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Irregular behaviour in stating preferences for nature protection. A Choice Experiment in Belarus

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Irregular behaviour in stating preferences for nature protection. A Choice Experiment in Belarus

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Abstract

Using choice experiment, this paper investigates how Belarusian citizens value planned Zvanets mire protection programmes. Two approaches are used to analyze ignored attributes: a debriefing question, and estimating parameters at the individual level. We have found inconsistencies between people's declarations on ignoring certain attributes in the follow-up questions and the results of modelling at the individual level. These inconsistencies lead to statistically significant differences in WTP estimates obtained.

Keywords:
willingness to pay (WTP), choice experiment (CE), random parameter logit (RPL) model, lexicographic preferences, nature protection, wetlands

JEL:
Q50, Q51

Introduction

Choice experiments (CE) are a popular non-market valuation method that allows the simultaneous assessment of several attributes. In some variants, respondents are to state which out of several alternatives containing different levels for each attribute they prefer the most. In other variants, the task is to rank the alternatives. Thus, respondents are believed to make trade-offs between attributes. Analysts usually assume that respondents take all the attributes into account. However, there is growing evidence that many respondents use simplified non-compensatory decision-making rules when answering the choice questions. For example DeShazo and Fermo [2002 and 2004] point out that respondents frequently ignore one or several attributes.

Different explanations have been proposed to explain such a strategy. Some people may decide to ignore the cost variable as a protest against making trade-offs between money and the environment [Stevens *et al*. 1991]. In some cases the very design of the study may result in a lexicographic kind of behaviour, for example when one attribute is more important than the others or when the cost levels are not high enough to result in trade-offs [Rosenberger *et al*. 2003; Rizzi and Ortúzar 2003]. Not accounting for a lexicographic type of behaviour, or for respondents who ignore the cost variable, would likely result in biased welfare estimates and lead to wrong policy implications.

Some previous studies both in transportation [Hensher et al., 2005] and in the environment [DeShazo and Fermo, 2004; Campbell *et al*., 2006; Campbell *et al*., 2008, Carlsson *et al*. 2009] used approaches that relied solely on debriefing questions to identifying ignored attributes. All these papers, except for Carlsson *et al.* [2009] provided evidence of biased parameters. They found, however, ambiguous results regarding the direction of the bias. In Campbell *et al*. [2006 and 2008], WTP estimates decreased by more than 50% when lexicographic preferences were accounted for, and Hensher *et al*. [2005] found significantly lower WTP estimates for travel time savings in a model which assumed that certain attributes were ignored. In contrast, DeShazo and Fermo [2004] found significantly higher results. Interestingly, Carlsson *et al.* [2009] reported no statistical differences when lexicographic preferences were accounted for.

In order to identify individuals who ignored one or more attributes we propose to estimate parameters at the level of an individual, and check whether the declarations regarding ignored attributes in the debriefing questions match the estimates at individual level. To illustrate it, an Individual Modelling (IM) approach, as suggested by Louviere *et al*. [2009], was implemented in a case study involving protecting program options of a Belarusian natural area. The design followed the optimal efficient discrete choice experiment developed by Street and Burgess [2007]. Multiple observations per choice set per individual were obtained using best-worst type of questions and data at individual level were analyzed with the exploded logit formula. The estimates obtained at individual level were afterward used to identify respondents with lexicographic preferences or respondents who ignored some attributes most of the time, i.e. those individuals who did not have significant estimates at individual level.

The paper is organized as follows. Next section introduces the policy program. It is followed by a description of the survey, the methodology used, the econometric modelling and the results. It ends with some discussion and conclusions.

The policy site

Our policy site is the Zvanets fen mire, located in South-Western Belarus, close to the Ukrainian border. The site's total surface is around 16 thousand hectares of which 10.5 thousand are currently protected as a state biological reserve.

