Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA)
Available online at www.inia.es/forestsystems
doi: http://dx.doi.org/10.5424/fs/2013221-03103

Forest Systems 2011 22(1), 94-105
ISSN: 1131-7965
eISSN: 2171-9845

The impact of protest responses in choice experiments: an application to a Biosphere Reserve Management Program

Melina Barrio[1] and Maria Loureiro[2]

[1] *Departamento de Economía e Historia Económica. Facultad de Ciencias Económicas y Empresariales. Universidad de Alcalá de Henares. Plaza de la Victoria, 3. 28802 Alcalá de Henares (Madrid), Spain*
[2] *Departamento de Fundamentos da Análise Económica. Facultad de Ciencias Económicas y Empresariales. Universidad de Santiago de Compostela. Campus Norte. Avda. Burgo das Nacións, s/n. 15782 Santiago de Compostela (A Coruña), Spain*

Abstract

Aim of study: To identify protest responses and compute welfare estimates with and without the inclusion of such responses using follow-up statements in a choice experiment exercise. To our knowledge, this is one of the first empirical applications that, following the conventional treatment used in contingent valuation methodology, explicitly deals with the treatment and identification of protest responses in choice experiments.

Area of study: The Eo, Oscos y Terras de Burón Biosphere Reserve sited between the regions of Galicia and Asturias. We are interested in the influence of such responses on preference elicitation for alternative management actions in this Reserve.

Materials and methods: A face-to-face survey conducted in a sample of residents and non-residents of this Reserve. In total, more than 450 surveys were collected.

Main results: They show that protest responses are fairly common in choice experiments, and their analysis affects the statistical performance of the empirical models as well as the valuation estimates. In fact, when the sample is corrected by protest responses, its size decreases to 303 individuals. Furthermore, we observe that protest responses are triggered by a less positive attitude towards the wolf.

Research highlight: Protest responses are a common issue in choice experiments and, therefore, future exercises should consider them explicitly, as previous contingent valuation studies have.

Key words: Biosphere Reserve; choice experiments; protest responses; willingness to pay.

Introduction

The use of choice experiments (CEs) to assess environmental and recreational values has increased in recent years (Adamowicz *et al*., 1998; Boxall *et al*., 1996; Morrison *et al*., 2002). CEs are very suitable for stakeholders to state their preferences with respect to various management programs. In fact, many of the earliest CEs published studies deal with protected area management programs (Hearne and Santos, 2005). The CE method is a generalization of the contingent valuation (CV) method, in the sense that rather than asking people to choose between a baseline scenario and a specific alternative, CEs ask participants to select between cases, which are described by attributes (Adamowicz *et al*., 1998). CEs share a common theoretical framework with dichotomous-choice CV based on Random Utility Models (RUM) (Luce, 1959; McFadden, 1974), as well as a common basis of empirical analysis with limited dependent variables (Greene, 1997).

As the relevant literature has shown, if protests occur in valuation exercises, stated preference methods may fail to determine the correct economic value of

* Corresponding author: melina.barrio@uah.es
Received: 14-05-12. Accepted: 22-10-12.

Abbreviations used: choice experiment (CE or CEs); conditional logit (CL); contingent valuation (CV or CVs); independently and identically distributed (IID); independence of irrelevant alternatives (IIA); multinomial probit model (MNP); random parameters logit model (RPL); status quo (SQ).

the good in question (Meyerhoff and Liebe, 2008). The treatment of protest responses is particularly important when the benefit aggregation issue is considered (Halstead *et al*., 1992). Such protests may result in the underestimation of welfare measures (*e.g.* Chuan-Zhong *et al*., 2004; Hearne and Santos, 2005) or in overestimated results if all the status quo (SQ) responses are removed (*e.g.* Adamowicz *et al*., 1998[1]). Therefore, a correct analysis of protest responses is required.

Protest responses have been widely debated in CV studies (Strazzera *et al*., 2003; Jorgensen *et al*., 1999, among others), and it has been shown that their identification and treatment may have a significant influence on welfare estimates. Problems commonly encountered in CV applications related to protest responses might also be present in CEs. However, not much attention has been given to these issues yet in this literature (with the exception of Meyerhoff and Liebe, 2008 and 2009) and their effect on welfare estimates remains unexplored.

In addition to the different attribute combinations associated with certain changes in the good or services valued, CEs typically present another option to respondents that contains the current situation and a zero payment, denoted as the SQ option (Mercer and Snook, 2004; Hearne and Santos, 2005). Protest responses may hide behind the selection of SQ options (Adamowicz *et al*., 1998; Hanley *et al*., 2006). In recent years authors such as Meyerhoff and Liebe (2008) have dealt more explicitly with the topic of protest responses in CEs. In particular, Meyerhoff and Liebe (2008) employed a follow-up question with CEs and CVs to highlight protest beliefs among all the responses and assess whether the likelihood of protest responses differs across methodologies. They did not find clear differences between protest responses in the two methodologies. Moreover, other reasons that could be related to the choice of the SQ alternative are the perceived choice task complexity and an attitude toward the good (Meyerhoff and Liebe, 2009). However, in the present work we are concerned with the identification and treatment of protest responses per se.

