An alternative approach to identifying protest attitudes in choice experiments

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Abstract

Protest responses have been a traditional topic in stated preference (SP) methods, and more specifically in contingent valuation (CV). However, applications dealing with this issue are limited in choice experiments (CE). In this paper we present a novel assessment of protest responses, based on the fact that protest may be hidden under the selection of any choice alternative, and not only behind the status-quo option. Through attitudinal questions and applying a latent class model (LCM) we identify two different classes of individuals, through which we denote protest and non-protest respondents. We analyze the heterogeneity between both groups and compare our results with a random parameter logit (RPL) model. The results show that if we do not take into account the protest beliefs in our estimations, we would be omitting heterogeneity in the sample.

Keywords: Atlantic Islands National Park, attitudinal questions, choice experiments, latent class model, protest beliefs

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Introduction

The treatment of protest bids in CE has not been sufficiently investigated. In fact, just a few previous studies have studied protest empirically in CE (Meyerhoff and Liebe, 2008; Meyerhoff and Liebe, 2009). In particular, Meyerhoff and Liebe (2008) employ a follow up question with CE and CV to differentiate the protest responses, and to assess whether the likelihood of protest responses differs across methodologies. They do not find clear differences between protests responses in both methodologies. In addition, Meyerhoff and Liebe (2009) analyze the motives to select the status quo alternative. Furthermore, they assess the impact of the alternative specific constant for the status quo in the computation of compensating surplus. Due to the few existing references, research in this field seems to be necessary as the alternatives to dealing with protest answers could have a high influence on the results.

In contingent valuation, CV onwards, there is a very extensive amount of literature dealing with protest responses. Traditionally, the identification of protests has been done through a set of debriefing questions that are presented to those respondents who are unwilling to pay (Loomis et al., 1996; Strazzera et al., 2003), dropping them in most cases from the sample for welfare estimation purposes. However, numerous authors claim the need for a change in the identification and treatment of such responses(Jorgensen and Syme, 2000; Meyerhoff and Liebe, 2006). In fact, the identification of protest responses only among those who are not willing to pay could be inadequate. The main justification is that a protest attitude could be present in any type of response (Jorgensen et al., 1999).

In CV studies, some of the alternatives to dealing with protest bids include the sample selection model, in which the protesters are identified among those that are not willing to pay (Strazzera et al., 2003); the identification of protest bids as real zero (Adams et al., 2008); or the inclusion of attitudinal questions to identify protest beliefs without eliminating them from the sample (Jorgensen and Syme, 2000). In the last years, some authors have suggested the Latent Class Model (LCM) as a good method to analyze

protest responses in CV (Meyerhoff et al., 2009; Cunha-e-Sá et al., 2010),,given that it can be used to endogenously identify classes of individuals with similar characteristics, such as preferences or attitudes, according to their responses to survey questions. Following this reasoning, we believe that attitudinal information can provide signals about protest beliefs. Protest and non-protest responses may have different preferences, and consequently, their grouping into classes seems reasonable. Specifically, we assume that the answers to attitudinal questions are expressions of exogenous well-behaved preferences. To our knowledge this is the first application where, taking into account attitudinal questions, protest responses are analyzed through a LCM in CE methodology.

Therefore the objectives of the current chapter are various. First, an estimation of classes is performed using only attitudinal data containing answers to Likert-scale type of questions, that let us differentiate between various types of protests beliefs such as those related with the lack of trust in the Government and its institutions, the unfairness to ask for money or the inability to value the environment[1], among others. A second objective consists of the estimation of the individual preferences, by use values.

Literature Review

There are a variety of ways to include preference heterogeneity in choice models. The most common way is through the inclusion of individual characteristics in the function, or through the differentiation among different groups based on observable characteristics (see, for example, Hanley et al., 1998). However, some studies have included attitudinal data to explain or as determinants of the individual's WTP (Willis et al., 1995; Alvarez-Farizo and Hanley, 2002). In fact, McFadden (1986) suggests that attitudes and beliefs could be used to understand and estimate individual's preferences among products.

[1] This could be related to lexicographic preferences (Rekola, 2003), because participants are not able to do a trade-off between goods or attributes.

Latent class modelling is one of several approaches for introducing heterogeneity in discrete choice analysis (Provencher and Moore, 2006). The underlying theory posits that individual behaviour depends on observable attributes and on latent heterogeneity that varies with factors that are unobserved by the analyst (Greene and Hensher, 2003).

