



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

**MONITORING CHOICE TASK ATTRIBUTE ATTENDANCE IN NON-MARKET VALUATION OF MULTIPLE PARK MANAGEMENT SERVICES:  
DOES IT MATTER?**

Riccardo Scarpa,  
Department of Economics  
Waikato Management School, room 2.13  
The University of Waikato, Private Bag 3105 Hamilton, 3240, New Zealand  
Office 0064(0)7-838 48 48  
Fax 0064(0)7-838 43 31  
e-mail: rscarpa@waikato.ac.nz

Mara Thiene,  
Dipartimento Territorio e Sistemi Agroforestali  
Agripolis - Via dell'Università 16 - 35020 Legnaro (PD)  
Italy  
Phone:  
Office 0039-049 - 8272760  
Fax 0039-049- 8272703  
e-mail: mara.thiene@unipd.it

David A. Hensher,  
Institute of Transport and Logistics Studies  
Room 315  
C37 - Newtown Campus  
The University of Sydney  
NSW 2006 Australia  
Office 0061-2-93510071  
Fax: 0061-2-93510088  
e-mail: davidh@itls.usyd.edu.au

*Contributed Paper prepared for presentation at the International Association of  
Agricultural Economists Conference, Beijing, China, August 16-22, 2009*

*Copyright 2009 by [authors]. All rights reserved. Readers may make verbatim  
copies of this document for non-commercial purposes by any means, provided that  
this copyright notice appears on all such copies.*

MONITORING CHOICE TASK ATTRIBUTE ATTENDANCE IN NON-MARKET  
VALUATION OF MULTIPLE PARK MANAGEMENT SERVICES:  
DOES IT MATTER?

June, 2009

Riccardo Scarpa,  
Department of Economics  
Waikato Management School, room 2.13  
The University of Waikato, Private Bag 3105 Hamilton, 3240, New Zealand  
Office 0064(0)7-838 48 48  
Fax 0064(0)7-838 43 31  
e-mail: rscarpa@waikato.ac.nz

Mara Thiene,  
Dipartimento Territorio e Sistemi Agroforestali  
Agripolis - Via dell'Università 16 - 35020 Legnaro (PD)  
Italy  
Phone:  
Office 0039-049 - 8272760  
Fax 0039-049- 8272703  
e-mail: mara.thiene@unipd.it

David A. Hensher,  
Institute of Transport and Logistics Studies  
Room 315  
C37 - Newtown Campus  
The University of Sydney  
NSW 2006 Australia  
Office 0061-2-93510071  
Fax: 0061-2-93510088  
e-mail: davidh@itls.usyd.edu.au

---

Riccardo Scarpa is Professor at the Department of Economics of the University of Waikato Management School, in Hamilton, New Zealand. Mara Thiene is Assistant Professor at the Dipartimento Territorio e Sistemi Agroforestali, University of Padua, Italy. David Hensher is Professor at Institute of Transport and Logistics Studies, in University of Sydney, Australia. The research was funded by the Parco Naturale delle Regole d'Ampezzo. The authors are grateful to Dr. John Rose and two anonymous reviewers for helpful comments and discussions, and wish to thank all the climbers and experts that took part in the research. All remaining errors and shortcomings are, of course, entirely our responsibility.

MONITORING CHOICE TASK ATTRIBUTE ATTENDANCE IN NON-MARKET  
VALUATION OF MULTIPLE PARK MANAGEMENT SERVICES:  
DOES IT MATTER?

**Abstract**

Land management in Alpine Parks provides multifunctional services to separate groups of users. Choice experiments can be used to derive estimates of value for different management attributes. However, little research has been conducted on how frequently respondents ignore attributes used to describe policy management scenarios. We fill this gap using an approach that identifies and compares both serial and choice-task attribute non-attendance addressing five different visitor types. Our results indicate that accounting for choice-task non-attendance significantly improves model fit and yield estimates of marginal WTP with a more plausible pattern of signs and greater efficiency.