The novelty of the analysis that follows is that it is based on the treatment of protest responses used typically in CVs, distinguishing explicitly between protest and non-protest responses based on the prior selection of the SQ option. In this way, the indirect utility function and the associated welfare estimates are computed with and without protest responses. Therefore, this analysis allows for the assessment of the impact of protest responses not only on the welfare estimates but also on the estimated parameters of the indirect utility function.

In order to properly account for the effect of protest responses, a conservative approach to protests is employed initially, treating protest responses in the analysis as true zero respondents. In a second approach, protest responses are excluded from the empirical analysis, under the assumption that individuals who do not share the valuation scenario should not be taken into account when estimating welfare estimates (Freeman, 1986), considering only the real zero answers. As far as we know, this is the first empirical application that explicitly deals with the treatment of protest responses per se in the context of CEs, following steps which are conventional in earlier studies conducted for CVs but are novel in CE studies. Previous studies by Meyerhoff and Liebe (2008) have dealt with protest beliefs in CEs, but they did not assess the sensitivity of welfare estimates and utility parameters of protest responses. Since this analysis follows the guidelines for dealing with protest in CVs, protest responses are identified among those individuals who always choose the SQ option, *i.e.* among those with a stated zero WTP in all choice occasions. This way to identify protest beliefs in CEs was indicated previously by Hanley *et al*. (2006), although they did not conduct such an empirical application. Secondary objectives are concerned with the understanding of the importance that individuals assign to different management actions to protect emblematic areas, and specifically towards one of the most recently declared Spanish Biosphere Reserves.

This paper is structured as follows. The next section reviews the previous literature linked to protest responses and their treatment. The CE model estimation is then presented in the first subsection of Material and Methods. The second subsection describes the case study area and the survey mechanism. The following section presents and compares the results for the whole sample with the results corrected for protest responses. Conclusions and some re-

[1] They removed individuals who always selected the current situation, who were treated in the same way as the "I don't know" response in a CV question.

commendations based on the obtained results are presented in the last section.

Analysis of protest responses

Protest respondents are those who oppose or do not approve of the survey mechanism and fail to respond the valuation question, giving either positive but invalid responses or allocating a non-true zero value to a product or service (Halstead *et al*., 1992). The first concern with protest responses appears with respect to their identification. There is no protocol or theoretical criterion for classifying responses (Boyle and Bergstrom 1999); however, the classification of all zero bids must be carefully examined to differentiate between the legitimate zero and protest responses. Previous analyses have used a set of debriefing questions asked to those respondents who were unwilling to pay (Meyerhoff and Liebe, 2008; Loomis *et al*., 1996; Strazzera *et al*., 2003). These procedures to include follow-up questions to determine valid/invalid responses have been considered in many valuation guidelines, including those by Department of Transport, Local Government and Regions (2002). In this current analysis, employing statements as previously used in the relevant literature, real zero values and protest responses were also identified.

In these cited previous studies, there are differences in the statements presented to classify individuals and also in the criteria applied to identify protest responses. Some authors present follow-up statements to the full sample (such as Meyerhoff and Liebe, 2008), seeking to distinguish not only protest responses related to zero WTP responses but also general protest beliefs in the full sample. By contrast, most previous CV studies only present statements to those individuals who are not willing to pay a given amount (Halstead *et al*., 1992; Loomis *et al*., 1996). Furthermore, the criteria for classifying protests and true zero values vary considerably from one author to another, although there are some commonalities across studies. Halstead, Luloff and Stevens (1992) present four statements, including reasons for the rejection of the payment vehicle, the concept of paying for the good, the inability to afford payment and an open-ended question. Along the same lines, most authors include other reasons related to the value of the good, the feeling that others should pay for the program and the respondents' inability to afford the payment.

Once protesters have been identified, different treatments are applied to protest responses in CV literature. Generally, three main ways of dealing with protest zero bids have been used (Halstead *et al*., 1992) in the relevant literature. The first consists of eliminating them from the data set (Freeman, 1986; Mitchell and Carson, 1989). The second includes protest bids in the data set and treats them as legitimate zero bids (Giraud *et al*., 2002); and the third assigns protest bidders mean WTP values based on their socio-demographic characteristics relative to the rest of the sample extrapolating mean sample WTP to the population as a whole (Walsh *et al*., 1984).

Thus, as the literature shows, there are various ways of dealing with protest responses, but the most common application in CV is to delete these observations from the sample (see Adamowicz *et al*., 1998; Morrison *et al*., 2000). However, Jorgensen and Syme (2000) consider that protest beliefs are representative of attitudes towards the valuation process and argue that the censoring of protest responses is unjustified. In the present application, we use CEs for the valuation of various management programs to be applied in a protected natural area, identifying protest responses among those participants who always choose the SQ alternative and differentiating them from real zero respondents. The argument is that the estimated WTP in CEs is a function of the various trade-offs among attributes (Louviere, 2001; McFadden, 2001). If we understand a protest answer as "refusal to trade one attribute for another", we may assume that individuals who always choose the SQ option are avoiding disclosure of their true WTP (Louviere, 2001).

Material and methods

Estimation of the CE data

CEs are consistent with utility maximization and demand theory (Bateman *et al*., 2002). Respondents are asked to choose between different bundles of (environmental) goods, which are described in terms of their attributes or characteristics and their respective levels.