LCMs are quite common in social sciences, and in the last years are becoming quite usual in environmental valuation studies (Morey et al., 2006; Boxall and Adamowicz, 2002; Provencher et al. 2002; Scarpa et al., 2003; Semeniuk et al., 2009). Some of these analyses have applied attitudinal questions to identify classes of respondents, but it is not a common practice. Provencher et al. (2002) use a LCM in a travel cost application to analyze the behavior of recreational anglers over the course of a season using only choice data. They assume class probability to be conditional on individual's age and experience. Semeniuk et al. (2009) examine the heterogeneity of tourist preferences for wildlife management at a stingray-feeding attraction in the Cayman Islands. They uncover segments directly from the stated choice responses in underlying classes and test if these groupings differ in their management support. They asked attitudinal questions with the sole purpose of explaining the latent groups in a decision-tree analysis. Along the same line, Scarpa et al. (2003) use a LCM to identify the market taste differences of the "creole" pig among the household sample in the state of Yucatan. Boxall and Adamowicz (2002) estimate a LCM with both attitudinal and choice data, conditioning preference class membership, which then drives the choice decision. In Morey et al. (2006), the attitude and choice data are driven by underlying preferences, which are identified by exogenous class membership variables.

RPL is a natural alternative to LCM, which provides information about the extent of the heterogeneity (Morey et al., 2003). Boxall and Adamowicz (2002) have compared both models. They concluded that the RPL model identifies heterogeneity, but it is captured in a different way that in the case of LCM. In fact, they indicate that this last model enriches the traditional economic choice model by including psychological factors. The LCM used in this study tries to reflect the fact that protesters have different preferences than the rest of the population.

In many previous studies, the identification of protesters is based in ad hoc criteria established by each researcher. The novelty in this study is that it is the individual himself/herself who with their answers will allow the identification of a class of protesters aptitudes. To our knowledge only a few previous unpublished studies have identified protesters through the LCM. In fact, this small amount of literature is focused on CV methodology (Meyerhoff et al., 2009; Cunha-e-Sá et al., 2010). In the work of Meyerhoff et al. (2009) the class membership is not dependent on attitudes; rather, attitudes are dependent on class, while Cunha-e-Sá et al. (2010) identify classes based on answers of individuals to an attitudinal question. We follow this second approach, in which, we identify different classes through attitudinal questions. Also, we estimate a RPL for comparative purposes in order to model and understand the individual´s heterogeneity.

Case study

The Spanish National Park's (NP) Network is an integrated system for protecting and managing the most valuable and representative areas of Spanish natural heritage. It is integrated by 14 NPs, with a total surface of 348,000 hectares, which represents more than 0.6% of the total terrestrial surface of the country. The Illas Cies National Park is located in the southwest coast of Galicia (Spain). The total surface is 8,480 hectares (7,285.2 marinal and 1,194.8 terrestrial) and is formed by different archipelagos (Cíes, Ons, Sálvora and Cortegada). As we can observe in the map, the majority of the Park is on a marine area, 86% of total (see map 4.1).

We estimate the preferences of the individuals with respect to different alternatives of management in this NP. Two are the main samples of analysis, tourists and residents. In table 1, we present the socio-demographic characteristics of our sample. We include two reference populations for comparison, the Spanish sample for the tourists, and the Galician population for the residents. The percentage of males in the residents' sample is close to 48% and the females are 52%. These percentages are maintained in the tourist group, with 46% males and 54% females. In relation to the Spanish reference population, these percentages differ slightly, because in Spain's case the proportion of

men and women are 49.5 and 50.5 %, respectively. For the total sample, the average age is 42.5 years, a value that is below the Spanish and Galician samples (47.3 and 49.9 years, respectively). Furthermore, we should indicate that the age of tourist is 37.2 years, which is well below of the residents' age, 46.5. This difference could be explained by the fact that the majority of people who visit this NP are young.

Related with the educational levels, we note that the tourists surveyed have a high education level; with 48.9% holding a university degree compared to 22.3% of residents. This rate is even higher than the average value in the Spanish sample, which reaches 24.3%. Moreover, only 6.1% of tourists have primary education or lower, as opposed to 36.4% of residents. On the other hand, the percentages of respondents with secondary school or professional education are practically the same between each of samples.

The results show that the sample of tourist has higher income, since the majority of tourists, 86.6%, have incomes above 19,000€ per year, compared to the 48.72% of residents. This percentage for Spain is 59.3% and for Galicia 56.6%. Also, the tourists' sample differs from the residents' sample in the percentages of incomes lower than 19,000€. This percentage reaches 13.41% as opposed to a 51.3% of residents.