**Key words:** multifunctional land management, nonmarket valuation, choice experiments, preference heterogeneity, random utility model, attribute processing rules.

**JEL classification:** C25, H41, Q26, Q51

## I. INTRODUCTION

The effects of park management policies on outdoor recreation are increasingly coming under public scrutiny. Alpine park land is amongst the most valuable land in terms of outdoor recreation. Park management decisions are often controversial because of differences between objectives pursued by conservationists and the tourist industry. Park land management agencies find it increasingly difficult to fund all the services needed to facilitate the ever broadening variety of outdoor recreation activities. This is further exacerbated by the increasing expectations for high quality recreational experiences by a population of recreationists with a heightened sensitivity to environmental and conservation issues. Such a situation widens the scope for multi-attribute non-market valuation methods, especially for those methods capable of capturing and modelling the preferences of heterogeneous visitors who seek to pursue a variety of activities in the land under study. Our research reports the results of a study designed to address attribute non-attendance (henceforth abbreviated as AN-A), which, despite being quite a common decision heuristic, has only recently started being explored by analysts. With this decision heuristic respondents ignore some of the described attributes in their evaluation of alternatives within a given choice task. They hence act as if a zero weight were assigned to the ignored attributes in the utility of the respective alternatives. We study this issue by using a well-known statistical model of discrete choice: the multinomial logit model. This random utility model is often used for the purpose of multi-attribute non-market valuation, but the effects of accounting for AN-A are still relatively unexplored. Information on AN-A is commonly collected by questioning each respondent at the end of the sequence of choice tasks. Respondents are asked to list those attributes that they feel they have systematically ignored in the whole sequence of choice-tasks in their panel. We call this form “serial AN-A”, because it extends to all the choice-tasks performed by the same respondent. However, Puckett and Hensher (2009) warn practitioners that AN-A may vary from choice-task to choice-task as respondents progress along the panel of choice situations allocated to each of them. We term this form “choice-task AN-A” because it varies between choice-tasks performed by the same respondent. A novel contribution of our empirical investigation is the evaluation of whether data collection to define choice-task AN-A is worth its additional cost in survey time in terms of benefits produced in the form of additional WTP estimation accuracy and increased model fit.

Multi-attribute stated-preference methods, such as choice-experiments, are of particular interest in the context of non-market valuation for multi-functional land use because they provide sufficient versatility to be adapted to a variety of both valuation settings and users. The present study reports the results of a choice-experiment survey directed to a population with different visitor types in one of the best known Parks in the Italian Alps: the Park of Cortina d’Ampezzo, in the heart of the Dolomites. For its remarkable beauty and grandiose surrounding mountains, this Park land is a very sought-after location for Alpine holidays, summer and winter alike. Over the years the naturally restricted property markets developed from a typical collection of Alpine hamlets into an area hosting extremely expensive and exclusive second homes. As in many other Alpine settings, the use of the land within this Park is regulated by very ancient collective rules (“Le regole D’Ampezzo”) especially for timber production and summer pastures. These rules still apply to the Park land and co-exist alongside new land use designations, where land is mostly valued for recreation, rather than for

its traditional Alpine products, such as dairy and timber. It is therefore not surprising that the Park management prefers to prioritise its actions on the basis of visitor preferences.