For centuries the mire served as a source of biomass harvested by local farmers, to support cattle raised in the area. As a result of regular harvesting, a unique ecosystem emerged. It became a wetland of international importance and a habitat for a number of rare species, including aquatic warblers (considered a bird of international importance), corncrakes, and greater spotted eagles [Kazulin *et al.*, 2005]. In particular, one third of the world population of globally endangered aquatic warbler *(Acrocephalus Paludicola L.)* nests there [APB, 2009]. The agricultural significance of the site decreased over the last decades. Cattle stopped grazing there, and almost nobody is interested in harvesting hay due to the unfavourable natural conditions and current socioeconomic trends.

An ambitious draining programme was implemented in the Soviet times, leading to drastic changes in wetland ecosystems in the Palessie region of Belarus. Once a land of vast pristine mires and bogs, nowadays it has only a few large wetlands. These, however, are still quite extensive and relatively intact by European standards. Nevertheless, the ongoing natural succession is likely to cover the wetland with bushes and trees thus eliminating the open undisturbed space that proved to be a unique habitat for a number of species.

A protection management programme could prevent or mitigate the undesirable succession. Annual biomass harvests of 1500-2000 hectares of the fen mire -with plots alternating every year, so that each place is harvested every few years- are expected to effectively slow down the expansion of shrubs. However, a vulnerable character of the habitat sets certain constraints upon applicable management practices. Three management scenarios meeting the ecological requirements of the site have been proposed: hand scythe mowing, mechanical mowing and controlled burning of the dry biomass in winter. A fourth option contemplated by some policy makers is a chemical treatment of shrubs with herbicides. It is not clear that it would serve its ecological purpose; however, it was included in the management methods to be valued.

Hand scythe mowing is considered the most environmentally friendly way of hay harvesting because it does no harm to sedge tussocks, which serve as an important element of the landscape and a crucial factor of the aquatic warbler breeding success. On the other hand, it is very demanding in terms of labour, and could hardly be afforded by local communities. Neither the manual, nor the mechanical mowing techniques, are appropriate during birds' breeding season starting in early March and lasting until late July. This discards the traditional forage hay-mowing in two rounds. The biomass harvested in autumn and winter has almost no value as a feedstuff. However it can be used locally as a source of solid fuel, if processed with the appropriate briquetting technology. The third option, controlled burning of dry biomass in winter, can imply negative consequences in terms of peat layer mineralisation. In addition, nutrients remain within the ecosystem to trigger an undesirable succession. The energy content of the biomass would be lost in this case as well. Finally, herbicides may be effective for the main aim of the policy, but with significant undesirable side effects.

Besides the method itself, such factors as the surface annually harvested, the hydrological regime restoration, spatial enlargement of the protection regime (60% of the mire have a protection status at the moment) come into play to make the matter more complex.

The survey

The main aim of the valuation study was to estimate the mean WTP of the Belarusian population for a complex protection program. The attributes and their levels were determined after consultation with policy makers and biologists, as well as focus groups, and a pre-test of the survey. Table 1 reflects the attributes and levels used in the questionnaire. The payment vehicle was an obligatory annual payment that Belarusian residents would have to make to a fund exclusively dedicated to the protection of Zvanets mire.

Choice sets consisted of a Business-as-Usual (BAU) situation, with no protection program and no payment required, and three protection alternatives. An experimental design was used to structure the five attributes and their levels form a universe of $(4^4x2)x(4^4x2)x(4^4x2)$ possible combinations for the three program alternatives. We used a Street-Burgess design approach [Street and Burgess, 2007] to create 16 choice sets, each with three generic choice options. NGENE software was used for this purpose. Starting with a best-worst approach, each individual was asked to fully rank all four alternatives of the choice set.

Table 1. **Attributes and levels used in the Choice Experiment**

Attribute	Description	Levels
Method of removing shrubs	Four different methods contemplated by reserve management team and biologists were accounted for. Respondents were informed about pros and cons of each technique. BAU*= none	1) Hand scythe mowing 2) Mechanical mowing 3) Controlled burning of the dry biomass in winter. 4) Using herbicides
Area	Annual area over which the shrubs would be removed (ha/year). BAU = 0	1) 1000 2) 2000 3) 3000 4) 4000
Hydro	Improving hydrological conditions i.e. stabilizing the water table by constructing sluices etc. BAU = No	1) Yes 2) No
Enlarging protection level	Enlarging protection level of the reserve from the current 10,000 ha. BAU = 0	1) 0 2) +2000 ha 3) +4000 ha 4) +6000 ha

Cost	Annual cost per person (2010 values) BAU = 0	1) 30,000 BYR 2) 100,000 BYR 3) 170,000 BYR 4) 240,000 BYR

*BAU: Business-as-Usual

The questionnaire consisted of five parts. The first one contained questions that help to determine the respondent's attitude towards biodiversity conservation issues.

