Are models and respondents talking the same language: evidence from stated and inferred discontinuous preferences in a choice experiment valuing Public Goods?

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1. Abstract

In the choice experiment framework, it is assumed that respondents consider all the attributes when making their choices. However, there is evidence that respondents may not consider all the attributes. This study has proved that in our Choice Experiment survey evaluating public goods, there is significant correlation between the stated preferences declared in a continuous scale by the respondents and the parameter estimates inferred from the models. The correlation has been tested for the coefficient of variation estimated in a Random Parameter Logit and the probability of ignoring derived from a 2^K latent class model.

2. Introduction

Choice Experiments (CE) are one of the most commonly used stated preferences methods in the literature

In the CE application it is assumed a number of axioms, among them one important one is the Continuity axiom that it is based in the standard neoclassical consumer theory. This axiom assumes unlimited substitutability amongst attributes and implies passive bounded rationality, whereby individuals consider all of the available information uniformly before making trade-offs between the attributes used to describe the alternatives (Puckett and Hensher, 2008). However, many studies have identified that respondents do not considered all attributes, therefore ignoring discontinuous preferences could result in a biased estimation of the respondents utility (e.g. Hensher et al., 2005; Campbell y Lorimer, 2009; Campbell et al., 2008; Scarpa et al., 2009; Carlsson et al., 2010).

One non-compensatory decision process is lexicographic preference ordering, which can be strict or modified (Rosenberger et al. 2003). Strict procedures refer to the situation in which certain goods (or attributes in the case of the choice experiment) are always prioritized over other goods, that is, certain attributes are ignored in the choice experiment. Modified lexicographic preferences mean that the respondent either imposes thresholds on attribute levels or assigns a condition to one attribute on the level of another attribute (see, e.g., Swait 2001, Hensher et al. 2005).

The suggested reasons for preference discontinuity include: 1) actual preference structure, that is, some attributes are not behaviorally relevant for the respondent; 2) use of a simplifying strategy to manage the cognitive burden in a complex choice situation and 3) ethical reasoning, that is some respondents refuse to trade money and environmental attributes.

Welfare estimates are likely to be biased under modelling specifications that do not consider the violations of the continuity axiom. Indeed, growing evidence strongly advocates the use of models which have the capacity to accommodate violations of the continuity axiom and limit potential bias which could lead to subsequent inaccurate
policy implications (Puckett and Hensher, 2008).

From the data, the discontinuous preference structure can be identified based on debriefing questions from the survey (e.g. Hensher et al., 2005; Campbell et al., 2008), or by identifying actual choice behavior (e.g., Lockwood 1999, Hess and Hensher, 2010; Scarpa et al., 2009).

Once identified, the attribute can be either removed from the utility function (Hensher et al., 2005b) or taken into account parametrically by adjusting the statistical model. These statistical ways include: introducing a scale parameter in an error component logit model to reveal difference in variance (Campbell et al., 2008), introducing the attribute processing strategy as heterogeneity in the mean of a random parameter (Hensher et al., 2007).

However, it has been shown by a number of authors (e.g. Hess and Rose, 2007; Hess and Hensher, 2010) that there is no one-to-one correspondence between stated processing strategies and actual (i.e revealed) processing strategies (Hess and Hensher, 2012).
In fact in the research by Hess and Hensher it is stated that in fact respondents who indicate that they did not attend to a given attribute simply assigned it lower importance, and that the probability of indicating that they ignored a given attribute increases as the perceived importance of that attribute is reduced (Hess and Hensher, 2012). As a conclusion it is depicted that the respondent stated attribute non-attendance should be considered simply a function of the respondent specific perceived attribute importance. Following the line of research of Hess and Hensher (2012), the contribution of this study is that to the best of our knowledge it is the first time that instead of asking respondent to state whether they have ignored/considered one attribute, the question was to indicate in a continuous scale the importance of each attribute. This information has been used to compare the stated attribute importance with the parameter estimates derived from a Random Parameter Logit Model and with the probability of belonging to each of the classes in a 2^K latent class model (the classes reflecting the probability of ignoring). This specification will be further described in section 3.