According to this framework, an individual i has a utility function (U) of the form:

$$U_{ij} = V\left(X_{ij}\right) + \varepsilon_{ij} = \beta X_{ij} + \varepsilon_{ij} \qquad [1]$$

This indirect utility function can be described as a sum of two components: a deterministic part (V) and a stochastic part (ε). The first element is a function of the attributes of the different management programs (X) to be valued. β is a vector of parameters to be estimated. The stochastic element represents unobservable factors in individual choices independent of the deterministic part.

A person chooses the alternative k when $u_{ik} > u_{ij}$ for all $k \neq j$. Accordingly, with J choices, the probability of choice k is:

$$P\left(choose\ k\right) = P\left(u_{ik} > u_{ij}\ \ for\ all\ k \neq j\right) \quad [2]$$

One of the main models used in previous papers to model choice behavior is the multinomial logit or conditional logit (CL). This is our baseline model. However, one of the assumptions of this model is that the error term is independently and identically distributed (IID). The non-fulfillment of IID implies violations in the independence of irrelevant alternatives (IIA) property. This property states that the ratio of choice probabilities between two alternatives in a choice set is unaffected by changes in that choice set. In order to test for IID/IIA violations, a Hausman-McFadden test was conducted[2] which involved the construction of a likelihood ratio test around different specifications of the same model where alternative choices were excluded. A χ^2 value of 208.83 was computed for a conditional logit model when the alternative "Option B" was excluded from the choice set. This value exceeds the critical value (which from the Chi-squared table at 5% significance level with 5 degrees of freedom is 11.07). Therefore, the null hypothesis was rejected, providing evidence against the assumption of IIA.

When a violation of the IIA hypothesis is observed, more complex statistical models are necessary to relax the assumptions used. These include the multinomial probit model (MNP) (Chen and Cosslett, 1998; Hausman and Wise, 1978; Lusk and Schroeder, 2004), the random parameters logit model (RPL) (Revelt and Train, 1998; Train, 1998; Train, 2003), the nested logit model (Louviere *et al*., 2000), and the heterogeneous extreme value logit model (Allenby and Ginter, 1995; Bhat, 1995; Lusk and Schoroeder, 2004).

The estimation approach is based on an RPL model or mixed logit model. This model allows for heterogeneous preferences in the population. The probability of choice in the RPL model is thus given by:

$$P_{ij}\left(j\ is\ chosen \mid \lambda_i\right) = \exp\left(\beta X_{ij}\right) \Big/ \sum_k \exp\left(\beta X_{ik}\right) \quad [3]$$

where λ_i is an individual-specific random disturbance of unobserved heterogeneity. Following Lusk and Schroeder (2004), in general, the coefficient vector for individual i in the RPL is $\beta_i = \bar{\beta} + \sigma\lambda_i$, where $\bar{\beta}$ is the population mean, σ is the standard deviation of the marginal distribution of β, and λ_i is a random term assumed to be normally distributed mean zero and unit standard deviation. When there was no prior belief about the sign of some coefficient, the normal distribution was chosen (Nunes *et al*., 2001). If $\sigma = 0$, then the RPL results are equivalent to those from the CL model.

Data

In this study we analyze different management alternatives in the *Eo, Oscos y Terras de Burón* Biosphere Reserve in Spain. This Biosphere Reserve is an area located in the Northwest of the country, on the scenic Cantabrian coastline. In this reserve, the Eo River estuary is an internationally recognized wetland under the RAMSAR treaty and has sustainable development management plans. Livestock, forestry, and tourism are currently the area's main economic activities. Biosphere reserves are designed to bring together a broad range of agents to work co-operatively towards common objectives (UNESCO, 2005). In total, there are 564 Biosphere reserves worldwide in 109 countries (UNESCO, 2010).

The designation of a Reserve does not carry any legal implications in terms of protection, although

[2] The statistic for this procedure is given by the following equation:

$$\chi^2 \sim \left(\hat{\beta}_s - \hat{\beta}_f\right)' \left[\hat{\Sigma}_s - \hat{\Sigma}_f\right]^{-1} \left(\hat{\beta}_s - \hat{\beta}_f\right)$$

where $\hat{\beta}$ indicates the coefficient vector, $\hat{\Sigma}$ denotes the estimated covariance matrix, and f and s the full and reduced choice specifications respectively. This statistic follows a limiting chi-squared distribution with s degrees of freedom, where k is the number of attributes.

Table 1. Attributes, Levels and SQ

Attribute (*Variable*)	Description	Levels	SQ
Forest program (*Forest*)	A policy to increase the native forested area	5% increment in forest or 5400 ha 20% increment in forest or 21000 ha	0 ha
River and salmon program (*River*)	A restoration program requiring the cleaning of the Eo river and the conservation of Atlantic salmon	Yes, if cleaning and restoration actions are undertaken No, otherwise	No
Heritage rehabilitation program (*Heritage*)	State aid for rehabilitation and restoration of interesting local heritage sites, such as dovecots	Yes , if rehabilitation of architectural cultural heritage is undertaken No, otherwise	No
Wolf management program (*Wolf*)	Wolf management program to keep the different wolf populations close, avoiding physical barriers such as roads and fences	Yes, if management action for wolf recovery is undertaken No, otherwise	No
Tax (*Tax*)	Annual tax increase on current levels	€15 increase in tax on current levels €30 €50	€0

actions to integrate biodiversity conservation and economic development are expected. For policy purposes, the understanding of different interventions is relevant, given that policymakers need to ensure better integration of varying community interests. With this objective in mind, we designed a choice modeling survey that was administered to 453 individuals, 276 of whom live inside the Reserve and 177 in neighboring areas. The survey was conducted face to face between November 2008 and March 2009. The sample was restricted to individuals aged 18 and older and the number of surveys in each city and village was determined by proportional sampling weights.