Survey

The survey follows the same structure as previous surveys applied in other areas with slight novelties. The first part of the survey gathers views of respondents on various social problems, following with a question about whether they have previously visited the NP, and in affirmative case, which island, and when. The second part of the survey highlights the impact that the NP has in the area, asking which economic sector is perceived as being most affected by the establishment of the Park, and in what direction. Then, a series of statements about various measures that could be carried out in the NP are presented, asking about the agreement or disagreement with each of them. In the third part of the questionnaire, we offer information about the NP. We show the map presented above (map 1), and ask questions about who are the most favored and

disfavored by the declaration of NP, as well as, the perception of the degree deterioration due to different reasons.

In the fourth part of questionnaire, the main management actions to be applied in the NP are presented to respondents. This description was supported with a card (Appendix). These actions had a hypothetic aspect, considering:

1. Increase of the NP's size (*size*), both marine and terrestrial. One of the debated alternatives is to include two additional islands, the Tambo Island and the Estelas Island. The other alternative is that the expansion, in addition to the islands mentioned above, includes also the Corrubedo Natural Park located in the A Coruña province with an area of 996 hectares.
2. Reduce the number of visitors (*visitors*) by 10% in the Cíes archipelago, by means of applying more control, since the control of the private transportation is quiet difficult.
3. Establishment of smoking areas (*smoke*), because of the increment of visitors in the summer increases the risk of fires by negligence.
4. Periodical actions to avoid or reduce the alien species propagation and specifically the eucalyptus.

Following this information, the different choice experiments were presented (an example is the figure 1) with two alternatives plus the "status quo[2]". Then, different questions about their decision were asked, as well as a group of attitudinal questions that are described in the next section. Finally, the last part of the survey contains some ethics and socio-demographic questions.

Experiment design

From the all-possible combinations of attributes, we obtain seventy-two $\left(3^2 \times 2^3\right)$ possible combinations. The final scenarios were constructed from an orthogonal main effects design, which resulted in thirty-two choices sets[3]. However, this was assumed to

[2] The Status Quo option indicates the current situation, which means to not do anything.
[3] Using SPSS 15.0.

be too large a survey for each individual. Thus the design was blocked into two versions of the questionnaire with eight choices tasks presented to each respondent. This is a typical mechanism to reduce the number of choices (Louveire et al., 2000), and has been previously used in studies such as Adamowicz et al. (1998) or Camarena and Sanjuán (2005). All categorical variables were effects-coded (Hensher et al., 2005).

Empirical specification

The choice experiment method is 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 the levels that these take.

According to this framework, the individual *i*, from choosing an alternative *j*, have a utility function (U) of the form:

$$U_{ij}=V\left(Z_{ij},S_{ij}\right)+\varepsilon_{ij}=\beta X_{ij}+\varepsilon_{ij} \qquad (1)$$

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 scenario alternatives and the social characteristics (S) of the individuals. The second element represents unobservable influences on individual choices and it is independent on the deterministic part.

Thus, the probability that individual *i* chooses alternative *j* from a choice set to any alternative k, can be expressed as the probability that the utility associated with option *j* exceeds that associated with all other options (see equation 2). Assuming that the relationship between utility and attributes is linear in the parameters and variables, and that the error terms are independently and identically distributed with an extreme-value (Weibull distribution), the probability of any particular alternative *j* being chosen as the most preferred selection can be expressed in terms of the logistic distribution.

$$P\left[\left(U_{ij} > U_{ik}\right) \forall j \neq k\right] = P\left[\left(\beta X_{ij} - \beta X_{ik}\right) > \left(\varepsilon_{ij} - \varepsilon_{ik}\right)\right] \quad (2)$$

Conditional logit is commonly used to estimate the choice modeling exercise. An assumption of the conditional logit is the distribution of the error terms, independently and identically distributed (IID). The violations of IID would imply 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 (Alpizar et al., 2001). In order to test for IID/IIA violations, a Hausman-McFadden test was conducted, that basically involves constructing a likelihood ratio test around different versions of the model where choice alternatives are excluded. A χ^2 value of 132.57 was computed for a conditional logit model when the ‘‘Option B’’ alternative was excluded from the choice set. This value exceeds the critical value (11.07 obtained from the Chi-squared table at 5% significance level with 5 degrees of freedom). Therefore, the null hypothesis was rejected, indicating an IIA problem. This approach has been criticized by the limited ability to accommodate heterogeneous preferences (e.g McFadden and Train, 2000).