The second part described the ecological importance of stopping the succession of trees and bushes at the mire and explained the nature and importance of programme attributes to provide respondent with sufficient information for ranking the programmes. Since protection of the Zvanets mire is important for saving the flagship aquatic warbler *(Acrocephalus Paludicola L.)*, maps with its current distribution, breeding sites and photos were presented to the respondents.

The third part was devoted to a CVM study, to help analysts determine respondents with positive, negative and zero WTP for a Zvanets conservation programme. Respondents were initially asked a question about their willingness to pay a commonly affordable sum of BYR 1000 annually in favour of conservation of Zvanets. Respondents declaring positive WTP were proposed a payment ladder, others shifted to reverse question followed by payment ladder aiming to determine their willingness to pay for the programme of Zvanets' drainage with subsequent intensive agricultural exploitation. The results of this part of the survey are not reported here.

The fourth part was the choice experiment itself. Each respondent faced sixteen successive choice sets, which were presented as colour tables with alternatives being visualised and verbalised in a popular manner. Individuals were asked to choose the best alternative first, then the worst one and finally the better one of the remaining two alternatives.

The fifth part contained some debriefing questions followed by socioeconomic inquiries, including his/her sex, age, location, household characteristics, income and material well-being.

The questionnaire was administered face-to-face to a sample of Belarusian population. Interviews were conducted in respondents' homes in December 2009 and January 2010. The survey covered Minsk (the capital of Belarus), regional and district centres situated in different parts of the country as well as rural areas. Questionnaires were randomly assigned to 200 individuals.

The econometric modelling

The data at individual level from the 16 ranked choice set answers of the 200 respondents were analyzed with the use of the exploded logit formula, which is the product of logit formulae. Data at aggregated level, i.e. all observations pooled together, were analyzed with the use of a random parameter model, and only information on best choices was accounted for. Since each respondent faced 16 choice sets, the unobserved part of the utility is likely to be correlated over choices made by the same individual. In order to account for this possibility, a panel version of the model was used. The unexplained part of the utility is likely to be correlated between the program alternatives. In order to account for this possibility, an error component specification was used. Details of these models are presented below.

In a CE exercise individuals are asked to identify their preferred choice *i* among a given set of *J* alternatives. The data analysis follows a standard Random Utility Maximisation (RUM) model [McFadden, 1974]. Under RUM, it is assumed that the observed choice from an individual *n* is the one she expected to provide her with the highest utility. Her utility function, U_{ni}, can be decomposed into a systematic part, V_{ni}, and a stochastic part, ε_{ni}, such that

$$U_{ni} = V_{ni} + \varepsilon_{ni}$$

The probability P_{ni} that individual *n* chooses alternative *i* instead of another alternative *j* of the choice set is

$$P_{ni} = \Pr(V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj} \forall j \neq i) .$$

If ε_{nj} is assumed to be independently and identically distributed extreme value type I, this probability has a closed form expression,

$$P_{ik} = \frac{e^{\beta' x_{ni}}}{\sum_j e^{\beta' x_{nj}}} . \qquad <1>$$

where *x* is a vector of variables and β a vector of parameters. Expression <1> is often referred to as a logit choice probability function.