The structure of this survey followed other previous protocols conducted with similar objectives. The first section collected participant's opinions about different social problems and asked whether they have visited the Reserve. Section Two provided participants with information about the Biosphere Reserve then asked information about the participant's degree of approval of this designation and poses various perception questions with respect to some of the management actions presented. Then, the different choice sets were presented, with each containing two alternative programs and the SQ option. We included an SQ option not only to differentiate between protest and non-protest but also to assure that one of the options is in the respondent's currently feasible choice set in order to interpret the results in standard welfare economic terms (Hanley *et al*., 2001). In choice modeling, most researchers include the alternative "do nothing" or SQ (Adamowicz *et al*., 1994; Adamowicz *et al*., 1997; Blamey *et al*., 2000; Hearne and Santos, 2005; Hanley *et al*., 2006), although others do not (Mackenzie, 1993; Holmes *et al*., 1998).

Table 1 shows the different attributes, the description of the management alternatives or alternatives that described the election and the corresponding levels used in the valuation scenario. The various management alternatives contained: reforestation actions, river and salmon conservation actions, wolf recovery actions, heritage and architectural restoration actions, and finally the associated cost as an increase in the current income tax level.

These attributes and levels were designed following the guidelines of the Biosphere Reserve Council. In order to test the understanding of survey participants, a pretest was conducted on 40 participants, concluding that the survey in general and the attributes and levels, in particular, were understood by individuals. Furthermore, following previous CV literature, when the individuals selected the SQ option, follow-up

Table 2. Statements that allow us to differentiate between True Zeros and Protests Response in our Survey

Motives to choose the status quo option	Classified as protest response
These actions are interesting, but nowadays I can't afford the payment	No
I don't like the presented actions (Why?)	No
I don't like the different combinations	No
I don't like the different levels	No
I don't like a specific action such as wolf recovery or forest restoration	No
It is not fair that I have to pay to protect the Biosphere Reserve, because I pay enough taxes	Yes
Other reason (indicate)	No
Too expensive	No
People should not have to pay for these actions	Yes

questions were presented with statements to identify whether their no-votes were protests or real zeros. The set of statements presented were selected from the most common used in previous CV studies, including also an open-ended question recommended by some authors (Bateman *et al*., 2002). Table 2 shows the final statements that allow us differentiate between true zero and protests response.

Finally, the last part of the survey contained ethical and socio-economic questions about the characteristics of the respondent.

Results

A total of 453 completed questionnaires were collected with an overall response rate of 40.27%, which is quite acceptable given that no economic incentives were provided to participants. Furthermore, this could be related with the socio-demographic composition of the area of study, which is mainly rural, with a high percentage of elderly people with low levels of education.

Each individual responded to six choices[3], collecting a total of 2718 observations for the entire sample. Surveys were conducted inside and outside the protected area, on a sample of the general population. Table 3 summarizes the socio-demographic characteristics of the total sample and the sample corrected for protest responses.

Table 3. Socio-economic Composition of the Sample

Socio economic composition	Sample corrected for protest responses	Full sample
Average age	48.12	52.40
Studies		
None	3.63	7.5
Primary	31.02	39.96
Secondary	20.13	17.66
Vocational training	18.15	14.35
Higher	27.06	21.85
Sex		
Male	50.83	47.68
Female	49.17	52.32
Income < 400	0.99	0.88
400 < 600	2.64	2.43
≥ 600 < 1000	6.27	7.95
≥ 1000 < 1500	39.27	47.02
≥ 1500 < 2000	24.42	21.41
≥ 2000 < 2500	10.89	8.83
≥ 2500 < 3000	7.26	5.52
≥ 3000 < 4000	4.95	3.75
≥ 4000	3.30	2.21

The empirical representation of the utility function has the following functional form:

$$V_{ij}=\beta_1 Forest_{ij}+\beta_2 River_{ij}+\beta_3 Wolf_{ij}+\beta_4 Patrimony_{ij}+\beta_5 Tax_{ij}+\varepsilon_{ij} \quad [4]$$

[3] From all possible combinations of attributes, we obtain seventy-two ($3^2 \times 2^3$) possible combinations. The final scenarios were constructed from an orthogonal main effects design, using SPSS 15.0. The design was blocked into two versions of the questionnaire. This is a typical mechanism used to reduce the number of choices (Adamowicz *et al*., 1998; Louviere *et al*., 2000).