Given that we are interested in accounting for heterogeneity in preferences of the residents and tourists from the various management options of the NP attributes in function of protest beliefs. According to Swait (1994), heterogeneity can be addressed using latent class approaches or using heterogeneous model estimators like the random coefficient probit and logit models. For this reason, we have used the RPL model (Meijer and Rouwendal, 2000; Revelt and Train, 1998) and the LCM (Boxall and Adamowicz, 2002; Greene and Hensher, 2003). In this work, we try to assess the influence of attitudinal questions that may be behind protest beliefs. The former model allows heterogeneous preferences in the population, by allowing model parameters to vary randomly over individuals. However, as Boxall and Adamowicz (2002) point out, these models are not well suited to explaining the sources of heterogeneity, which are related to the characteristics of individual consumers in many cases. Then, the probability of choice in the RPL model is given by:

$$\mathrm{P}_{ij}\left(j \text{ is chosen} \mid \lambda_i\right) = \frac{\exp\left(\beta X_{ij}\right)}{\sum_k \beta X_{ik}} \tag{3}$$

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 normally distributed mean zero and unit standard deviation. If $\sigma = 0$, then the RPL is equivalent to the conditional logit, and there is no heterogeneity.

The second model, the LCM, involves the characterization of different segments among the population. According to Boxall and Adamowicz (2002) the classification variables influencing segment membership are related to latent general attitudes and perceptions as well as socioeconomic characteristics of the individuals. In this approach, we assume the existence of S segments in a population and that individual *i* belongs to segment s. The utility function can now be expressed as

$$U_{ij|s} = \beta_s X_{ij} + \varepsilon_{ij|s} \tag{4}$$

where β_s is the segment specific vector of coefficients, X_{ij} is the vector of attributes associated with each alternative and $\varepsilon_{ij|s}$ is the random component of utility for each segment. Under the assumption of IID error terms that follow a Type 1 extreme value distribution, and since utility parameters are now segment specific, the equation (3) becomes:

$$\mathrm{Pr}_{ij|s} = \frac{\exp\left(\beta_s X_{ij}\right)}{\sum_k \exp\left(\beta_s X_{ik}\right)} \tag{5}$$

where β_s is a segment-specific utility.

Membership to a specific segment is determined by an unobservable or latent likelihood function *M* that classifies respondents to one of the segments with probability P_{is}. For a specific individual *i*, this function can be described by the following equation:

$$M_{is} = \lambda_s Z_i + \xi_{is} \tag{6}$$

where Z_i is a vector of socio-economic, attitudinal and other observed characteristics of the respondent *i* and segment s, λ_s is a vector of parameters and ξ_{is} is an error term. Assuming that this error term is also IID and follows a type 1 extreme value distribution, the probability that a respondent *i* belongs to segment *s* is given by

$$\Pr_{is} = \frac{\exp\left(\lambda_s Z_i\right)}{\sum_s \exp\left(\lambda_s Z_i\right)} \tag{7}$$

The joint probability that individual *i* belongs to segment *s* and chooses alternative *j* is given by

$$\mathrm{P_{ijs}} = \left(\mathrm{P_{ij/s}}\right) * \left(\mathrm{P_{is}}\right) = \left[\frac{\exp(\beta_s X_{ij})}{\sum_k \exp(\beta_s X_{ik})}\right] * \left[\frac{\exp(\lambda_s Z_i)}{\sum_s \exp(\lambda_s Z_i)}\right] \tag{8}$$

The standard conditional logit is a special case of LCM because the joint probability in equation (4.8) reduces to conditional if $\lambda_s = 0$. In this case, the β_ks.are homogeneous and all individuals share a common utility function (Milton and Scrogin, 2006)

Different authors have pointed out the advantages that LCM has. First, the LCM does not require any specific assumption about the distributions of parameters across individuals (Green and Hensher, 2003). It is a semi-parametric approach, while in the RPL the preference parameters are assumed to have some assumed distribution, usually normal. Second, the LCM indicates the probability of belonging to one class, taking into account that there is uncertainty about a respondent's class membership (Shen and Saijo, 2009).

Protest responses and attitudinal questions

As we have mentioned, the attitudinal questions employed in our survey were presented with the objective to identify potential protest beliefs. Attitudinal questions to investigate protest beliefs have been previously used in some studies (Meyerhoof and Liebe, 2009; Jorgensen et al., 2001), although few are the attempts with LCM and none of them with LCM in CE. Table 2 presents the items used and their assignment to the protest or no protest category.

Once the choice sets were presented to the individuals, the attitudinal questions were asked. The answers were given on a five Likert scale. Also we present a question about the difficulty to answer the choice sets. The agreement with the variable *tootax*, "I pay enough taxes already", indicates that the individual could be classified as protester Furthermore, those respondents that indicate that the government should use the collected funds and not seek other additional contributions, *collectedfunds*, tend to have a protest attitude. The lack of trust in the Government is gathered through the variable *wastemoney*. The protesters are expected to be in agreement with the fact that if the Government would not waste money we might have a better management and control of the NP. Along the same line, we found the variable *objectives*: "I do not believe that the collected money would be used for these objectives". The agreement with this statement could indicate a protest attitude. Moreover, those participants who consider that it is unfair that they have to pay for the maintenance of the NP, *unfair*, are expected to be protesters. In addition, protest responses are expected to agree with the idea that those who enjoy the Park should pay for the measures, *users*, when they are not visitors; and to refuse it in the case that they visit the NP. In our case, as we have two different samples, the sign may vary across them. Finally, related with the attitudinal questions, those individuals who indicate that they cannot afford the payment nowadays, *nafford*, would be classified as non-protest.