Under the assumptions applicable to the standard logit model, the probability of any ranking of the alternatives from best to worst can be expressed as the product of logit formulae [Train 2003]. For example, if a respondent was presented with four alternatives labelled *A*, *B*, C and D then Prob(ranking C, B, D, A) can be expressed as:

$$P_{(Ranking C,B,D,A)} = \frac{e^{\beta' x_{AC}}}{\sum_{j=A.B.C.D} e^{\beta' x_{nj}}} \frac{e^{\beta' x_{AB}}}{\sum_{j=A.B.D} e^{\beta' x_{nj}}} \frac{e^{\beta' x_{AD}}}{\sum_{j=A.D} e^{\beta' x_{nj}}}$$

The standard multinomial logit model (MNL) has some limitations, as listed by Train [2003]. (i) It exhibits a property of independence from irrelevant alternatives (IIA). (ii) MNL can represent only the systematic taste variation, but not random taste variations. (iii) It cannot handle situations where the unobserved part of the utility function is correlated over time.

To overcome these limitations a more flexible RPL model has been applied to analyze the pooled data. Mixed logit probabilities can be expressed as the integrals of standard logit probabilities over a density of parameters. Thus, a mixed logit model is any model whose choice probabilities take the form:

$$P_{ni} = \int \frac{e^{\beta_n' x_{nit}}}{\sum_j e^{\beta_n' x_{nit}}} \phi(\beta | b, \Omega) d\beta , \qquad <2>$$

where: $\frac{e^{\beta_n' x_{nit}}}{\sum_j e^{\beta_n' x_{nit}}}$ is a standard logit formula, $\phi(\beta | b, \Omega)$ is a density of a random coefficients with mean *b* and covariance Ω. For example the logit expression in <1> can be treated as a special mixed logit case with β being fixed. Limitation (ii) of the standard MNL is relaxed by assuming a mixing distribution that is not degenerated at fixed parameters; this type of model is commonly called Random Parameter Logit model.

Mixed logit is a highly flexible model that can approximate any RUM model [McFadden and Train, 1996]. For example, an analogue to nested logit is obtained by specifying a dummy variable for each nest that equals 1 for each alternative in the nest and zero for alternatives outside the nest. With K non-overlapping nests, the error components are $\mu_n^{'} z_{nj} = \sum_{k=1}^{K} \mu_{nk} d_{jk}$, where $d_{jk} = 1$ if j is in the k nest and zero otherwise [Train 2003]. The variance of the error component captures the magnitude of the correlation. It plays an analogous role to the inclusive value coefficient in NL models. A specification accounting for correlations between alternatives and assuming non-random coefficients is often known as the Error Components Model (ECM).

In MNL, the unobserved factors that affect respondents are assumed to be independent over the repeated choices, which may be considered unrealistic in the CE exercises where respondents usually make more than one choice. There might be some unobserved factors that are constant over the choices made by the same individual facing several choice sets, and consequently unobserved parts of the utilities over the choices may be correlated. Mixed logit models can account for dependence across repeated choices from the same respondent by specifying a panel version of the model, which overcomes the MNL limitation (iii) listed above. Conditional on β, the probability that the individual n makes a sequence of T choices is the product of logit formulae, as in

$$P_{ni} = \prod_{t=1}^{T} \left[\frac{e^{\beta_n^{'} x_{nit}}}{\sum_j e^{\beta_n^{'} x_{njt}}} \right], \qquad \text{<3>}$$

where t denotes the sequence of choices made by the same respondent.

Since β_n is not known, the unconditional probability is given by the integral over all possible values of β_n, i.e.

$$P_{ni} = \int \prod_{t=1}^{T} \left[\frac{e^{\beta_n^{'} x_{nit}}}{\sum_j e^{\beta_n^{'} x_{njt}}} \right] \phi(\beta | b, \Omega) d\beta, \text{<4>}$$

with $\phi(\beta | b, \Omega)$ being the density of a random parameter with mean b and covariance matrix Ω.

