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Estimating Willingness to Pay for Alpine Pastures: A Discrete Choice Experiment Accounting for Attribute Non-Attendance

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Abstract: Alpine pastures generate important ecosystem services, some closely related to the environment, others to historical and cultural aspects. The economic valuation of these services helps their recognition in public policies, thus encouraging their conservation and improvement. Discrete Choice Experiments are particularly useful in estimating ecosystem services as they allow the evaluation of each individual ecosystem service, allowing for policy modulation. However, preferences and willingness to pay may be influenced by some heuristics that respondents adopt when making their choices. The present study contributes to the Attribute-Non-Attendance (ANA) literature by analyzing the effect of serial ANA on WTP for the improvement of the ecosystem services of an Alpine pasture, the Entrelor pasture located in Val d'Aosta (North-West Italy). The novelty of this study is that we investigated ANA by asking a first group of respondents which attributes were ignored during choices, and a second group which attributes they considered. Our results show that considering ANA matters in DCE. In particular, framing the question positively (which attributes were attended) yields differences in marginal WTPs that are significantly and systematically higher for all the attributes. Conversely, with negative framing, differences in marginal WTP seem to be insignificant and unstable both in terms of magnitude and sign. Moreover, positively framing the ANA question can be more informative, as ANA appears more frequently. These results suggest that respondents probably do not feel judged for not having adopted the expected degree of attention with a positively framed ANA question.

Keywords: alpine pasture; ecosystem services; decision heuristics; stated attribute non-attendance; serial attribute non-attendance; Italian Alps; random parameter logit

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1. Introduction

Alpine pastures (called in Italy "malga" or "alpe") have traditionally been managed for centuries in the European Alps [1], producing various ecosystem services (ES) for the benefit of society. Today they are under threat, as their utilization depends on the competitiveness of their production systems [2]. The European Common Agricultural Policy provides funds for mountain grazing, but they are insufficient to cover all additional expenses for herders to raise their cattle to summer grazing. These costs include the rent for the use of the pasture and related facilities; recruitment of seasonal staff for milking operations and the processing of dairy products; the transport of livestock, equipment and food; less milk production and increased risk to animals. Payments by tourists could be an additional source of revenue that would allow a profitable use of pastures during the summer season. The development of tourism and outdoor recreation is therefore of high relevance for the maintenance of this traditional land use and the ecosystem services provided, such as the beauty of the landscape, the conservation of biodiversity and other cultural services related to the production of dairy products and the conservation of historical and cultural heritage

features [3]. The Willingness To Pay (WTP) estimate for access alpine pastures is therefore a relevant policy issue.

Among the different valuation techniques, the discrete choice experiment (DCE) method allows the estimation of the value that visitors place on each ecosystem service of a pasture. A DCE asks respondents to choose the preferred alternatives (i.e., policy scenarios) from a number of alternatives, each consisting of different levels of realization of the attributes of the good or service to be valued, in a sequence of choice tasks [4]. The monetary value of each ES can support the adoption of correct management policies because it allows explicit trade-offs in the decision-making process [5].

However, respondents may adopt certain decision heuristics in answering choice tasks. One of these heuristics is Attributes Non-Attendance (ANA), which consists of ignoring one or more attributes during the decision process [6]. Attributes may not be considered because they do not enter respondents' utility function or because ignoring some attributes decreases the cognitive burden in the decision process [7]. Some studies showed that accounting for ANA leads to lower WTP estimates [6,8–14], while some others found higher marginal WTP [15–17]. ANA therefore matters in DCE, but the effect on WTP remains unclear.

The present study contributes to this literature by analyzing the effect of serial attributes non-attendance on WTP for the improvement of the ecosystem services of an Alpine pasture, namely the Entrelor pasture located in Val d'Aosta (North-West Italy). In particular, we studied whether and how much visitors would be willing to pay an entrance ticket to finance farmers to take the animals to pasture, and therefore to continue to enjoy a well-kept landscape with a good level of biodiversity, to maintain the buildings and the transformation of milk in mountain pastures, as well as all aspects that can only be achieved with proper management of the pasture at high altitude.

The novelty of this study is that we investigated attribute non-attendance by asking a first group of respondents which attributes were ignored during choices and a second group which attributes they considered. We were interested in comparing these two different ways of detecting self-reported ANA. Our hypothesis is that when asked to indicate non-attended attributes, respondents may feel judged for not having adopted the expected degree of attention in their choices, and consequently may be inclined not to indicate all the non-attended attributes. On the other hand, mentioning the attributes they considered does not have such a negative meaning, so that respondents can easily state the attributes they considered. Which effects have ANA question framing on welfare estimates has relevant implications for future applied studies.

To value the effect of the ANA elicitation method on coefficients' estimates, we compared fitting statistics among models estimated without considering ANA and models that consider the effect of this heuristic. Moreover, we detected whether individuals' WTP distributions derived from the different discrete choice model's specifications were significantly different in terms of the cumulative distribution function. In addition, we detected differences with regards to the number and locations of modal values of the means of the posterior distributions of WTPs across the different sets of estimates, and if posterior marginal WTP distributions differ in terms of means.