The structure of the paper is as follows. In the next section, it is described the Choice Experiment methodology to evaluate Public Goods and Agricultural Externalities (PGaE). In section 3, there is a description of the methodology applied in the study to evaluate discontinuous preferences. In section 4, the results are presented and the paper ends with a discussion that highlights the main results and further potential avenues for research.

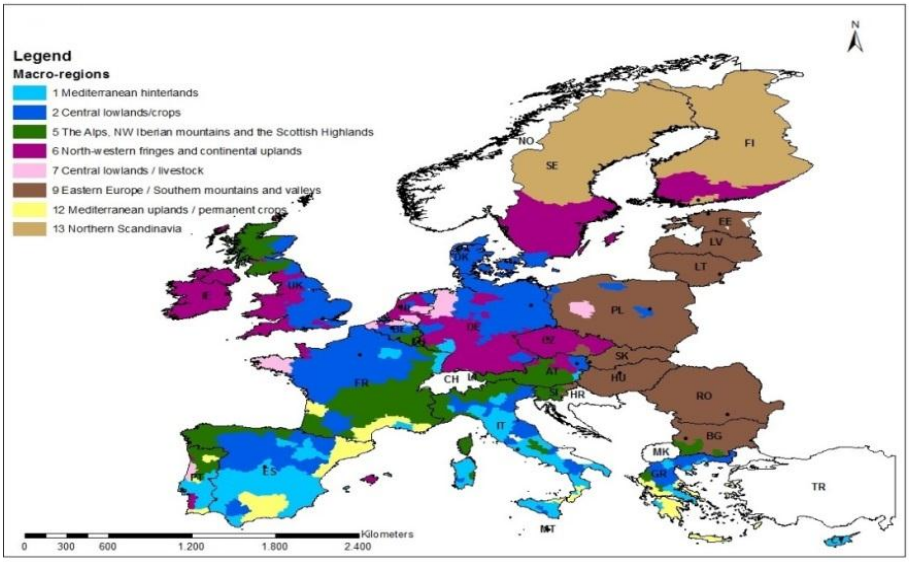
3. Description of the choice experiment setting to value EU Public Goods

3.1 Description of the Evaluation Framework to value PGaE in EU

The database in which the study is based corresponds to a case study test of an empirically based framework to value Public Goods and Externalities (PGaE) of the European Union Agriculture.
Agricultural landscapes deliver multiple, highly valued goods and services such as cultural amenities, biodiversity conservation and climate stability. Public goods and externalities (PGaE) of agriculture are often delivered as side-effects of farmers' production decisions, which are driven at broad supranational scales by changes in agricultural and trade policies. Human well-being is thus affected by these policies in ways that are usually not accounted for in policy decisions, which creates a demand for the economic valuation of changes in multiple PGaE of agriculture at broad, supranational scales.
To address this demand, there is a need for valuation exercises that are empirically-based, policy-relevant and understandable by the general public in different countries; there is also a need for context-rich scenarios inviting respondents to actually engage in the economic trade-offs that are required for valid valuation.
Public goods and externalities (PGaE) of EU agriculture include landscape, cultural heritage, farmland biodiversity, air, soil and water quality, climate stability, and resilience to fire and flooding. When we look at them from the demand-side, the entire European population is the potential beneficiary of positive changes in the provision level of these PGaE.
Changes in multiple of these PGaE are framed within specific Macro-Regional Agri-Environmental Problems (MRAEP), which aim at providing respondents with context-rich valuation scenarios at a broad, macro-regional scale. Each MRAEP is characterized by: (1) the particular farming systems and agricultural landscape(s) prevailing in a specific macro-region (MR), that is: the relevant agro-ecological infrastructure; (2) the bundle of PGaEs

currently delivered by that agro-ecological infrastructure; (3) an expected direction of future change in land use, e.g. farmland abandonment or agricultural intensification; and (4) the expected effects of such change on the delivery of PGaE in that MR.
A total of seven macro-regions were considered (see Figure 1), while each one might encompass more than one MRAEP.

Figure 1 - Macro-regions adopted for choice scenarios (Source: Madureira and Santos, 2013).