Modelling results

From the sample of 200 individuals, 32 did not provide enough information to fully incorporate them in the analysis, because they did not answer. Thus, data from 168 individuals were used. Table 2 reports the share of respondents who declared to ignore a certain attribute. The cost and area attributes were declared by respondents to be the most commonly ignored attributes. Table 3 shows the proportion of respondents ignoring one or more attributes. A bit less than half of the sampled individuals declared to ignored at least one attribute when ranking the alternatives. Compared with for example Carlsson *et al*. [2009], this proportion is a bit lower in our study. Nevertheless, like in other studies [Carlsson *et al*. 2009, Campbell *et al*. 2006 and 2008], the cost attribute is among the most commonly ignored attributes according to the answers to the debriefing questions. Also like in the cited studies it is quite uncommon for people to ignore more than two attributes, with 11% declaring to do so.

Table 2. **Share of respondents who ignored a certain attribute**

	Based on declarations from the follow up question	Based on IM results
Method	0.07	0.19
Area	0.21	0.45
Hydrology	0.15	0.49
Reserve	0.12	0.53
Cost	0.23	0.37

Table 3. **Share of respondents who ignored attribute combinations**

	Based on declarations from the follow up question	Based on IM results
Share of respondents who ignored at least one attribute	0.43	0.82
Ignored one attribute	0.21	0.20
Ignored two attributes	0.11	0.26
Ignored three attributes	0.09	0.17
Ignored four attributes	0.02	0.15
Ignored five attributes	0.0	0.04

In order to check whether people's declaration on ignoring certain attributes match their actual behaviour in the experiment, we estimated individual level parameters using the ranking data. Compared with a single choice approach, ranking provides extra information about individuals' preferences. Tables 2 and 3 reflect the share of respondents who ignored a certain attribute and different number of attributes, based on the individual modelling estimates. An attribute was assumed to be ignored when it was found insignificant at 0.1 level.

There is a notable difference between declarations in the debriefing phase and choices in the elicitation exercise. The IM results indicate that people tend to ignore attributes more frequently than they declare in the debriefing questions. Only 18% of respondents considered all attributes, according to the econometric analysis, and more than one third (36%) ignored more than two attributes. A similar pattern is reported by Louviere *et al*. [2009], where most people tended to consider two to three attributes out of six.

We also checked to what extend people's declarations in the debriefing question are good predictors of the significance of the coefficient in the IM study. To do so we estimated the probability of the coefficient to be insignificant conditional on the declaration that this attribute was ignored. The estimated probability was 0.52. In other words, the probability of the coefficient to be significant conditional on the statement that it was ignored equaled 0.48. Therefore people's declarations seem to be poor indicators of whether the attribute was ignored according to the IM approach.

Another discrepancy between the debriefing and IM results involves the cost attribute. According to the statement of the respondents the cost of the preservation programme was the most frequently ignored attribute, whereas in the econometric analysis it was the second most significant coefficient –the first one being the mowing method.

The information concerning which attributes a respondent ignores can be used to restrict attribute parameters to zero [Hensher *et al*. 2005]. The probabilities in the likelihood function are then only a function of the attribute parameters that have been considered. Using the information from the follow-up questions and the results at the individual level, we estimated three separate RPL models. In the first one, all observations were included (Model 1). In the second one (Model 2), individual parameters for the ignored attributes were restricted to zero only for those individuals who declared ignoring one or more attributes in the debriefing questions. In the third one (Model 3), the individual parameters for the ignored attributes were restricted to zero, using the information from IM estimates.

The results for the random parameter logit models are presented in Table 4. The cost coefficient was assumed to be fixed in all models; other coefficients were assumed to be normally distributed. For simplicity, we only included the attributes, plus an alternative-specific constant for the BAU alternative. The integral in equation <4> cannot be evaluated analytically, and the estimation of the probabilities has to rely on a simulation method. In this application a simulated maximum likelihood estimator with Halton draws was used. In each run, 200 Halton draws were generated, which produces an approximation similar to 2000 pseudo-random draws [Train, 1999]. The parameters of the utility function were estimated with the use of the NLOGIT 4.0 statistical software.

All coefficients, apart from burning, are statistically significant at the 0.01 level. All random parameters, except for burning, have significant standard deviations at the 0.01 level, indicating heterogeneity in the preferences.