Furthermore, we include in our estimation the variable *difficult*, which indicates the degree of difficulty encountered by the respondent to answer the choice sets. Those individuals for whom the answers were more difficult would be those who spent more

time to complete the survey, giving a more accurate response, and showing a non-protester aptitude.

Econometric latent class model

The latent class model with attitudinal questions assumes that individuals with a similar attitude will show response patterns that are highly correlated (Meyerhoff et al., 2009). For this reason, a sample can be divided into a number of classes, each one with a similar response pattern. From the attitudinal variables presented previously, the majority were included in the model through the Z_i vector in equation (8). The X_i vector contained the levels of five attributes associated with the management program of the NP presented in the choice task. The log-likelihood (LL) function for a S-class model is:

$$LL=\sum_{n=1}^{N}\sum_{m}\sum_{j\in C_m}\delta_{nmj}\ln\left[\sum_{s=1}^{S}\left(P_{ij/s}\right)*\left(P_{is}\right)\right] \tag{9}$$

where N refers to the 871 individuals, m represents the 6968 choice sets and δ_{nmj} equals 1 if individual i choose j and 0 otherwise.

Criteria for number of classes

The number of classes, S, is unknown a priori. Previous research has used a number of indicators for choosing the optimal number of groups, recognizing that these indicators are only suggestive (Wedel and Kamakura, 2000), and as Swait (2007) points out, always it is necessary to use common sense and simplicity. In this analysis, the log likelihood, the consistent Akaike information criteria (CAIC), the Bayesian information criteria (BIC) and the Bozdogan Akaike information criteria (AIC3) were used. Comparing these criteria among the different model estimates with a varying number of classes will help us to decide the final number of groups.

The CAIC can be calculated as

$$CAIC = -2LL + \left[1 + Ln\left(N\right)\right]P \quad (10)$$

The formulae of BIC and AIC are respectively,

$$BIC = -2LL + Ln(N)P \quad (11)$$

and

$$AIC3 = -2LL + 3P \quad (12)$$

Table 3 contains the calculations of these criteria as well as for the RPL. As we can see all the statistics indicate that the two-class model is the optimal number of classes.

Results

The estimation results for the LCM and the RPL are presented in tables 4 and 5, respectively. Note that the parameters of attitudinal variables for the second class are equal to 0 due to their normalization during the estimation. Consequently, the probability of belonging to this first class must be described relative to the second class which was denoted as the "protesters" class. The latent class 1 is designed as the "non-protesters". The reason is that for this class, the probability that an individual agrees with the fact that he/she pays too many taxes (*tootax*) decreases. Also, the variable *collectedfunds* is negative and significant, indicating that respondents who agree with the fact that the Government should use the funds that they have and not seek more are less likely to belong to this class. The same sign and significance have the variables *unfair* and *users*. That means that individuals who consider that is unfair to be asked for money to maintain the NP are less likely to belong to class 1. The *users* variable shows that the individuals who consider that only the users should pay are less likely to belong to the first class. Confirming the identification of the different classes, we can observe the sign and significance of the variable *nafford*. The positive sign indicates that those individuals who agree with the fact that they cannot afford the payment nowadays have a higher likelihood to be found in the non-protest class. Lastly, the variable *difficult* has a positive and significant sign. This means that the respondents who point out higher

degrees of difficulty to answer the choice sets, have higher likelihood to be in the non-protester class. As we have mentioned, this can be related to the fact that non-protesters are those who spend more time thinking about their responses, providing a more realistic and informative response.

If we focus in the utility function parameters (β_s), we can note that the parameter associated with the *tax* variable is negative and significant in both classes, being consistent with economic theory. Only, the sign of the attribute *smoke* changes across classes, while in the non-protesters class is positive, for the protesters it is negative. This means that protesters would not agree with creating smoking areas in the NP. Also, we have included some socio-demographic characteristics of the individuals, including the age (*age*) and the fact that previously they visited the NP (*pvisit*) before.