This paper is organized into six sections. The second section shows the background of the study. The third section presents the DCE methodology and econometric modelling. Section four includes results, and section five discusses the findings on the effect of ANA on preferences and willingness to pay. Finally, the sixth section concludes.

2. Background

In the last fifteen years, ANA has attracted increasing attention in DCE studies in a variety of fields. Initially addressed in transportation [6,15–18], ANA has been investigated in environment studies [8–10,12,14,19–23], health studies [11,24–26] and agricultural economics [13,27–33].

This increasing attention is justified by the serious implications that ANA can exert on welfare measurement, particularly when ANA affects the cost attribute [34]. In their guidelines for stated preference valuation, Johnston et al. [35] underline that ANA is a behavioral response anomaly that should be addressed not only at the analysis stage but also in the study design (experimental design) and pretesting. A recent and detailed review of the literature on ANA can be found in [34].

To date, three approaches have been used to identify and quantify ANA, namely: (a) respondent self-reports of non-attendance (stated ANA); (b) analytical (or inferred) non-attendance (inferred ANA) and (c) respondents' eye movements (visual ANA).

The first approach relies on self-reported information, which is collected through debriefing questions asked in conjunction with the choice experiment questions.Debriefing questions are asked either at the end of the full sequence of choices (serial ANA) (e.g., [8,12,13,15,19,21–23,27–29,33]) or after each choice task (choice task ANA) (e.g., [9,17,31,32]), with the former approach (serial ANA) being more frequently employed than the latter. The questions can be framed to provide binary responses (ignored/did not ignore) (e.g., [9,15,32]) or responses in an ordinal scale, such as from "never" ignored to "always" ignored (e.g., [13,23,30]). Instead of identifying non-attendance, the questions can be framed to identify the degree of attendance asking respondents which attributes they considered (e.g., [8,12,13,20,21,23,30,36]). To the best of our knowledge, no studies have compared the effect of using the two question formats in the same study.

The second approach (inferred ANA) does not need self-reported information, but infers ANA behavior directly from the choices made by the respondents. This approach employs econometric models to estimate the probability of ANA without the use of supplementary data. Latent class logit models, for instance, allow to assigned respondents to several discrete and latent classes, where each latent class is defined by which attributes are attended to and which are not [10–13,18,23,26,37].

In the most recent approach (visual ANA), respondents' attention to individual attributes is acquired through data produced by eye movements [25,29,31]. Eye movements are recorded using eye-tracking equipment, and attention to specific attributes can be measured by analyzing how many times and for how long the respondent looks at each attribute. Given the necessity of eye-tracking equipment, this approach is more suitable for studies carried out in a lab setting than in the field.

3. Material and Methods

3.1. The Study Area

The Entrelor pasture is located in the Valle d'Aosta Region (North-West Italy), in the Rhêmes Valley, whose territory is part of the Gran Paradiso National Park. The area presents a valuable landscape characterized by the presence of numerous plant and animal species; grassy surfaces and forests contribute to the creation of an uncontaminated natural environment. The pasture extends to approximately one thousand hectares, at an altitude of 2140 m, and includes a building used as a shelter for shepherds which can also be used to transform milk into cheese, called malga or alpe in the Italian regions. The mountain pasture can only be reached on foot via a fairly steep path. During the summer season (from July to September) approximately sixty dairy cows and twenty calves are mounted. The pasture is managed with a technique that allows the animals to never be sheltered but to live in the open air. The existence of the grazing area and the good maintenance of the meadow are guaranteed both by the presence of cows grazing in summer and by that of chamois throughout the year. Therefore, it is also thanks to cattle breeding that visitors to this area can appreciate the beauty of the landscape and engage in recreational activities. In the months of July and August, visitors are offered a guided tour of the mountain pasture and a tasting of typical cheeses made with the milk of grazing cows.

3.2. Survey Design, Administration and Data Description

We conducted an intercept survey on-site in July and August 2013. Three trained interviewers administered a face-to-face questionnaire to a random sample of visitors.

We used a questionnaire similar to the one used in a survey conducted in Trentino (North-East Italy) to evaluate a pasture in a context very similar to that of Entrelor pasture [1]. The questionnaire followed acknowledged guidelines for stated preferences studies [38] and was the result of focus group discussions with experts and the general population. It consisted of four sections. In the first section, a question asking for willingness to answer the questionnaire was followed by warm-up questions to investigate the knowledge of the study area. In the second section, the respondents were shown four photographic and descriptive cards relating to the four attributes identified to describe the pasture and to three different management levels. These cards had been prepared to make the respondent better understand the results of the possible management policies that can be adopted on the basis of the attributes and levels proposed. Respondents were then asked to order the four attributes according to their preferences. Next, three more cards were presented showing the possible combinations of attributes with the three different management levels. The first card presented the highest level of management for each attribute, the second card an intermediate combination in the management of the pasture and, finally, the third card the consequences of the absence of management and therefore of abandonment. The third section included the choice cards preceded by a cheap talk script [39] to mitigate hypothetical bias. The last section contained the usual socio-economic and demographic questions.