3.2 Description of the Pilot Survey attributes

The pilot for the EU large-scale survey was designed and implemented to the MRAEP "farmland abandonment" in the macro-region "Mediterranean uplands/permanent crops", hereby referred by the valuation problem "farmland abandonment in the Mediterranean uplands". In this dry and hilly area the abandonment of the agricultural activity is a tendency that is expected dramatically to accentuate in policy-off scenarios, hence increasing the fire risk and soil erosion which are two relevant negative externalities coupled with this MRAEP. Hence, in this case the public-good payments policy would be effective in preventing the expected negative effects of this core dynamic trend on relevant PGaE, which include fire risk and soil erosion, but also cultural landscape and farmland biodiversity (assuming that those would also experience significant losses in the policy-off scenarios). The questionnaire was tested in Portugal and Germany, allowing to test non-resident preferences.
The public goods attributes to prevent the "farmland abandonment in the Mediterranean uplands" are described on Table 1.

Table 1 – PGaE attributes

PGaE	Commitments for farmers	Benefits for society
Landscape (LAN) (cultural services)	Keep the traditional crops in production; Adopt an environmentally friendly farming style	Conservation of cultural heritage; High quality foods; Traditional landscape available for recreation purposes.
Biodiversity (BIO)	Conserve the habitats of threatened animal and plant species; Adopt an environmentally friendly farming style.	Knowing that threatened fauna and flora are preserved; Using these wildlife-rich areas for recreation.

Soil erosion (ERO)	Maintaining terraces in high slopes; Keeping the soil covered with vegetation and avoiding soil ploughing.	Ensuring soil fertility and soil capacity to support the landscape and biodiversity.
Resilience to fire (FIRE)	Cleaning scrub growth; Keeping the farmed elements in the landscape mosaic to create barriers to fire progression.	Avoid damage to people and goods; Avoid air pollution and the emission of greenhouse gases.

Source: Madureira and Santos, 2013

The payment vehicle was defined as a tax increase, generally described. It was told to the respondents that the implementation of the programmes and the supply of the public goods entailed a cost for their households in the form of a tax increase, which could be an increase in income tax and/or the creation of indirect taxes, over products or visitants. This overall tax increase over individual income has been used by other authors (e.g. Colombo and Hanley, 2008).

The tax increase was specified as an annual pre-defined amount to be paid by the household during a period of five years. Such time period was chosen to match the duration of payments to farmers, ensured by five-year contracts. Several authors valuing multiple PGaE (e.g. Takastuka et al., 2006, Wang et al., 2007, Baskaran et al., 2009; Borresh et al., 2009) had also opted for this time span for the price attribute, building on the supply-side contracts duration.

The levels of the environmental attributes were set as the % of benefited area by the public good programme. Hence, people could choose to prevent the reduction in the current level of provision of each PG in the entire area or only in 50% of it or choose the policy-off scenario in which the benefited area was set to 0%.

The levels for the price attribute were firstly established with an ad hoc procedure, using as guideline a very rough estimate of the average amount the EU taxpayers currently pay to fund the CAP, which is around 40 euros per household[1]. This amount was settled as the maximum bid for the set of bids tested in the pre-test survey. A bid set (2, 5, 10, 20 and 40 euros) was tested in the pre-test survey. Final bid set was adjusted according to the WTP for the different attributes obtained in the pre-test survey, and consisted on the price vector: 3, 12, 21 and 39 euros.

The validation, at the demand-side, of the choice context defined on the supply-side was undertaken through two focus groups, joining for group discussions, resident persons in the macro-region Mediterranean Uplands (while only Portuguese).

3.3 Survey experimental design and implementation

Experimental design techniques were used, because the combination of the four non-monetary attributes with three levels together with the four levels for the price originated 256 possible choice alternatives and 4096 possible choice sets. An efficient design was adopted (see e.g. Hensher et al., 2005; Rose and Bliemer, 2009). Efficient designs aim to minimise standard errors of parameter estimates. To get this aim, prior information on the estimates for the attribute's coefficients are needed.