In the case of non-protest responses, only the age for the alternative A and the fact that the respondent has visited the NP for the alternative B are significant. That is, the utility of the individuals in this class increases when their age increases, related to the choice of SQ alternative. Nevertheless, the utility of individuals who visit the park decreases when they choose an alternative different from the SQ. In the protest class, all the coefficients are negative and statistically significant. The older individuals and those that have visited the NP previously have less utility than those that are younger and have never visited the Park. This can be a signal that in the protest class the characteristics of the individuals are more homogeneous with respect the non-protest class. The average class probabilities indicate that 62.3% of the sample are members of the non-protest class and the 36.2% left are part of the protest class.

The RPL results are presented in table 6. The fixed (equal among individuals) variables are *tax* and *visits*, while the other variables were assumed to follow a normal distributed across the sample[4]. The coefficient of *tax* is negative and significant according to the economic theory. The rest of the coefficients are significant and positive, that is, we obtain the same results as for the class protesters. Related to the socio-economic characteristics of the respondents, we observe that, in general, increments in age

[4] We started with a model where all the variables except *tax* were assumed to be normally distributed. However, because the standard deviation of *visitor* was not significant, we estimated a new model with this variable fixed.

decrease the utility of individuals. Also, the fact that the individuals visited the NP previously decreases their utility, although this is only significant for the alternative B.

The results suggest that respondents have positive preferences for the different attributes[5]. However while in the non-protest class of LCM the utility of the respondent increases when a smoking area is created, in the protest class the opposite occurs. It is obvious that the results of the non- protest class are more similar to those obtained by the RPL model. Therefore, including only the estimations of this model without any analysis of protest attitudes could lead to a loss of information about the heterogeneity of preferences, which may be relevant for policy targeting.

Welfare estimations

To see how individuals evaluate the different management alternatives in the AINP, and analyze how protest attitudes influence through monetary values, the willingness to pay values (WTP) were calculated. Respondents' WTP is given by the following equation:

$$\mathrm{WTP}_{\mathrm{attribute/s}} = \frac{\beta_{\mathrm{attribute/s}}}{\beta_{\mathrm{tax/s}}} \tag{13}$$

where $\beta_{attribute/s}$ are the estimated parameters associated with the attributes *size, visits*, *smoke* and *eucalypt* in each class, protester and non-protester, and $\beta_{tax/s}$ for the *tax* attribute in each class. According to Shen and Saijo (2009) because these two coefficients vary across classes, the estimated WTP values could identify heterogeneity among individuals. For the RPL, we have just one estimation for each attribute. Furthermore, the class probability weighted WTP was estimated for the LCM. The WTP weighted equation is:

[5] Following Camarena and Sanjuán (2005) we have estimated the amount level of individuals that prefer each level of attributes. According to the expression:

$$\mathrm{Prob}\left[\beta_{attribute} > 0\right] = \mathrm{Prob}\left[z > \frac{0-\beta_{attribute}}{S_{attribute}}\right] = 1 - \mathrm{Prob}\left[z \le \left(-\frac{0-\beta_{attribute}}{S_{attribute}}\right)\right]$$

The results indicate that 88% of the respondents prefer the creation of smoking areas, whereas 11.9% do not prefer it. Ninety percent prefer the increment of area of NP respectively. Finally, 94% prefer for the control of alien species, specifically actuations with the eucalyptus.

$$WTP_{weighted} = \sum_{s=1}^{2} WTP_{attribute/s} * Prob_s \quad (14)$$

where $Prob_s$ is the probabilities of respondents in class s.

The results are presented in table 6. We observe that the values vary across classes and models. In general, the WTP estimates for the non-protest class and the weighted WTP are, in general, larger than those corresponding values for the RPL. If we focus on the welfare estimations of the different identified classes, we can see that the WTP for non-protest and protest are different, being higher in the first class for all the attributes. That confirms the expected result that protesters usually provide lower WTP values. Related to the RPL results, only the attribute *size* has a higher value comparing with the weighted WTP and the non-protesters' WTP. However, in the case of protest class the estimates are always lower. Therefore, we can conclude, that although the RPL model includes the protest effect in their estimations, we cannot observe explicitly the size of the effect. This problem is solved when we have different classes, because we can distinguish the influence of these different attitudes and preferences and assess their impact on the results.

Moreover, depending on the circunstances of the valuation exercise, the weighted WTP may be an appropriate welfare measure since it takes into account both classes of respondents and their preferences. With this measure we take into account the protest beliefs not through an arbitrary identification. Classical approaches have dropped the sample of protests from estimations usually by ad hoc criterion, with some consequences such as elimination of part of the sample and even the information loss. This methodology allows us to maintain the entire sample, but considering the fact that part of it may have a different attitude towards the good, towards the mechanism to be evaluated or even towards the Government.