For all three models the signs of the variables are consistent with *a priori* expectations. The positive coefficients for "Area", "Reserve" and "Hydrology" suggest that protection programmes were more likely to be chosen when the area from which the shrubs were to be removed was larger, when hydrological conditions were improved and when the increased area of protection was larger. Positive and statistically significant coefficients for "Manual" and "Mechanical" indicated that people, on average, preferred these two methods of removing shrubs to the use of herbicides. The relatively small standard deviations of random parameters of "Manual" and "Mechanical", compared to their means, suggest that there is only small fraction of people in population who prefer use of herbicides to manual scythe mowing or mechanical mowing. The coefficient by the "Burning" alternative indicated that, on average, this method is also preferred to chemical treatment; however, this coefficient was not statistically significant at the 0.1 level. Table 5 presents WTP estimates; standard errors (in parentheses) were obtained with use of the delta method.

The results indicate that irrespective of the model used respondents, on average, are willing to pay for the protection programme. The ranking of attributes in terms of WTP is stable over the model used. On average, the highest WTP is for the manual scythe mowing. This result is not a surprise since this option was presented as the most adequate for protecting the ecosystem. On average, the WTP for the mechanical mowing program was only slightly lower. WTP for the controlled burning program was not statistically different from the base-line level (i.e. herbicides use). In all three models, the WTP for restoring the hydrological conditions was roughly equivalent to the WTP for the mechanical mowing option (again, with respect to the herbicides use). Respondents, on average, are willing to pay from 1.5 to 3 times more (depending on the restrictions imposed) for increasing the area mowed by 1 hectare compared to enlarging the Zvanets protection by 1 hectare.

Table 4. **Estimated random parameter logit models; standard errors in parentheses**

	Model 1 (no restrictions)		Model 2 (ignored attributes restricted to 0 according to follow-up questions)		Model 3 (ignored attributes restricted to 0 according to IL[a])	
	Coefficient (std. error)	Std dev. (std error)	Coefficient (std. error)	Std dev. (std error)	Coefficient (std. error)	Std dev. (std error)
Manual	2.645*** (.172)	1.599*** (.134)	2.355*** (.189)	1.453*** (.134)	2.616*** (.172)	1.387*** (.166)
Mechanical	1.658*** (.122)	.782*** (.105)	1.751*** (.122)	.673*** (.124)	1.861*** (.1547)	1.035*** (.154)
Burning	.171 (.119)	.300 (.209)	.0988 (.1302)	.234 (.179)	.0336 (.1665)	.581*** (.194)
Area	.000347*** (.447D-04)	.000466*** (.503D-04)	.000364*** (.438D-04)	.000367*** (.448D-04)	.000464*** (.000107)	.000698*** (.893D-04)
Hydrology	1.134*** (.102)	1.0971*** (.111)	1.531*** (.128)	1.154*** (.111)	1.539*** (.207)	1.491*** (.200)
Reserve	.000113*** (.195D-04)	.000135*** (.187D-04)	.000141*** (.246D-04)	.000208*** (.247D-04)	.000313*** (.376D-04)	.000204*** (.432D-04)
SQ	-5.069*** (.224)	3.041*** (.0898)	-4.839*** (.813)	2.758*** (.431)	-2.027*** (.383)	.514*** (.299)
Fixed coefficient						
Cost	-.148D-04*** (.586D-06)		-.169D-04*** (.419D-06)		-.263D-04*** (.931D-06)	
μ		5.183*** (.0608)		5.499*** (.753)		3.017*** (.288)
LL	-2054.066		-2003.966		-1852.977	
Pseudo R2	.23311		.18363		.21487	
N	168		168		168	

[a] – according to results at the individual level
*** significant at 0.01 level
μ – variance of the error component

Since there were large differences regarding ignoring a certain attribute between people's declarations and IM estimates, the result that the WTP vary over the three models is not a surprise. First of all, the method used for identifying the ignored attributes has a significant impact on the WTP estimates. In our case study, the impact was larger when information regarding the respondents who ignored attributes was obtained from modelling preferences at the individual level.