Table 4. Results for the Full Sample. CL and RPL Models

Attribute	CL Full sample		RPL Full sample	
	Coefficient (Std. Err.)	**Z**	**Coefficient (Std. Err.)**	**Z**
Random parameters in utility functions				
Wolf	—	—	–0.385 –2.299*	(0.167)
Non random parameters in utility functions				
Forest	0.031 (0.010)	3.138**	0.029 (0.010)	2.807**
River	0.129 (0.152)	0.850	0.231	1.388
Wolf	–0.277 (0.149)	–1.863*	— (0.167)	–2.299*
Heritage	0.645 (0.069)	9.315***	0.645 (0.072)	9.020***
Tax	–0.039 (0.005)	–7.300***	–0.039 (0.006)	–6.979***
Derived standard deviations of parameter distributions				
Wolf	—	—	0.889 (0.260)	3.413***
Log simulated-likelihood	–2722.480		–2720.31	
AIC	2.007		2.006	
BIC	2.018		2.019	
Adj-R^2	6.58		6.56	
Individuals	453		453	
Number of observations	2718		2718	

Note: ***, **, * = Coefficients significantly different from zero at 0.1%; 1%; and 10% significance levels.

where the attributes *Forest*, *River* and *Patrimony* represent recovery actions with different levels related to the corresponding natural and cultural capital; whereas *Wolf* indicates recovery actions to wolfs´ populations and *Tax*, the corresponding payment requested for each combination of attributes. All these attributes have been earlier defined in Table 1 and the error term follows a type I extreme error distribution.

Table 4 presents the results for the baseline model CL and the RPL for the full sample. Based on the wide variety of responses towards the wolf preservation program and other immediate reactions obtained in the survey, we have assumed that the attribute *Wolf* follows a normal distribution. The standard deviation accommodates the presence of preference heterogeneity in the sample population, which specifically implies the existence of a non-constant effect of the attribute *Wolf* across respondents[4]. Following previous studies such as Layton and Brown (2000), Revelt and Train (1998) or Lusk and Schroeder (2004), the price coefficient is assumed to be fixed in the population.

The results for the full sample indicate that all the attributes except the *River* recovery actions are statistically significant in determining each participant's utility for the management programs assessed. The attributes *Forest* and *Heritage,* which represent recovery actions linked to better preservation of forests and the local architecture and heritage sites, have a

[4] We started our estimations with all the attributes, except *Tax*, random. After the different estimations we found that only the *Wolf* coefficient had a derived standard deviation statistically significant.

positive sign, while the coefficient corresponding to the required *Tax* payment and the *Wolf* management action carry negative ones, as expected. This implies that the presence of the former attributes increases utility, while the latter attributes decrease it in a statistically significant way. According to the magnitudes of the coefficients, the programs related to *Wolf* and *Patrimony* carry the strongest effects in the utility function, whereas *Forest* is the weakest.

Identification of protest responses

Protesters are identified using the statements in Table 2. By employing these follow-up questions, we have identified different motivations behind the responses and we can thus classify as "protest responses" those individuals who were unwilling to pay more taxes because they considered that already paid enough and individuals who considered that they should not have to pay for programs of this type. Two classifications were attempted in order to investigate the scale of these protest responses. First, protest responses were treated as zero responses and included in the dataset. Second, protest responses were differentiated and excluded from the sample.

In the overall sample, we find that 53.9% of individuals chose SQ on at least one occasion, and 37.3% always chose SQ. The most important reason behind the protest responses is that participants consider that they are already paying enough taxes, while the true zeros are usually unable to afford to pay for the program. Taking into account these arguments, 33.1% of respondents are considered as protest responses. This percentage is in line with previous CV studies[5]. In the next section, we compare results according to the classification outlined.

Results per treatment of protests

The sample is reduced to 303 individuals when corrected for protest responses. Table 5 presents the results for the CL and RPL models corrected for protests. The first two columns show the results for CL and the last two for RPL. For the corrected sample the *Wolf* recovery program, although random, is not statistically significant. To compare these results with those from the full sample, we estimate the same models for the corrected sample. The correction of the sample for protest responses could explain the reduction in the heterogeneity, indicating that the standard deviation associated with the randomly distributed attribute (*Wolf*) is not statistically significant, so that all attributes should be entered as fixed. The rest of the attributes are positive and statistically significant, with the exception of the *Tax* attribute, which is negative, as expected.

A comparison of these results with those obtained above for the full sample (Table 4) reveals differences between the two sets of estimates that are mainly related to the significance levels of the *River* and *Wolf* attributes. Furthermore, the *Heritage* and *Tax* attributes maintain their significance levels and signs, while *Forest* increases its significance level from 1% to 0.1%. Although the models with the total and corrected samples cannot be compared with the AIC and BIC criterion because of different samples, an analysis of the overall statistical fit shows that the corrected models have a better adjusted R^2, up from 6.5% to 13.8% for the CL model and from 6.6% to 19.8% for the RPL.