Conclusions

In this chapter we have used attitudinal questions to identify protests and non-protests among the residents and tourists in the AINP. We have presented the individuals different alternatives of management. The attributes include the possibility of reducing the number of visits, the control of alien species, the creation of smoking areas and the increment of the size of the NP. We have estimated a LCM and a RPL model. Both models offer alternative ways of capturing unobserved heterogeneity (Green and Hensher, 2003). However, in our empirical application, and our objective being to explain part of the heterogeneity through the protest behavior of respondents, the LCM appears to be more appropriate. Using attitudinal questions about taxes, the use of existing funds, or the impossibility to afford nowadays a payment, among others, allowed us to identify heterogeneity preferences between the two different classes, called protest and non-protests.

The LCM, which provides a much richer interpretation of the behavior of individuals to the management actions, indicates that the protest responses provide in general lower WTP estimates. The RPL results show the existence of heterogeneity in the sample. Moreover, the welfare estimations are lower than those from the non-protest class, and higher than the protest one.

The majority of the empirical applications in valuation only represent the preferences of individuals classified as being non-protest responses. Compared to the class identified as non-protest in the LCM, the weighted WTP allows us to present a unique measure that takes into account the preferences of all individuals, protest and non-protest respondents. Also, another advantage is linked to the fact that this identification was made without the application of arbitrary rules, because the answers of respondents to the attitudinal questions are the elements that determinate the weight of protesters' preferences.

As we have mentioned, there are few empirical analyses of protest responses in CE results. The majority of the analyses and studies were conducted with the CV method. In the previous chapter 3, we have applied the traditional way of identifying protests in

CV to CE. Following this line, we applied a LCM to the protest problem in CE. To our knowledge this is the first application in CE, while overall little has been done previously in other stated preferences methods. Based on the obtained results, we consider that this approach can be an alternative to more traditional ad-hoc ways to identify and treat protesters.

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Annex 1 Figures

Figure 1: Example of choice experiment presented in the survey

	Option A	**Option B**	**Status Quo**
Increase of the Atlantic Island National Park's size	 1024 ha	 1024 ha	0 ha
Decrease the number of visitors in Cíes in a 10% and increase the control in others islands.	✗ NO	✓ YES	✗ NO
Establishment of smoking areas and avoid the fire risk.	✓ YESI	✗ NO	✗ NO
Periodical actuations to control the Eucalyptus, alien species that causes the loss of biodiversity	✗ NO	✓ YES	✗ NO
Punctual tax (€)	**15€**	**30€**	**0€**
Choose (please, choose the preferred)			
Rank from high to low your preference			

Table 1: Socio-economic characteristics of samples

Socio-economic characteristics	Total sample	Reference sample (Spain)	Reference sample (Galicia)	Tourists	Residents
Age average	43	47	50	37	47
Studies					
Primary school or lower	21	32	42	6	36
Secondary School and Trainer Formation	43	44	36	45	41
Higher Education	36	24	22	49	22
Gender					
Male	47	59	48	46	48
Female	53	51	52	54	52
Household Annual Income					
≤9000 Euros	4	13	15	1	7
9000 - 14000 Euros	13	14	14	5	22
14000 - 19000 Euros	16	15	15	8	23
19000 - 25000 Euros	29	16	16	25	33
25000 - 35000 Euros	21	20	21	28	14
>35.000 Euros	18	24	20	34	2
Number of respondents	871			440	431

Table 2: Attitudinal questions and difficulty of choices sets to identify protesters and non-protesters

Variable	Affirmations	Protest Attitude
	Attitudinal Questions[6]	
tootax	I pay too many taxes already	Agree
collectedfunds	The government should use the collected funds and not seek other contributions	Agree
wastemoney	If the Government did not waste the money, we could have a better management and control of the National Park.	Agree
unfair	It is unfair asking for money to maintain the National Park	Agree
users	Those who enjoy the Park should pay for the measures	Agree or disagree
objectives	I do not believe that the collected money was used for these objectives	Agree
nAfford	I cannot afford the payment nowadays	Disagree
	Respondents' Understanding[7]	
difficult	Indicate the degree of difficulty to answer the previous choice experiments about the different management alternatives in the National Park Atlantic Islands.	Agree or disagree

Table 3: Information criterions for different number of classes

Number of classes	Number of parameters (P)	Log Likelihood (LL)	CAIC	BIC	AIC3
2	27	-5593.87	11453	11426	11269
3	45	-6117.064	12677	12632	12369
RPL model	13	-6324.38	12777	12764	12688

[6] Completely Agree, Agree, Neither Disagree nor Agree, Disagree, Completely Disagree.
[7] A scale from 1 to 10, with 1= nothing difficult and 10=extremely difficult.