In other studies, all attributes were found to vary in the same direction. For example, in Campbell *et al*. [2006 and 2008] WTP estimates decreased for all attributes by more than 50% when lexicographic preferences were accounted for. However the direction of the change in our study was not the same for all attributes. WTP estimates for most of the attributes decreased, but the WTP for "Reserve" was higher in Model 3 compared to Model 1, and the WTP for "Hydrology" in Model 2 was higher than for Model 1.

Table 5. **WTP results (in BYR 2010)**

WTP	MODEL 1 no restrictions	MODEL 2 restriction according to follow-up questions	MODEL 3 restrictions according to IM
Manual[a]	178 312*** (11 524)	149 278*** (10 219)	99 180*** (6 470)
Mechanical[a]	111 786*** (8 604)	103 528*** (7 344)	70 559*** (5 877)
Burning[a]	11 522 (8 063)	5 843 (7 693)	1 274 (6 324)
Area	23.39*** (2.89)	21.50*** (2.54)	17.59*** (3.90)
Hydro	76 483*** (7 034)	90 511*** (7 087)	58 342*** (7 191)
Reserve	8.01*** (1.30)	8.37*** (1.42)	11.87*** (1.35)

*** Significant at 0.01 level. The standard errors obtained with use of the delta method.
[a] herbicides method used as a reference level.

Analyzing the data at individual level allowed for identifying a share of individuals (15%) who focused only on one attribute and ignored the remaining four. Those individuals ranked the alternatives only with respect to one attribute. In 70% of cases it was the "Method" attribute and in 30% "Hydrology". No one ranked alternatives according to attribute "Area" or "Reserve" only. These individuals were selecting the most preferred alternative (for all choices) on the basis of a level of one attribute only, irrespective of cost. This type of behaviour could have a large impact on the mean WTP estimates. Identifying such individuals was feasible when estimating a model at the individual level. A continuous utility function does not exist for a "lexicographic" type of behaviour, so the parameters at individual level cannot be estimated. Interestingly, with this kind of extreme behaviour (when all attributes except for one were ignored) only half of such respondents declared to ignore all four attributes.

Nevertheless, there were also opposite cases. Respondents who declared to ignore four attributes (or less) had significant coefficients for some of them. As a result, a lexicographic type of behaviour that was easily identified with the IM approach could not be fully accounted for when only the information from the debriefing questions was used. Ranking alternatives according to one attribute concerned single attributes: "Method" and "Hydrology". The differences in WTP between models that accounted for lexicographic preferences using information from the debriefing questions or models at the individual level are the largest for those two attributes.

Discussion and Conclusions

For various reasons, people may ignore certain attributes when participating in stated preference studies. When investigating individuals' WTP in a CE it is important to be aware of which attributes a respondent considered and which ones ignored, because not accounting for a lexicographic type of behaviour for respondents who ignore the cost variable may result in biased welfare estimates and unwanted policy implications.

Using a Street-and-Burgess [2007] type of design, combined with best-worst type of questions, we obtained a full ranking of four alternatives for 16 choice sets. An exploded logit formula analysis allowed for estimating parameters at the individual level. We have found inconsistencies between people's declarations on ignoring certain attributes in the debriefing questions and the results of modelling at the individual level. These inconsistencies could go in either direction. A respondent who declared ignoring a given attribute could have a statistically significant coefficient when an individual model was performed, or the opposite. As a result, we have found significant differences in WTP between these two methods of accounting for lexicographic preferences. The cost variable was found to be the least considered in the debriefing question, while based on the IM results it was found among the most considered ones.

The results obtained indicate that irrespective of the method of accounting for lexicographic preferences, on average, respondents are willing to pay for the protection programme of the Zvanets mire. The highest mean WTP is for the manual scythe mowing. The WTP for the mechanical mowing programme was found to be slightly lower. The WTP for the controlled burning program was not statistically different from the base-line level (i.e. the use of herbicides). In the different models estimated, the WTP for restoring the hydrological conditions was similar to the WTP for the mechanical mowing option (again, with respect to the use of herbicides). On average, and depending on the restrictions imposed, respondents are willing to pay from 1.5 to 3 times more for increasing the area mowed by 1 hectare than for extending the Zvanets reserve status by 1 hectare.

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