The valuation scenario presented in the third section considered the possibility for the Gran Paradiso National Park to recover funds to financially support breeders by introducing an entrance ticket to access the path that leads to the Entrelor mountain pasture. The other attributes used to describe each choice card were landscape, biodiversity, historical and cultural function and milk processing. Each level was accompanied with a picture to better illustrate its meaning. Attributes and levels are presented in Table 1.

Each attribute has been described by two levels, plus a third level associated with the abandonment of the pasture, which represents the status quo alterative. The levels associated with landscape were very tidy and quite tidy landscape, while biodiversity was associated with high and medium levels. The historical-cultural function had levels corresponding to the possibility or otherwise of visiting the malga. Finally, milk processing was presented as made in the malga or in the valley, where the milk from the pasture is mixed with that obtained in the stables at the bottom of the valley.

The attribute levels were combined in the choice cards by using an Optimal Orthogonal Choice Design [40], which was 100% efficient for estimating the main effects. Each choice card consisted of four policy alternatives and a status quo alternative that was not associated with an entry ticket. Respondents completed 16 choice cards, adopting the best-worst choice format. Respondents were asked to choose their most preferred alternative over the initial set of five alternatives and then the least preferred on the remaining four alternatives. Then they were involved in a second round of best-worst choices, choosing their second preferred alternative and, finally, their second least preferred on the remaining two [41]. The preference elicitation procedure was rigorously controlled by the interviewers. We have adopted this elicitation format due to its usefulness when applied in the case of remote areas with low frequency of visits that allow small samples. In these circumstances, it is preferred to complete ranking, since it should be easier for respondents to identify the best and worst options from a given set than to rank all the alternatives [42]. Figure 1 shows an example of a choice card.

To capturing serial non-attendance, a debriefing question was asked at the end of the choice experiment, that is, after respondents elicited their preferences through the sixteen choice sets. A first group of respondents, which we refer to as negative ANA sub-sample, received a questionnaire containing a question framed to identify non-attendance (which attributes were ignored when making the choices). A second group, which we conversely called positive ANA sub-sample, received a question to identify the degree of attendance

(which attributes were considered). Through this debriefing question, respondents could indicate one or more attributes at the same time, so that both the number of attributes ignored (or considered) and the number of times each attribute was ignored (or attended) could be observed. Each respondent was randomly assigned to one of the two sub-samples.

Table 1. Attributes and levels.

Attributes	Levels	Abandonment
Access fee	2 €, 5 €, 8 €, 12 €	0 €
Landscape	Very tidy: the pasture used for grazing livestock keeps the spaces open and avoids invasion by bushes and trees. Quite tidy: weeds are regularly mowed in spaces around buildings	The abandonment of the mountain pastures involves the invasion of weeds, bushes and trees with the loss of open spaces. Buildings are in ruins.
Biodiversity	High biodiversity: with the guidance and control of grazing animals, the presence of many species of flowers, insects and birds is guaranteed. Medium biodiversity: without the guidance and control of grazing animals, invasive species take hold and desirable ones diminish.	The abandonment of the pasture leads to the invasion of weeds and bushes with a strong reduction of the desirable species.
Historical/cultural function	Malga open to the public: live witness of local history and culture. Visitors can enter the malga and watch, if done, the cheese being made. Malga closed to the public: Mute witness of local history and culture. Visitors cannot enter the hut.	Abandoned hut: wreck of local history and culture.
Milk processing	Milk transformed in mountain pastures: the cheese produced in the mountain pastures maintains beneficial nutritional properties (for example a higher content of α-linoleic acid that protects the cardiovascular system) and typical characteristics (yellow color and intense aroma). Milk processed in the valley: Alpine milk is mixed with milk from the valley floor. The cheese thus produced does not maintain the beneficial nutritional properties and typical characteristics.	No milk production in the mountain pastures: in the absence of mountain pastures, there is no milk production.

	Altern. A	Altern. B	Altern. C	Altern. D	Altern. E
Access fee €	8	5	12	2	0
Landscape	Quite tidy	Quite tidy	Very tidy	Very tidy	Abandonment
Biodiversity	High	Medium	High	Medium	
Historical/Cultural function	Visitable malga	Not accessible malga	Not accessible malga	Visitable malga	
Milk processing	In Malga	In Malga	At the valey	At the valey	

Figure 1. Example of choice card.

Interviewers intercepted 171 tourists, of whom 142 agreed to answer the questionnaire. A response rate of 83% was therefore obtained. As each respondent provided a sequence of

16 complete rankings using the best/worst elicitation method, we had a total of 9152 choices. 73 respondents received the questionnaire with the negative ANA question, whereas 69 respondents received the questionnaire with the positive ANA question.