Table 4: Latent class model

	Latent class 1 Non protest class		Latent class 2 Protest class	
Attribute	**Coefficient (Std. Err.)**	**Z**	**Coefficient (Std. Err.)**	**Z**
Size	0.170 (0.012)	14.297***	0.008 (0.004)	2.088**
Visits	1.048 (0.109)	9.577***	0.114 (0.031)	3.633***
Smoke	0.695 (0.063)	10.954***	-0.099 (0.032)	-3.085***
Eucalyptus	0.675 (0.030)	22.496***	0.345 (0.032)	10.711***
Tax	-0.011 (0.003)	-3.574***	-0.012 (0.002)	-5.731***
Pvisit (A)	-0.186 (0.129)	-1.442	-0.192 (0.047)	-4.052***
Age (A)	0.024 (0.005)	4.747***	-0.040 (0.002)	-19.756***
Pvisit (B)	-0.265 (0.133)	-1.993**	-0.172 (0.047)	-3.694***
Age (B)	0.002 (0.005)	0.363	-0.040 (0.002)	-18.936***
	Theta(1) in class probability model		***Theta(2) in class probability model***	
Constant	6.445 (0.406)	15.879***	0	(Fixed Parameter)
Tootax	-0.562 (0.076)	-7.378***	0	(Fixed Parameter)
Collectedfunds	-0.440 (0.074)	-5.952***	0	(Fixed Parameter)
Wastemoney	-0.111 (0.073)	-1.528	0	(Fixed Parameter)
Unfair	-0.971 (0.049)	-19.985***	0	(Fixed Parameter)
Users	-0.002 (0.001)	-3.141***	0	(Fixed Parameter)
Objectives	-0.001 (0.001)	-1.196	0	(Fixed Parameter)
Nafford	0.213 (0.045)	4.706***	0	(Fixed Parameter)
Difficult	0.219	11.129***	0	(Fixed

	(0.020)		Parameter)
Average class probabilities	0.623		0.362
Log-likelihood		-5593.87	
AIC		1.6375	
BIC		1.6644	
McFadden Pseudo R-squared		0.26	
Number of observations		6865	

***, **, * = coefficients significantly different from zero at 0.1%; 1%; and 10% significance level.

Variable Definition:	
Pvisit	=1 if previously had visited the National Park; =0 otherwise
Age	Age of respondents

Table 5: Random parameter logit model

Attribute	Coefficient (Std. Err.)	Z
Random parameters in utility functions		
Size	0.648 (0.032)	19.952***
Smoke	0.422 (0.089)	4.755***
Eucalyptus	1.899 (0.088)	21.628***
Non random parameters in utility functions		
Visits	1.281 (0.106)	12.090***
Tax	-0.053 (0.007)	-7.476***
Pvisit (A)	-0.337 (0.122)	-2.768***
Age (A)	-0.075 (0.005)	-16.180***
Pvisit (B)	-0.336 (0.088)	-3.817***
Age (B)	-0.052 (0.005)	-10.970***
Derived standard deviations of parameter distributions		
Size	2.079 (0.073)	28.643***
Smoke	2.365 (0.372)	6.362***
Eucalyptus	3.274 (0.451)	7.264***
Log-likelihood	-6316.743	
AIC	1.844	
BIC	1.856	
Pseudo R^2	0.16	
Chi-squared	2450.46	
p-value	0.000	

Nº observations	6865

***, **, * = coefficients significantly different from zero at 0.1%; 1%; and 10% significance level.

Variable Definition:	
Pvisit	=1 if previously had visited the National Park; =0 otherwise
Age	Age of respondents

Table.6: Welfare estimations of LCM and RPL

	LCM		**RPL**
	WTP (95% C.I.)	**WTP weighted (95% C.I.)**	**WTP (95% C.I.)**
	Non-protest		
Size	15.80 (-3.26, 34.87)	10.08 (-2.11, 22.64)	12.31 (5.38,19.25)
Visits	195.14 (185.52, 204.76)	128.69 (124.45, 137.18)	48.68 (46.87,50.49)
Smoke	129.42 (121.86, 136.99)	74.47 (71.15, 81.28)	16.06 (14.97,17.14)
Eucalypt	125.68 (115.59, 135.76)	99.79 (93.73, 107.55)	72.19 (67.74,76.63)
	Protest		
Size	0.66 (-0.11, 1.43)		
Visits	19.66 (18.94, 20.39)		
Smoke	-17.01 (-17.75, -16.26)		
Eucalypt	59.37 (57.92, 60.81)		

* Confidence intervals have been calculated employing the delta method