Attitudes towards protected areas have been analyzed previously in numerous studies (Lehmkuhl *et al.*, 1988; Durrant and Shumway, 2004 and Kideghesho *et al.*, 2007, among others). Many negative attitudes are attributed to perceived impacts on livelihood, specifically damage to crops by protected animals or restrictions on hunting and fishing (Durrant and Shumway, 2004). With respect to the attributes considered in this study, previous literature has shown that conservation measures for the wolf population can be a controversial topic. In fact, Karlsson and Sjöstrom (2007) find that favorable attitudes towards wolf conservation are positively associated with distance from the nearest wolf territory. Moreover, increments in wolf population give rise to livestock depredations that can erode public social tolerance for wolves and make long-term management more difficult. In this case study, this area is very sensitive to this topic, as wolf attacks are recorded every year. This could explain the negative attitude found in the full sample. However, Karlsson and Sjöström (2007) also indicate that there are other variables that influence human attitudes towards wolves, such as education, age, gender, income, living on a farm and belonging to interest groups

[5] For example, Halstead *et al.* (1992) identify 32% of responses as protests and Giraud *et al.* (2002) identify 41.8%.

Table 5. Results for the Corrected Sample. CL and RPL Models

Attribute	CL Without protest		RPL Without protest	
	Coefficient (Std. Err.)	Z	Coefficient (Std. Err.)	Z
Random parameters in utility functions				
Wolf	—	—	–0.115 (0.213)	–0.543
Non random parameters in utility functions				
Forest	0.063 (0.013)	4.968***	0.053 (0.014)	3.766***
River	0.606 (0.198)	3.069**	1.118 (0.247)	4.529***
Wolf	0.039 (0.176)	0.222		
Heritage	0.986 (0.097)	10.160***	0.949 (0.107)	8.881***
Tax	–0.037 (0.007)	–5.292***	–0.033 (0.008)	–4.265***
Derived standard deviations of parameter distributions				
Wolf	—	—	1.513 (0.220)	6.881***
Log simulated-likelihood	–1609.423		–1598.51	
AIC	1.776		1.765	
BIC	1.791		1.783	
Adj-R^2	13.83		19.83	
Individuals	303		303	
Number of observations	1818		1818	

Note: ***, **, * = Coefficients significantly different from zero at 0.1%; 1%; and 10% significance levels.

such as hunters or nature conservation groups, among others. Furthermore, the attribute *River* is associated with a type of fishing-based tourism that is rejected by most locals nowadays. However, the results change when the sample is corrected: it can be concluded that river and salmon actions are valued positively by respondents while the wolf preservation program is not significant. Therefore, the correct identification and analysis of protest responses also appears to be important in CE applications, especially when results are used to design management policies.

WTP Estimates

WTP estimates are computed with the formula shown in equation [5] (Table 6). The mean WTP for each attribute is estimated as the ratio of the coefficient associated with the attribute of interest over the *Tax* coefficient (see Hanemann and Kanninen, 1999). Each of these ratios is understood as a price change associated with a unit increase in a given attribute:

$$WTP = -\left(\beta_{attribute} / \beta_{tax}\right) \quad [5]$$

When protest responses are excluded WTP estimates are not significantly different across the models. In fact, the confidence intervals of the estimates overlap. Only for the *River* attribute in the RPL model is there no overlap between the estimates for the two samples. On average, the respondents in the total sample are willing to pay €16.6 per year for rehabilitation and restoration programs on heritage sites; if protest responses are excluded the corresponding WTP is

Table 6. Welfare estimates

	WTP	95% C.I.	WTP	95% C.I.
	CL Model Baseline Model		RPL Model	
Full sample				
Forest	0.80	(0.49, 1.11)	0.75	(0.41, 1.09)
River	3.31	(–5.09, 11.7)	5.95	(–3.87, 15.77)
Wolf	–7.12	(–16.35, 2.1)	–9.9	(–20.73, 0.94)
Heritage	16.58	(12.93, 20.22)	16.59	(12.86, 20.32)
Without protest responses				
Forest	1.71	(0.24, 1.47)	1.59	(1.32, 1.87)
River	16.48	(0.51, 15.97)	33.62	(5.15, 62.09)
Wolf	1.06	(–7.97, 9.03)	–3.47	(–17.4, 10.46)
Heritage	26.79	(6.93, 19.86)	28.53	(19.51, 37.55)

Note: Confidence intervals were estimated using the Delta method.

€26.79 per year and €28.53 per year for the CL and RPL models, respectively. The lowest positive WTP estimate is obtained for the reforestation policy *(Forest)*, ranging from €0.75 to €0.80 per year for the full sample and from €1.59 to €1.71 per year for the sample with no protest responses. The lowest estimates correspond to the RPL model and the highest to the CL model. Finally, the river and salmon programs for the corrected sample have an associated WTP of €16.48 per year for the CL model and €33.62 per year for the RPL, while that for the total sample are €3.31 and €5.95, respectively. As can be observed, WTP is higher in the corrected sample.

Subtle differences are observed with respect to WTP estimates for actions to be implemented in the Reserve depending on how protest responses are taken into account. However, the main differences are related to agreement or disagreement with the different management actions presented. Therefore, treating responses correctly seems to be really important in terms of results, specifically for understanding the attitudes towards the river and wolf protection actions.

Conclusions

In this research, we investigate the effects of protest responses on the results of a CE exercise and the sensitivity of the derived WTP estimates. We estimate CL and RPL models for samples with and without correction for protest responses. Protest responses are classified using follow-up questions as in CV methodology. The results show important qualitative differences between the two samples, indicating that the valuation of some attributes, such as the wolf protection program and river and salmon restoration actions, vary slightly in terms of statistical significance. These findings make sense in a geographical area where wolf protection and river fishing are controversial issues.