The majority of respondents (82.31%) were of Italian nationality, while 8.16% were from France, 4.08% from Belgium, 3.4% from Netherlands and 2.04% from Switzerland. Approximately half of the respondents were male (54.93%), and the average age was 50 years. Most of respondents had a high school degree (49.3%), while respondents with a university degree were 40.85% of the sample. Sixty percent of respondents had a monthly net income between € 1000 and € 2000 (Table 2).

Table 2. Sample statistics.

	Absolute Value	Percentage
Nationality		
Italian	121	82.31
French	12	8.16
Belgian	6	4.08
Dutch	5	3.40
Swiss	3	2.04
Gender		
Male	78	54.93
Female	64	45.07
Age		
Average 50.07 Min 20 Max 76		
20–30	17	11.97
31–40	20	14.08
41–50	30	21.13
51–60	32	22.54
61–70	36	25.35
71–80	7	4.93
Education		
Primary School	0	0.00
Middle School	14	9.86
High School	70	49.30
Undergraduate or Graduate	58	40.85
Net monthly income		
<1.000 €	15	10.56
1.001–1.500 €	45	31.69
1.501–2.000 €	40	28.17
2.001–3.000 €	22	15.49
>3.001 €	8	5.63
No income	12	8.45

3.3. Econometric Analysis

The modelling approach is derived from the Random Utility Theory [43], where the utility U comprises a deterministic part V and a random term ε:

$$U = V + \varepsilon \quad (1)$$

The deterministic part is a function of the observed attributes X_{int} of the alternatives and considers the systematic effect of these attributes on choices, represented by the vector of parameters β to be estimated:

$$U_{int} = \beta X_{int} + \varepsilon_{int} \quad (2)$$

where n is the respondent, i the alternative and t the choice situation.

Among the various models used to model a certain sequence of choices, the random parameter logit (RPL) model is widely applied as it accounts for heterogeneity in preferences. The probabilities of the RPL can be calculated as follows [44]:

$$P_{ij} = \int \frac{e^{\beta_n' X_{ij}}}{\sum_j e^{\beta_i' X_{ni}}} \varphi(\beta|b,\ \Omega) d\beta \tag{3}$$

where $\varphi(\beta|b,\ \Omega)$ represents the probability density function of the coefficients' distribution. The RPL assumes that the coefficients are specific to the individual and follow a random distribution. Since respondents stated their most and least preferred alternatives among five alternatives J (j_1, j_2, j_3, j_4, j_5), we estimated an "exploded" random parameter logit model [1,45]:

$$\begin{aligned} &P_{ij}[ranking\ j_1, j_2, j_3, j_4, j_5] \\ &= \int \frac{e^{\beta_n' X_{nij_1}}}{\sum_{j=j_1,\ j_2,j_3,j_4,j_5} e^{\beta_n' X_{nij}}} \times \frac{e^{\beta_n' X_{nij_1}}}{\sum_{j=j_1,\ j_2,j_3,j_4} e^{\beta_n' X_{nij}}} \\ &\times \frac{e^{\beta_n' X_{nij_1}}}{\sum_{j=j_1,\ j_2,j_3} e^{\beta_n' X_{nij}}} \times \frac{e^{\beta_n' X_{nij_2}}}{\sum_{j=j_1,\ j_2} e^{\beta_n' X_{nij}}} \varphi(\beta|b,\ \Omega) d\beta \end{aligned} \tag{4}$$

To identify the effect of considering information about ANA on model performance, preferences and willingness to pay, we estimated a model on the original data and models on data that do not include attributes not attended by each respondent, and compared them. In particular, to account for ANA, we estimated models where for non-attended attributes identified using a positive ANA question, negative ANA question or both, the correspondent level equals to zero; otherwise, if the attribute was attended during the choice experiment, its level is equal to those shown in the choice card. Consequently, across the models, the number of observations is constant and equal to 9152. The best model's specification was selected according to the BIC and the AIC criteria.

The RPL model has been estimated using Nlogit 6.0, assuming normal distributed coefficients for non-monetary attributes and a fixed price coefficient. Moreover, models were specified to account for attributes' correlation.

To infer on WTP, for each model's specification, the estimates of the vector of means and their variance-covariance matrix were considered. WTP has been calculated as the negative ratio between non-monetary coefficients and the cost coefficient. To graphically compare WTP distributions across the model's specifications, we derived kernel smoothing of the individual posterior means of WTP distributions, and used a standard Kolmogorov-Smirnov test on the differences between the distributions of means of the individual specific marginal WTP for sample respondents. Finally, we present a paired samples t-test assuming asymptotic normality, to detect if posterior marginal WTP distributions differ in term of means. The latter results can be taken only as indicative, as the sampling distributions of these random variables are unknown and likely to be quite different from normal.