[1] CAP expenditure was at around 50 billion Euro in 2010 (see e.g. http://ec.europa.eu/agriculture/cap-post-2013/graphs/graph1_en.pdf). With 500 million inhabitants in the EU27, this makes around 100 Euros per capita for the overall CAP expenditure. To translate this to a per household expenditure, we took an average household for our expected survey of a little more than 2 individuals per household, which established our rough estimate at around 40 Euros per household.

To the pre-test survey an efficient design was obtained with Ngene software (version 1.1.1). It was assumed a MNL model specification, assuming zeros as priors of the estimates of the PGaE coefficients. The experimental design finally selected, build on the priors obtained with the pre-test data, comprised 20 choice sets, which were randomly assigned to four blocks of five choice sets. Consequently, experimental design options entailed four questionnaire versions, each presenting five choice situations to each respondent.
Pilot survey was conducted to the three samples, .900 valid interviews were obtained (300 for each of the sub-sample), and three datasets were obtained: (1) Portuguese resident in Lisbon conurbation area with CAPI (Computer-Assisted Personal Interviewing) face-to-face survey (F2F_PT); (2) Portuguese, national sample, with CAWI (Computer-Assisted Web Interviewing) panel-based (WEB_PT); (3) German, national sample, with CAWI panel-based (WEB_DE).
The questionnaire encompassed three components. Firstly a small set of questions addressing the familiarity and experience of the respondent with the Mediterranean uplands macro-region, including the viewing of a map showing its delimitation and revealing well-known places of it. The second part of the questionnaire comprised the choice-experiment and follow-up questions. Finally, the questionnaire collected the socioeconomic data.

4. Description of the methodology applied in the study to evaluate discontinuous preferences

The Random Parameter Logit (RPL) formulation is fast becoming one of the most widely used econometric structures for the analysis of Choice Experiments. This approach allows parameters to vary across respondents, flexible substitution patterns and correlation with unobserved factors (Train, 2003).
In this model, the utility function associated with each of the alternatives can be expressed as follows:

$$U_{ALTA} = \beta' \chi + \varepsilon$$
$$U_{ALTB} = \beta' \chi + \varepsilon$$
$$U_{SQ} = ASC_{SQ} + \beta' \chi + \varepsilon$$

where ASC_{SQ} is the alternative specific constant for the status quo choice, χ is a vector representing the attributes . The vector of coefficients (β) reflects individual preferences and as these are allowed to vary across individuals it is randomly distributed in the population following a density function $f(\beta n|\theta)$, where θ represents the distribution parameters β. All random error terms (ε) follow a gumbel distribution and have been assumed constant among the different choices made by each individual. Thus, choices are modelled following a panel structure.
The integral of the probability is the product of logistic formulae (Train, 2003) and thus the joint probability that individual *n* chooses alternative *i* in each of the T choices can be expressed as:

$$P(t(n)) = \int \prod_t^T \frac{\exp(\lambda \beta_n' \chi_{ti})}{\sum_{JCA} (\lambda \beta_n' \chi_{ti}} f(\beta|\theta) d\beta \varphi(0, \sigma^2)$$

where t = {ALT_A, ALT_B, SQ} is the choice set, λ is a scale parameter, $f(\beta|\theta)$ is the density of the attributes random parameters.

This equation cannot be evaluated analytically because the choice probability does not have a closed form. Hence, it is approximated using simulation methods, in our case using 1,000 Halton draws. All attributes are assumed to follow a Normal distribution.
After estimation, it is possible to obtain more information on the likely values of for individual respondents by conditioning on the observed choices for specific individuals obtaining the conditional distribution of the parameter for each respondent.
To incorporate the uncertainty in the conditional distributions, Hess and Hensher (2010) have put forward the idea of working with the coefficient of variation, .i.e the ratio between the standard deviation and the mean conditional distribution. In their analysis, the threshold to allocate respondents between was set to 2^2.
In our analysis we have determined if there is a correlation between the stated importance attribute, the conditional β estimates and the coefficient of variation. It is expected a positive correlation among the stated importance and the β estimates and negative correlation with the coefficient of variation.
The second model estimation corresponds to a 2^k Latent model (Hess et al., 2011). The reference latent class specification relies, on 2^K different classes, where K is the number of attributes in the model. Each of the 2^K different classes makes use of a different combination of estimated coefficients and coefficients fixed to zero.
Crucially, a given coefficient will take the same value in all classes where that attribute is included, thus not allowing for additional random heterogeneity.
In mathematical terms, we make use of a vector β containing a separate element for each of the K attributes. In addition, we have a SxK matrix Δ, in which each row contains a different combination of 0 and 1 elements, where $S = 2^K$. Next, let A º B be the element-by-element product of two equally sized vectors A and B, yielding a vector C of the same size, where the kth element of C is obtained by multiplying the k^{th} element of A with the k^{th} element of B. Using this notation, the specific values used for the taste coefficients in class s are then given by the vector $\beta_s=\beta$ º Δ_s.
The likelihood of the observed sequence of T choices for respondent *n*, say y_n, is given by:

