Std. Err.**
lnincome	0.18**	0.09	0.48**	0.23	0.47**	0.22
Education	-0.02	0.04	-0.08	0.13	-0.07	0.13
Family size	-0.01	0.03	-0.03	0.08	-0.03	0.08
Age	-0.12***	0.04	-0.36***	0.1	-0.35***	0.1
Employment	-0.1	0.12	-0.12	0.31	-0.15	0.34
Place	0.11	0.08	0.32	0.23	0.33	0.22
_cons	-0.25	0.52	-2.74*	1.57	-2.67**	1.3
/ln alpha	-	-	-	-	0.49	0.25
Alpha	-	-	-	-	1.64	0.41
R-squared (Pseudo)	0.057	-	0.062	-	-	-

Note: *P(<0.1); **P(<0.05); ***P(<0.01).

Source: Questionnaire survey (2016); author's calculations.

Table 3: Regression results for LARGE farms

	OLS		Poisson		Negative bin. Reg.	
Variable	**Coef.**	**Std. Err.**	**Coef.**	**Std. Err.**	**Coef.**	**Std. Err.**
lnincome	0.04	0.08	0.08	0.22	0.07	0.2
Edu	0.04	0.04	0.14	0.15	0.16	0.14
Family size	-0.04	0.03	-0.11	0.09	-0.09	0.08
Age	-0.11***	0.03	-0.35***	0.09	-0.36***	0.09
working	-0.02	0.1	0.09	0.3	0.15	0.32
Urban	-0.06	0.08	-0.19	0.24	-0.21	0.23
_cons	0.45	0.51	-0.85	1.36	-0.94	1.12
/lnalpha	-	-	-	-	0.54	0.23
Alpha	-	-	-	-	1.72	0.39
R-squared (Pseudo)	0.05	-	0.16	-	-	-

Note: *P<0.1; **P<0.05; ***P<0.01.

Source: questionnaire survey (2016); author's calculations.

Table 4: Regression results for SMALL farms.

Willingness to pay for the small farms was 24.60 euro/per person/per year. Most of the respondents 71% were not willing to pay anything for agriculture landscape. 27% of respondents were willing to pay 12-240 euro/per person/per year. The smallest amount of respondents only 2% was willing to pay more than 240 euro/per person/per year [8].

By comparing previous results respondents who were interviewed are willing to pay 0.72 euro/per person/per year more for the small farms than for large farms [9].

After gathering data and summarizing the results of the questionnaire we conducted a regression analysis of the willingness to pay for large and small farms. The results are provided in the Tables 3 and 4, respectively. Table 3 illustrates the regression results with robust standard errors for the estimated willingness to pay for large farms of all respondents [10].

All of the variables have small effect. Model is statistically significant (p-value <0.05). The variable income is statistically significant at alpha 0.05. This means that for each one-unit increase in income, the expected log count of the amount of money the person is willing to pay for the current agricultural landscape increases by 0.47. The variable age is statistically significant at alpha 0.01. This means that for each one-unit increase in income, the expected log count of the amount of money the person is willing to pay for the current agricultural landscape decreases by 0.35.

Table 4 illustrates the regression results with robust standard errors for the estimated willingness to pay for small farms of all respondents.

Again all of the variables have small effect. Model is statistically significant (p-value <0.05). The variable age is statistically significant at alpha 0.01. This means that for each one-unit increase in income, the expected log count of the amount of money the person is willing to pay for the current agricultural landscape decreases by 0.36.

Conclusions

The research assumes and tries to prove that individuals living in towns and cities are more prone to pay for landscape. The research anticipates that participants residing in towns and cities will express their willingness to pay for cultivation land nevertheless they are large or small in size.

After running a regression the research concludes that where participants place of home is also a factor that influences their likeness to pay for landscape. Further, the town and city citizens are extremely willing to pay for farmlands which are with high hectares.

The earnings of the participants and their attained schooling level make a considerable correlation for their willingness to pay.

The research anticipates the participant who carries a higher level of knowledge due to his/her education will be highly willing to pay as opposed to those individuals who have gained basic or no education. The same consequences expected with individuals with higher earnings and lower earnings.

After looking at various geographic regions in Slovakia it is eminent that Nitra is more established region in terms of cultivation. The protection of land in this area is often attached to cultural and

ecological aspects. The research data analysis concludes the most prominent factor for WTP is the earnings of the individual participants. Even though Slovakia is not a poor country due to low levels of earnings by people living in rural areas they are very careful of spending. This is due to the fact of tight disposable income levels. Some other researches however said earnings are not correlated to WTP. In addition higher knowledge individual appreciate the view than people with no or little education. The research anticipates these two factors have some interconnectedness. Which means people who had university or other high knowledge accumulation is likely to have higher earnings.

From the analysis of this paper it is eminent that there are no significant changes in socio-demographic items of the respondents. Age of the participants were around the age of 50 and been woman. Mainly the participants were from village areas.

Even though there are several different opinions on the planed tax rate increase in according to increase the quality of agriculture, the research could estimate the normal willingness to pay for landscape. As mentioned in the research majority of the farm size been large and the WTP for those large lands are 23.88 Euros per individual per calendar year. However, over 2/3 of the participants said they are unwilling to pay for agricultural landscape. 28% almost all the rest mentioned willingness to pay between 12-240 Euros annually. The 2% of the participants were delighted and willing to pay over 240 Euros per year. There are several prominent factors affected the WTP of individuals. The most prominent factor has been age. Young participants were willing to pay more than the elderly. Further, respondents with higher earnings had the motivation and willingness to secure landscape and were willing to pay more. Additionally people living in cities and town who were missing the relax atmosphere were much more WTP.

To conclude the results and observations it is imminent citizens of Slovakia do not concern the value of public goods and preservation of agricultural landscape.

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