4. Results

Overall, only 10 respondents (7% of total respondents) attended to all the attributes when making choices, while 132 did not attend to one or more attributes. Table 3 shows that in the positive ANA treatment, only 14.49% of respondents self-reported that they attended to all the attributes during the decision process, while the majority of respondents attended to two (43.48%) or three (20.29%) attributes. The second part of Table 3 indicates the number of times each attribute has been attended. Landscape appears to be the most attended attribute, followed by milk transformation and price, which was attended 18.75% of the time, while biodiversity and historical cultural function were both attended 14.58% of the time.

Table 4 shows information about attributes ignored (negative ANA) during the choices process. Most of respondents (34.25%) did not consider one attribute, while 21.92% did not consider two and 27.40% of respondents did not ignore any attributes.

Table 3. Results for positive ANA treatment.

Number of Respondents That Attended to One or More Attribute			Number of Times Each Attribute Was Attended		
	Number of Respondents	**%**		**Number of Time**	**%**
1 attribute	9	13.04	Landscape	36	25.00
2 attributes	30	43.48	Milk process	28	19.44
3 attributes	14	20.29	Price	27	18.75
4 attributes	6	8.70	Biodiversity	21	14.58
All attributes	10	14.49	Historical	21	14.58
			All attributes	11	7.65

Table 4. Results for negative ANA treatment.

Number of Respondents That Did Not Attend to One or More Attribute			Number of Times Each Attribute Was Not Attended		
	Number of Respondents	**%**		**Number of Time**	**%**
1 attribute	25	34.25	Price	26	22.41
2 attributes	16	21.92	Historical	26	22.41
3 attributes	9	12.33	Milk process	24	20.69
4 attributes	3	4.10	No attribute [1]	20	17.24
No attribute [1]	20	27.40	Biodiversity	11	9.48
			Landscape	9	7.76

[1] All attributes attended.

By comparing the number of times each attribute was attended or not attended (Tables 3 and 4), we can notice that landscape was both the most attended and the least ignored attribute, and that historical conservation ranked as the first most ignored attribute (with the price) as well as the least attended. These results are coherent with the order of preferences stated by the respondents, as landscape was the most preferred attribute indicated by respondents, and historical conservation was the third one. For the other attributes, the results are mixed. As most studies highlight, in this study the price is the most frequently ignored attribute (22%), but at the same time it is the third attended of the attributes over five (see Table 3).

Table 5 shows the number of respondents who did not attend to one or more attributes with the two different question frames. The non-attended attributes for the positive ANA have been calculated by difference with respect to the number of attributes attended by the respondents. From Table 5 it can first be noted that when respondents were asked which attributes they ignored (negative ANA), 27.4% stated that they did not ignore any attribute (i.e., considered to all the attributes), while, when asked which attributes were considered, only 14.49% of respondents stated they considered all the attributes. Overall, self-reported ANA is more frequent with the positively framed ANA question than with the negatively framed ANA question.

Table 5. Number of respondents who did NOT attend to one or more attributes with the two different question frames.

Negative ANA			Positive ANA		
	Number of Respondents	**%**		**Number of Respondents**	**%**
1 attribute	25	34.25	1 attribute	6	8.70
2 attributes	16	21.92	2 attributes	14	20.29
3 attributes	9	12.33	3 attributes	30	43.48
4 attributes	3	4.10	4 attributes	9	13.04
No attribute [1]	20	27.40	No attribute [1]	10	14.49
Total	73	0	Total	69	

[1] All attributes attended.

Table 6 shows results of the RPL models estimated without considering ANA, considering only ANA positive, only ANA negative and both. In all the model's specifications, all attributes are significant at 1% level. The fact that most people have ranked the status quo as the least preferred alternative is reflected in the high negative value of its coefficient estimates. This means there is a strong aversion to the status quo among respondents. Therefore, respondents prefer policy alternatives over the abandonment of the pasture. Moreover, as expected, the coefficient relative to the entrance fee is negative, meaning that as the price increases marginal utility decreases. Preferences for non-monetary attributes are heterogeneous, as demonstrated by statistically significant standard deviations.

Table 6. Choice model estimates on original data and considering ANA.