With respect to the empirical objectives at hand, we show the need to identify and deal with protest responses in CEs, given that the statistical model fit improves considerably, while the results from the management implications change considerably. Specifically, the utility of the river and salmon actions increases when the sample is corrected for protest responses. However if the full sample is considered for analysis the river attribute is not significant. Also, there are statistical differences between the two analyses in regard to the wolf protection program. Consequently, from a policy design viewpoint the implications of the way in which protest responses are treated are important.

In the context of CV, Halstead, Luloff and Stevens (1992) show that excluding protest responses may bias WTP results, but the direction of that bias is indeterminate a priori. However, most studies indicate that samples without protest bidders result in higher WTP estimates (Jakobsson and Dragun 2001). The same result is found here, using CEs. Therefore, protest responses must be taken into account when estimating WTP, as they can provide a range of estimates that give more accurate results. Future research should therefore seek to identify and treat protest responses in the context of CEs.

Acknowledgements

The authors acknowledge funding support from Fundación Caixa Galicia-Claudio San Martín. Project: «Valoración medioambiental, cultural y paisajística de los espacios rurales» (Number: 2005-CL046).

References

Adamowicz W, Boxall P, Williams M, Louviere J, 1998. Stated preference approach for measuring passive use values: choice experiments and contingent valuation. American Journal of Agricultural Economics 80: 64-75.

Adamowicz W, Louviere J, Williams M, 1994. Combining stated and revealed preference methods for valuing environmental amenities. Journal of Environmental Economics and Management 26: 271-292.

Adamowicz W, Swait J, Boxall I, Louviere J, Williams M, 1997. Perceptions *versus* objective measures of environmental quality in combined revealed and stated preference models of environmental valuation. Journal of Environmental Economics and Management 32: 65-84.

Allenby G, Ginter J, 1995. The effects of in-store displays and feature advertising on consideration sets. International Journal of Research in Marketing 12: 67-80.

Bateman I, Carson R, Day B, Hanemann M, Hanley N, Hett T, *et al*., 2002. Economic valuation with stated preference techniques: a manual. Edward Elgar Publishing Northhampton.

Bhat C, 1995. A Heteroskedastic extreme value model of intercity travel mode choice. Transportation Research B 29: 471-483.

Blamey RK, Bennett JW, Louviere JJ, Morrison MD, Rolfe J, 2000. A test of policy labels in environmental choice modelling studies. Ecological Economics 32: 269-286.

Boxall P, Adamowicz W, Swait J, Williams M, Louviere J, 1996. A comparison of stated preference methods for environmental valuation. Ecological Economics 18: 243-253.

Boyle K. Bergstrom J, 1999. Doubt, doubt, and doubters: the genesis of a new research agenda? In: Valuing environmental preferences: theory and practice of the contingent valuation method in the US, EU and developing countries (Bateman IJ, Willis KG, eds). Oxford University Press, Oxford.

Chen HZ, Cosslett RS, 1998. Environmental quality preference and benefit estimation in multinomial probit models: a simulation approach. American Journal of Agricultural Economics 80: 512-520.

Chuan-Zhong L, Kuuluvainen J, Pouta E, Rekola M, Tahvonen O, 2004. Using choice experiments to value the Natura 2000 nature conservations programs in Finland. Environmental and Resources Economics 29: 361-374.

Department Of Transport, Local Government and Regions (DTLR), 2002. Economic valuation with stated preference techniques. Edward Elgar, Cheltenham, UK.

Durrant J, Shumway M, 2004. Attitudes toward wilderness study areas: a survey of six southeastern Utah Counties. Environmental Management 33(2): 271-283.

Freeman AM, 1986. On Assessing the state of the art of the contingent valuation method of valuing environmental changes. In: Valuing environmental goods: an assessment of the contingent valuation method (Cummings RG, Brookshire DS, Schulze WD, eds). Rowman and Allanheld Publisher, Totowa, New Jersey.

Giraud K, Turcin B, Loomis J, Cooper J, 2002. Economic benefit of the protection program for the steller sea lion. Marine Policy 26: 451-458.

Greene W, 1997. Econometric analysis, 3rd ed. Prentice Hall.

Halstead J, Luloff AE, Stevens H, 1992. Protest bidders in contingent valuation. Northeastern Journal of Agricultural and Resource Economics 21(2): 160-169.

Hanemann WM, Kanninen B, 1999. The statistical analysis of discrete-response. In: Valuing the environment: preferences: theory and practice of the contingent valuation method in the US, EC and developing countries (Bateman I, Willis K, eds). Oxford University Press.

Hanley N, Mourato S, Wright R, 2001. Choice modelling approaches: a superior alternative for environmental valuation? Journal of Economic Surveys 15(3): 435-462.

Hanley N, Wright R, Alvarez-Farizo B, 2006. Estimating the economic value of improvements in river ecology using choice experiments: an application to the water framework directive. Journal of Environmental Management 78: 183-193.

Hausman J, Wise DA, 1978. A conditional probit model for quantitative choice: discrete decisions recognizing interdependence and heterogeneous preferences. Econometrica 46: 402-426.