$$L(y_n|\beta,n) = \sum_{s=1}^{S} \pi_S \prod_{t=1}^{T} P(i_{nt}^* | \beta_s = \beta \text{ º } \Delta s)$$

where i_{nt}^* is the alternative chosen by respondent n in choice task *t*. With $\beta_s=\beta$ º Δ_s where Δ is fixed a priori, we need to estimate the vector β as well as $\pi = (\pi_1,\ldots, \pi_s)$, the vector of probabilities for the S different classes.

The RPL and the 2^k model has been estimated with NLOGIT5 . [3] In the analysis, it has been assessed if there is correlation between the probability of ignoring each of the attributes determined by the posterior class probabilities of each respondent and the stated preference as well as the inferred estimated in the RPL previously described.

5. Results and analysis

[2] As described in their paper: "The choice of a value of 2 is a rather arbitrary but conservative threshold, and more work is required to evaluate the impact of the threshold choice on results.

[3] The maximum number of classes that can be specified in NLOGIT5 are 16 classes, therefore corresponding to the combination of ignoring 4 attributes. As in the study, we have 5 attributes. The model results corresponds to the average of the five models (in each one leaving out one attribute from the sets of ignoring one attribute).

5.1. Respondent stated importance of the attributes

In Table 2 is presented the stated importance of each of the Public Goods attributes for each of the samples (F2F_PT, WEB_PT, WEB_DE).

Table 2 – Descriptive statistics of the stated importance for each of the attributes and the sub-samples.

SAMPLE		I_LAN	I_BIO	I_ERO	I_FIRE	I_TAX
F2F_PT	Mean	1.53	1.41	1.59	1.23	2.48
	N	299	298	297	299	287
	Std. Dev.	0.57	0.54	0.59	0.430	1.01
WEB_PT	Mean	2.19	2.04	2.33	2.00	2.50
	N	295	295	295	294	282
	Std. Deviation	0.99	1.12	1.01	1.14	1.05
WEB_DE	Mean	1.78	1.66	2.27	2.25	2.81
	N	287	286	285	285	257
	Std. Deviation	0.88	0.87	0.95	0.99	0.99
Total	Mean	1.83	1.70	2.06	1.82	2.59
	N	881	879	877	878	826
	Std. Deviation	0.88	0.92	0.93	1.00	1.03

LAN= Landscape, BIO=Biodiversity, ERO=Erosion, Fire=Fire, Tax=Payment attribute.

The scale of the parameters is reflected in a decreasing scale from 1 to 4 (1=very important, 2=important, 3=little important, 4=not important).

It is interesting to show that the attribute stated that was less important was the payment attribute. This finding is not in line with other research in which the payment attribute was the less ignored attribute (Kosenius, 2010; Hess and Hensher, 2010). However, it is important to stress that while in the previous studies it was asked as ignored/not ignored in our case it was stated as a continuous scale. Therefore further research is needed in the respondent processing rules (heuristics) when stating the answer in a continuous or binary scale.