	ANA Not Considered		**Considered Using Only ANA Positive**		**Considered Using Only ANA Negative**		**Considered Using Both ANA Positive and Negative**	
	Coefficient	**Z**	**Coefficient**	**Z**	**Coefficient**	**Z**	**Coefficient**	**Z**
Mean:								
Access fee	−0.173 ***	30.53	−0.195 ***	31.33	−0.228 ***	30.97	−0.286 ***	−32.13
Landscape	0.405 ***	13.16	0.482 ***	15.06	0.510 ***	14.47	0.630 ***	14.39
Biodiversity	0.381 ***	14.83	0.493 ***	16.30	0.441 ***	14.96	0.570 ***	15.90
Historical/Cultural function	0.442 ***	15.68	0.500 ***	14.19	0.578 ***	15.59	0.690 ***	14.50
Milk processing	0.605 ***	14.70	0.771 ***	14.67	0.739 ***	13.91	0.981 ***	13.37
Status Quo	−33.084 ***	6.90	−26.63 ***	8.69	−25.56 ***	9.67	−34.27 ***	5.12
Standard deviation:								
Landscape	0.468 ***	13.19	0.429 ***	11.44	0.495 ***	12.97	0.555 ***	12.26
Biodiversity	0.402 ***	14.19	0.426 ***	12.41	0.424 ***	8.38	0.437 ***	9.39
Historical/cultural function	0.508 ***	15.00	0.549 ***	8.36	0.552 ***	10.26	0.575 ***	10.38
Milk processing	0.851 ***	14.68	0.902 ***	9.77	0.913 ***	10.23	1.010 ***	13.69
Status Quo	22.639 ***	6.82	15.094 ***	12.99	14.883 ***	36.82	21.199 ***	8.46
Observations	9152		9152		9152		9152	
Log likelihood	−5954.73		−5865.38		−5964.38		−5793.49	
AIC	11,951.50		11,772.80		11,970.80		11,629.00	
BIC	12,101.00		11,922.30		12,120.30		11,778.50	

*** indicate significance levels at 1% level.

In terms of the relative importance of attributes, milk processing is the most preferred attribute across all the model's specifications. Analyzing the mean coefficient estimates, it emerges that the relative order of importance of the different attributes without considering ANA is: Milk processing → Historical/Cultural function → Landscape → Biodiversity. The order is slightly different considering only ANA positive (Milk processing → Historical/Cultural function → Biodiversity → Landscape), while it does not change if ANA is stated using the negative way (e.g., non-attended attributes are declared).

Concerning the estimates of coefficients' standard deviation, all estimates are higher when accounting for ANA except the standard deviations of the status quo and that of the landscape in the positive framing. This occurs regardless of the considered treatment and implies more leptokurtic coefficient distributions.

Finally, accounting for ANA through the two different treatments (e.g., ANA positive or ANA negative), the coefficient estimated for the status quo decreases in absolute terms, meaning that not accounting for the heuristic implies an overestimation of the disutility associated with that alternative. This result is observed both in term of mean and standard deviation.

Turning our attention to the goodness-of-fit measures of the models, the RPL model that considers ANA both positive and negative has a significant lower log-likelihood (5793.49). This model also shows the lower levels of both AIC (11,629.00) and BIC (11,778.50), therefore the model addressing ANA fits the data much better.

Figure 2 displays the coefficient's magnitude across the different model's specifications and signals the underestimation of the attributes caused by the neglect of the ANA heuristic.

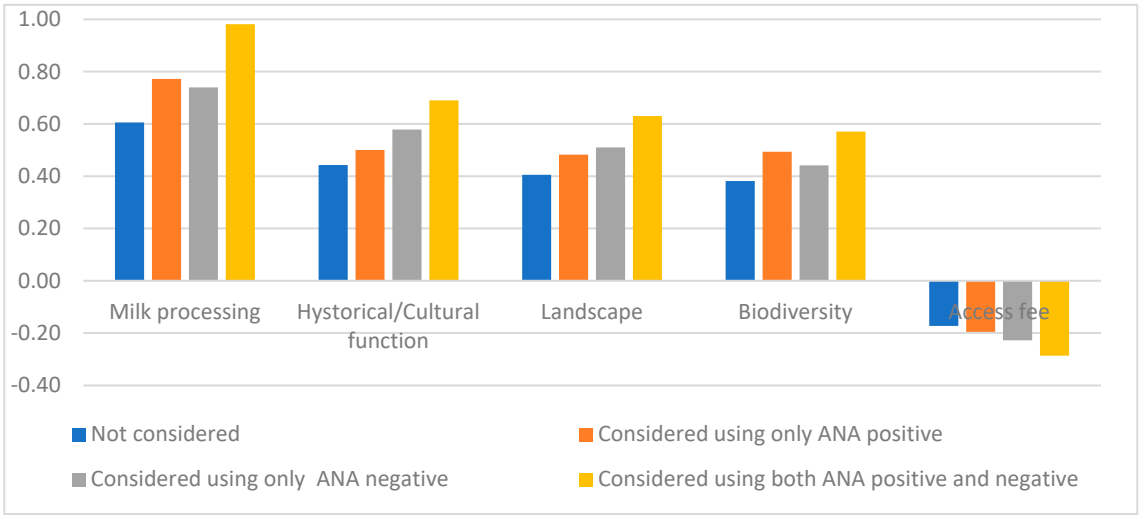

Figure 2. Coefficient estimates across model's specification.

The kernel smoothing of individual posterior means of marginal WTP sample distributions is shown in Figure 3. Graphs do not show a systematic variation of WTP distribution considering ANA. In particular, the number of modes, the range of distributions and the relative position are invariant, even if considering ANA an increasing of the density closely to the distribution barycenter seems to occur.