Hearne R, Santos A, 2005. Tourists' and locals' preferences toward ecotourism development in the Maya Biospher Reserve, Guatemala. Environment, Development and Sustainability 7: 303-318.

Holmes T, Zinkhan C, Alger K, Mercer E, 1998. The effect of response time on conjoint analysis: estimates of rain forest protection values. Journal of Forest Economics 4(1): 7-28.

Jakobsson K, Dragun A, 2001. The worth of a possum: valuing species with the contingent valuation method. Environmental and Resource Economics 19: 211-227.

Jorgensen B, Geoffrey S, Bishop B, Nancarrow B, 1999. Protest responses in contingent valuation. Environmental and Resource Economics 14: 131-150.

Jorgensen B, Syme G, 2000. Protest responses and willingness to pay: attitude toward paying for storm water pollution abatement. Ecological Economics 33: 251-265.

Karlsson J, Sjöströmb M, 2007. Human attitudes towards wolves, a matter of distance. Biological Conservartion 137: 610-616.

Kideghesho JR, Roskat E, Kaltenborn BP, 2007. Factors influencing conservation attitudes of local people in Western Serengeti, Tanzania. Biodiversity and Conservation 16(7): 2213-2230.

Layton DF, Brown G, 2000. Heterogeneous preferences regarding global climate change. The Review of Economics Statistics 82: 616-624.

Lehmkuhl JF, Upreti RK, Sharma UR, 1988. National parks and local development: grasses and people in Royal Chitwan National Park, Nepal. Environmental Conservation 15: 143-148.

Loomis J, González-Cabán A, Gregory R, 1996. A contingent valuation study of the value of reducing fore hazards to old-growth forests in the Pacific Northwest. Reseach Paper PSW-RP-229. Pacific Southwest Research Station. Forest Service. US Department of Agriculture.

Louviere J, 2001. Choices experiments: an overview of concept and issues. In: The choice modelling approach to environmental valuation (Bennet J, Blame R, eds). Cheltenham, UK, Edward Elgar Publishing Ltd. pp: 13-36.

Louviere JJ, Hensher DA, Swait JD, 2000. Stated choice methods: analysis and application. Cambridge, Cambridge University Press.

Luce D, 1959. Individual choice behaviour. John Wiley, New York.

Lusk JL, Schroeder TC, 2004. Are choice experiments incentive compatible? A test with quality differentiated beef steaks. American Journal of Agricultural Economics 86(2): 467-482.

Mackenzie J, 1993. A comparison of contingent preference models. American Journal of Agricultural Economics 75: 593-603.

McFadden D, 2001. Economic choices. American Economic Review 91(3): 351-378.

McFadden D, 1974. Conditional logit analysis of qualitative choice behaviour. In: Frontiers in econometrics (Zarembka P, (eds). Academic Press, New York.

Mercer E, Snook A, 2004. Analyzing ex-ante agroforestry adoption decisions with attribute-based choice experiments. In: Valuing agroforestry systems. Methods and applications (Alavalapati J, Mercer D, eds). Kluwer Academic Publishers. Netherlands.

Meyerhoff J, Liebe L, 2008. Do protest responses to a contingent valuation question and a choice experiment differ? Environmental Resource Economics 39: 433-446.

Meyerhoff J, Liebe L, 2009. Status quo effect in choice experiments: empirical evidence on attitudes and choice task complexity. Land Economics 85(3): 515-528.

Mitchell RC, Carson RT, 1989. Using surveys to value public goods: the contingent valuation method. Washington, DC, Resources for the Future.

Morrison M, Blamey R, Bennett J, 2000. Minimizing payment vehicle bios in contingent valuation studies. Environmental and Resource Economics 16: 407-422.

Morrison M, Bennett J, Blamey R, Louviere J, 2002. Choice modeling and tests of benefit transfer. American Journal of Agricultural Economics 84 (1): 161-170.

Nunes LC, Cunha-e-Sá MA, Ducla-Soares MM, Rosado MA, Day BH, 2001. Identifying non-consistent choice behavior in recreation demand models. Economics Letters 72(3): 403-410.

Revelt D, Train K, 1998. Mixed logit with repetead choices: households' choices of appliance efficiency Level. The Review of Economics and Statistics 80(4): 647-657.

Strazzera E, Genius M, Scarpa R, Hutchinson G, 2003. The effect of protest votes on the estimated of WTP for use values of recreational sites. Environmental and Resource Economics 25: 461-476.

Train K, 1998. Recreation demand models with taste differences over people. Land Economics 74: 230-239.

Train K, 2003. Discrete choice models with simulation. Cambridge University Press, Cambridge.

United Nations Educational, Scientific and Cultural Organization (UNESCO), 2005. Biosphere Reserves. Benefits and Opportunities. SC.2005/WS/49 REV. http://unesdoc.unesco.org/images/0014/001424/142453e.pdf.

United Nations Educational, Scientific and Cultural Organization. 2010. UNESCO's Man and the Biosphere Program (MAB). http://portal.unesco.org/science/en/ev.php-URL_ID=4801&URL_DO=DO_TOPIC&URL_SECTION=201.html

Walsh RG, Loomis JB, Gillman RA, 1984. Valuing option, existence, and bequest demands for wilderness. Land Economics 60(1): 14-29.