It has been tested if there are differences in the mean of the three sub-samples as well as in the two survey modes (CAPI and CAWI) and in the two countries (based on a t-test for equality of means with a 5% confidence interval). Results show that there are significant differences, except in the case of the importance of landscape and biodiversity in both countries, the erosion attribute between WEB_PT and WEB_DE and in the Portuguese population among the two survey modes in the evaluation of the importance of the Tax attribute. Regarding the mean differences, it can be stated that in the CAPI survey the attributes are more valued, which can be justified by the fact that the presence of the interviewer is conveying to respondents the importance of the attributes. The erosion, fire and tax attribute are more valued by the Portuguese population. This difference may be explained by the fact that portuguese population are more aware and have a use value derived by the

problems associated with these environmental attributes and related to the tax attribute the economic crisis is affecting more Portugal. On the other hand, comparing WEB_PT and WEB_DE, German population valued more the landscape and the biodiversity attribute.
All the correlations (based on the Spearman statistics) among the environmental attributes[4] are always significant (at the 1% level) and in the case of the monetary attribute is correlated with the biodiversity and erosion attribute.

5.2 Inferred importance of the attributes based on the RPL and the 2K latent model

In Table 3 are presented the correlation (based on the Spearman correlation coefficient) among the model estimates in the RPL, the 2^k model and the respondent stated importance.

In particular as an example for the landscape attribute the following parameters are considered.

I_LAN= Stated importance of the attribute (scale 1-4 decreasing order of importance)
B_LAN= Conditional β estimate (in absolute value) derived from the RPL model.
SD_LAN=Conditional standard deviation (sd) derived from the RPL model.
CV_LAN: Coefficient of variation (sd/ β in absolute value) derived from the RPL model.
PRO_LAN: Probability of ignoring the attribute derived from the 2^k models (0-1).

The model results are not presented in the paper as the aim is to compare the inferred and stated attribute importance and therefore other evaluation of the model estimates (e.g Willingness to Pay) are not relevant.[5]

Table 3 – Spearman coefficient correlation between the stated and the inferred parameters for each attribute.

	SD_LAN	B_LAN	CV_LAN	PRO_LAN
I_LAN	.062	-.220**	.220**	.105**
SD_LAN		-.072*	.206**	-.130**
B_LAN			-.985**	-.695**
CV_LAN				.659**
PRO_LAN				
	SD_BIO	B_BIO	CV_BIO	PRO_BIO
I_BIO	-.072*	-.196**	.195**	.094*
SD_BIO		.364**	-.225**	-.241**
B_BIO			-.985**	-.683**
CV_BIO				.671**
PRO_BIO				
	SD_ERO	B_ERO	CV_ERO	PRO_ERO
I_ERO	.014	-.137**	.134**	.039
SD_ERO		.019	.099**	-.186**
B_ERO			-.989**	-.445**

[4] The correlations have not been included in the paper, however are available contacting the authors.
[5] The interested reader can have access to the model results contacting the authors.

CV_EROS				.420**
PRO_ERO				
	SD_FIRE	B_FIRE	CV_FIRE	PRO_FIRE
I_FIRE	.023	-.245**	.250**	.190**
SD_FIRE		.172**	.014	.076
B_FIRE			-.974**	-.790**
CV_FIRE				.808**
PRO_FIRE				
	SD_TAX	B_TAX	CV_TAX	PRO_TAX
I_TAX	-.060	-.037	.033	-.032
SD_TAX		.272**	-.110**	-.135**
B_TAX			-.981**	-.513**
CV_TAX				.523**
PRO_TAX				

* Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

If the threshold of two of the coefficient of variation (Hess and Hensher, 2010) is considered in order to discriminate between respondent ignoring/not ignoring one attribute, the following results are obtained: 17.6%, 19%, 21.6%, 28%, 31.8% of the respondents are ignoring respectively the biodiversity, fire, landscape, erosion and bid attributes. These values are on average higher than the ones obtained by Hess and Hensher (2010).

However, the ranking of the attributes is very similar than the one reflected in the stated preference (FIR>BIO>LAN>EROS>TAX-Table 2), therefore supporting the fact that there is correlation among the stated and inferred importance of the attributes. The order of the absolute value of the coefficient of correlation (between inferred and the probability of ignoring) is as follows: FIR>LAN>BIO>TAX>EROS, while in the case of the relationship between stated and the beta estimates in the RPL is FIR>LAN>BIO>EROS>TAX. Therefore, it can be seen a pattern as the environmental attributes that a direct impact in the utility function of the respondents exhibit a higher consistency between inferred and stated. On the other hand, the environmental attributes in which the impact for the respondent is not so direct (i.e EROS and BIO) exhibit a lower consistency.