Table 7 reports results of the two-sample Kolmogorov-Smirnov tests carried out to verify if posterior marginal WTP distributions differ in term of cumulative distribution function across model's specifications. Results suggest significant differences in marginal WTP distributions for all attributes compared to the model, which does not consider ANA to those that considered ANA positive, negative and both, except for the tests carried out on the attribute named "Historical/Cultural function", when the baseline model (e.g., ANA not considered) is compared to the model that considers only ANA positive, and the one that considers only ANA negative. In these cases, the null hypotheses of equal marginal WTP distributions cannot be rejected.

Table 7. Two-sample Kolmogorov-Smirnov tests for null of identical cumulative distributions (Alternative hypothesis: two side).

	ANA Not Considered vs.					
	Considered Using Only ANA Positive		**Considered Using Only ANA Negative**		**Considered Using Both ANA Positive and Negative**	
	Diff.		Diff.		Diff.	
Landscape	0.087	***	0.083	***	0.1	***
Biodiversity	0.064	**	0.087	***	0.132	***
Historical/Cultural function	0.029		0.04		0.101	***
Milk processing	0.066	**	0.076	***	0.085	***
Status Quo	0.272	***	0.38	***	0.331	***

** and *** indicate significance levels at 5% and 1%, respectively.

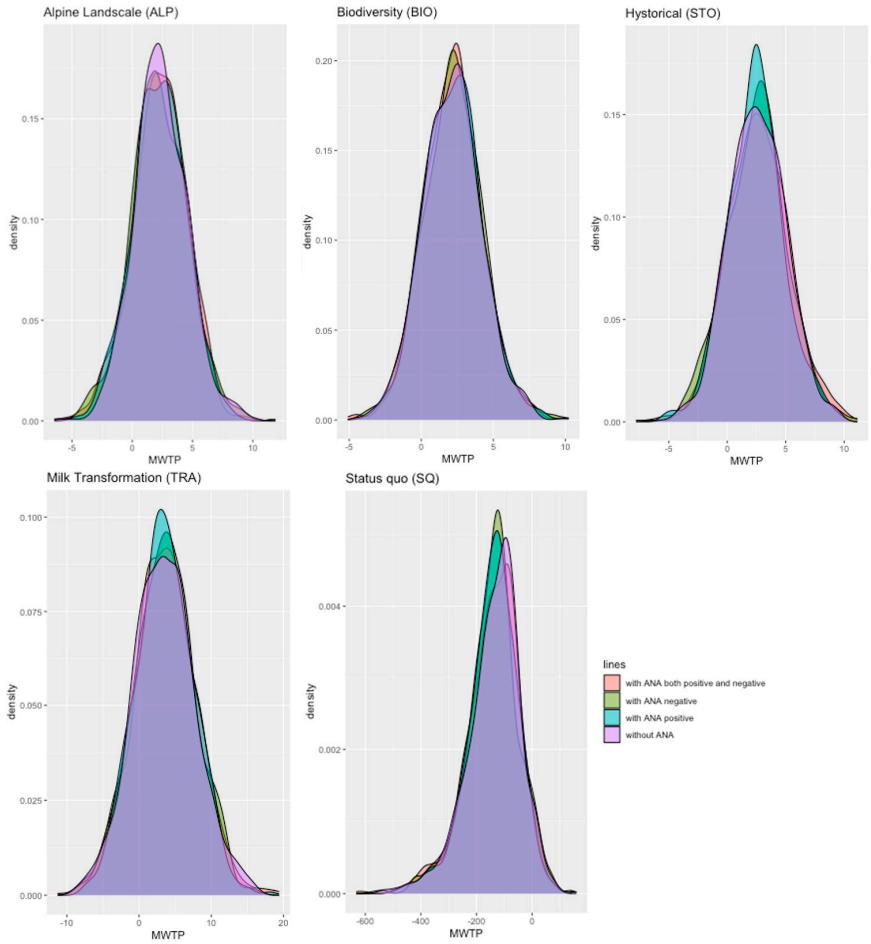

Figure 3. Kernel density plots for conditional WTPs.

Table 8 shows the mean, median, standard error, skew and kurtosis of marginal WTP for each attribute estimated adopting the different model specifications. Table 9 reports the results of paired sample t-tests carried out to verify the null hypothesis of identical means of marginal WTPs. Willingness to pay derived by the model that does not consider ANA is significantly lower than the corresponding WTP derived by using the model that considers only ANA stated "positively", except for the attribute named historical/cultural function. Differences between WTP obtained by the model that does not consider ANA and those obtained using the model that considers only ANA negative are prevalently not statistically significant, with the exception of the attribute named biodiversity and the status quo.

Table 8. WTPs summary statistics.

ANA not Considered	Mean	Standard Deviation	Median	Skew	Kurtosis
Landscape	2.33	2.76	2.29	0.02	0.08
Biodiversity	2.20	2.36	2.28	0.04	−0.02
Historical/Cultural function	2.56	2.79	2.57	−0.06	0.12
Milk processing	3.55	4.72	3.4	0.08	−0.11
Status quo	−192.87	128.48	−188.19	−0.12	−0.12
Considered using only ANA positive	**Mean**	**Standard deviation**	**Median**	**Skew**	**Kurtosis**
Landscape	2.45	2.25	2.42	−0.02	0.02
Biodiversity	2.54	2.2	2.59	0.14	0.16
Historical/Cultural function	2.59	2.82	2.67	−0.03	0.1
Milk processing	3.99	4.47	4.01	0.09	−0.02
Status quo	−137.34	75.88	−134.54	−0.12	−0.12
Considered using only ANA negative	**Mean**	**Standard deviation**	**Median**	**Skew**	**Kurtosis**
Landscape	2.21	2.1	2.24	−0.1	0.24
Biodiversity	1.93	1.9	1.96	−0.05	−0.12
Historical/Cultural function	2.57	2.45	2.55	0.04	−0.12
Milk processing	3.25	3.99	3.35	−0.06	0
Status quo	−112.98	64.09	−110.73	−0.12	−0.12
Considered using both ANA positive and negative	**Mean**	**Standard deviation**	**Median**	**Skew**	**Kurtosis**
Landscape	2.19	1.95	2.15	−0.05	0.03
Biodiversity	2.01	1.54	2.07	0	−0.03
Historical/Cultural function	2.4	2	2.41	0.02	0.02
Milk processing	3.46	3.54	3.44	0.07	−0.01
Status quo	−120.49	72.61	−118.01	−0.12	−0.12

Table 9. Paired samples t-tests for null of identical means of marginal WTPs. (Alternative hypothesis: two side.)

	ANA Not Considered vs.								
	Considered Using Only ANA Positive			**Considered Using Only ANA Negative**			**Considered Using Both ANA Positive and Negative**		
	Diff.	t		Diff.	t		Diff.	t	
Landscape	−0.215	−1.968	**	0.122	0.906		0.143	2.584	**
Biodiversity	−0.260	−2.587	***	0.274	2.060	**	0.194	2.840	***
Historical/Cultural function	0.031	0.247		−0.012	−0.103		0.156	1.298	
Milk processing	−0.574	−2.681	***	0.305	1.20		0.092	0.543	
Status Quo	−56.124	−11.559	***	−79.886	−39.230	***	−72.375	−40.963	***

** and *** indicate significance levels at 5% and 1%, respectively.

5. Discussion and Conclusions

Alpine pastures generate important ecosystem services, some closely related to the environment, others to historical and cultural aspects. The economic evaluation of these services helps their recognition in public policies, thus encouraging their conservation and improvement. DCE is particularly useful in estimating ecosystem services as it allows the valuation of each individual ecosystem service, allowing for policy modulation. However, preferences and willingness to pay may be influenced by some heuristics that respondents adopt when making their choices. The present study analyzes the effect of the heuristic of ANA on WTP for the improvement of ecosystem services of an Alpine pasture.

The DCE indicates that visitors are willing to contribute financially to the improvement of the ecosystem services of Entrelor pasture. The transformation of milk in the mountain

pasture turns out to be the most valued policy, and the protection of biodiversity the less valued one, whereas the historical and cultural aspects and landscape are valued in the middle. However, considering the occurrence of the ANA phenomena implies a partial variation of the attributes' order of importance: the most important attribute does not change, but there is a modification in the relative importance of the other attributes.

If we consider the different framing of the self-reported ANA question, framing the question positively (which attributes were attended) yields higher WTP means. This result is in line with some studies in transportation literature where accounting for ANA leads to higher marginal WTP [15,16,18].

Framing the question negatively (which attributes were ignored) yields unstable results. Respondents are indeed more willing to state the attributes that they considered than the attributes they ignored. The most ignored attribute was the cost; this is not new, and in fact this result has been highlighted by many studies [10,15,19,34,37]. This probably happens because the payment is hypothetical, or it could reflect the difficulty encountered by the interviewee in making the trade-offs between attributes and cost. The literature highlights that possible sources for ANA are a simple lack of interest in certain attributes—the attribute is not part of the respondent's utility function—or a heuristic adopted to limit cognitive effort [7]. The heterogeneity of preferences in our sample could be an indication that some respondents may not have considered some attributes because they do not value them. However, the complexity of the choice task, with a large number of choice cards and alternatives presented to respondents, makes us suppose that ANA could have been adopted by some respondents to limit their cognitive burden.

Overall, the results indicate that self-reported ANA can be informative. We share the suggestion of Lew and Whitehead [34] that ANA assessment should be part of any DCE study and we therefore encourage collecting ANA for incorporation into choice models to avoid communicating incorrect policy recommendations to decision-makers. Specifically, our results show that positively framing the ANA question, asking respondents to indicate the attributes they considered, can be more informative, as ANA appears more frequently. These results support our hypothesis that respondents probably do not feel judged for not having adopted the expected degree of attention with a positive framed ANA question.

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