When comparing the results of the stated preferences with the parameter estimates, it can be observed that for all the environmental attributes[6], there is a significant negative correlation with the absolute parameter estimates, and a positive correlation with the coefficient of variation (derived from the RPL) and the probability of ignoring (derived from the 2^K latent model). As the stated preference is expressed in an inverse scale, the results are online with the expectations, therefore indicating that respondents declaring a higher importance in one attribute, have a higher value in the beta estimates, a lower coefficient of variation and a lower probability of ignoring the attribute. On the other hand, there is no correlation among the declaration stated and the inferred parameter estimates for the payment attribute.

[6] This is true for all the environmental attributes, except in the case of the probability of ignoring in the ERO attribute.

In addition, it is interesting to compare the results derived from the parameter estimated in the two models. In particular, there is a significant negative correlation between the absolute β estimates, the standard deviation, the coefficient of variation and the probability of ignoring for all the environmental attributes[7] and the payment attribute. In addition, it is confirmed that for all the attributes there is a positive significant correlation between the probability of ignoring and the coefficient of variation. Therefore, confirming the fact that the two models give similar results regarding the inferred importance of each attribute.

6. Discussion and further research

Most of the research that is based on the respondent reported information relating to non-attendance is based on binary answers on whether the attribute has been considered or not when making their choices. However, there is evidence that there is no one-to-one correspondence between stated and actual (revealed) processing strategies. In fact, respondents declaring that they have ignored one attribute, often still show a non-zero sensitivity to that attribute, albeit one that is (potentially substantially) lower than that for the remainder of the population (Hess et al., 2011). The novelty of this research is that the stated preferences are based on an ordinal scale (and not a dichotomous choice). This information has been contrasted with two approaches to infer the importance of each attribute through a posteriori analysis that conditions on observed behavior based on a Random Parameter Logit (RPL) model and a 2^k latent class model.
Results show that there is a significant correlation between the stated importance of each attribute and the models results for the environmental attributes. In particular, there is positive correlation between the stated importance and the parameter estimates and a negative correlation with the coefficient of variation and the probability of ignoring. This relation does not hold for the payment attribute and therefore it should be further analyzed that (contrary to previous studies), the payment attribute is the less important in the stated and inferred analysis. One warning derived from the results is that the Spearman coefficient has a low value in the correlations between the stated importance and the model results (always below 0.2 in absolute value), therefore indicating that the relationship between them is weak. On the other hand the parameter estimation between the probability of ignoring derived from the 2k model and the beta estimates derived are stronger (always higher than 0.4 in absolute value).
Therefore the stated preference responses should be taken with caution if considered in the model estimation, as they will affect the results estimates (e.g willingness to pay of the attributes) and in some cases it may not reflect the real behaviour of respondents.

More work remains to be done, including refining the conditioning approach and defining a less arbitrary way or allocating respondents to the different groups. Testing the results based on other econometric model definitions like introducing scale parameters in an error component logit model to reveal differences in variance (Campbell *et al.*, 2008) or considered the heterogeneity in the mean based on the declared importance of the attribute (Espinosa and Barreiro, 2010) or the combined latent class mixed logit model which allows jointly for attribute non-attendance and for continuous taste heterogeneity (Hess et al., 2011). However, apart from the issue on how to accommodate the importance of each attribute on the model results, it is important to assess how the model specifications are affecting the model results, in particular the more important statistics for policy makers that are the estimations of the Willingness to Pay.

[7] Except in the case of the standard deviation in the ERO attribute.

In addition the factors influencing the stated preference could be analysed in order to have more insights on why non-attendance occurs.

Another venue for further research, however another interview has to be conducted, is to compare the current results derived from asking respondents after all the choice tasks (serial non-attendance) with the results derived from asking respondents after each choice task (choice-task non-attendance).

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