The issue of how respondents to preferred choice and ranking tasks evaluate alternatives, through the processing of attribute and attribute levels, has important modelling repercussions that have been highlighted by previous studies (e.g. Holmes and Boyle 2005; Caparros et al. 2008). In choice-experiments, attributes are used to describe the salient traits of alternatives. In the case at hand, these are Park land management services. In evaluating the alternatives within a given choice set, respondents may well ignore selected attributes. Some will do so to simplify their selection rule irrespective of whether the ignored attributes are of relevance to them or not. Others will do so because some attributes are immaterial to them, despite the researcher's decision to include them in the study. Regardless of the reason behind attribute neglect, assuming that all proposed attributes have been assessed by all respondents during the process of alternative selection, leads to substantial bias in welfare estimates. This issue has been previously addressed in the transport literature by Hensher et al. (2005) who concluded with a warning to practitioners. Similar warnings emerge from other empirical investigations in environmental economics. For example, Campbell et al. (2008) note that using statistical models allowing for AN-A significantly improves model fit and severely impacts on implied welfare estimates. Similarly, Carlsson et al. (2008) emphasize that AN-A is of importance, and that assumptions about its source and the consequent statistical treatment are key factors in correctly deriving welfare estimates. More recent research efforts in choice experiment data analysis have reinforced the point that monitoring AN-A by respondents may have a substantial effect on marginal willingness-to-pay estimates (e.g., Hensher and Rose 2009). The cumulative empirical evidence to date in environmental economics appears to be corroborating the hypothesis that collecting information on AN-A represents a useful exercise. Accounting for it tends to improve statistical fit of discrete choice models and allows analysts to run a sensitivity analysis of estimates of welfare measures to assumptions on attribute attendance.

Some statistical models that endogenously account for the degree of serial AN-A have already been used successfully (Gilbride 2006, Rigby and Burton 2006, Scarpa et al. 2009, Hess and Hensher 2009). However, the specific monitoring of choice task AN-A---as a form of intra-panel variation---is yet to be explored in the practice of environmental valuation, and it has only been minimally explored in other fields. While collecting information at this level of detail is expensive, and it adds an additional layer of complexity to survey design and execution, it is unclear (i) whether variation in intra-panel attribute attendance is frequent enough to justify the extra expense; (ii) whether this degree of additional information is of relevance in non-market valuation studies, and (iii) to what extent AN-A varies across respondents and attributes. One potential advantage of monitoring choice-task AN-A in non-market valuation relates to those respondents that only occasionally ignore cost (or any other attribute) in their sequence of choices. For these respondents one still obtains some information on how they trade-off money with other attributes in at least some of the choice-task they perform. It is unclear how consistent with true AN-A behaviour these respondents' reports are when collected at the end of a series of tasks. In particular, it is unclear to what extent they can be affected by recall problems and hence be approximations, rather than truthful reports of choice behaviour.

The present study contributes to the existing literature in several ways. We set out to record AN-A at the single choice task level and we find substantial intra-panel variation. We first use logit regression to explain the probability of AN-A at the choice task level using a number of socio-economic variables, and we contrast this with a similar regression for the more commonly studied form, that of serial AN-A. Second, we explore whether accounting for choice task, rather than serial AN-A, makes a difference in terms of the magnitude and efficiency of marginal WTP estimates. Finally, we use a heteroskedastic discrete choice model to investigate the variation in the scale parameter of the Gumbel error induced by both differences across types of respondents and waves of experimental design. We find significant advantages when both heteroskedasticity and choice task AN-A are explicitly in our models.

The rest of the paper is organized as follows. Section 2 provides information about the park land under investigation. Section 3 describes the survey and the data. The methods used for data analysis are described in section 4 and the results are discussed in section 5. The last section offers some key conclusions.

## II. THE AMPEZZO DOLOMITES NATURE PARK

The Ampezzo Dolomites nature park is located in the North-Eastern Alps in Italy. It was established on 22 March 1990 by Act number 21 of the Veneto Region and spreads over an area of 11,000 hectares to the north of Cortina d'Ampezzo on the border with the region of Alto Adige (South Tyrol) in the heart of the Eastern Dolomites. The Park encompasses the ancient property jointly owned by the "*Regole d'Ampezzo*", a vast area of woodland and grassland contained within the boundaries of the local Municipality. The "*Regole*", or Family Mountain Communities, are ancient land managing bodies comprised of local families descended from the early settlers. Their purpose is to oversee the joint use and administration of pastures and forests. Believed to date back to the times of Celtic and Roman colonization, today the institution is recognized by the Italian government and epitomizes the historical and cultural traditions of the local community.

Created with the agreement of the General Board of the "*Regolieri*" (members or the Regole), the Park was entrusted by the Veneto Region to the managing competence of the Regole d'Ampezzo "... in accordance with the ancient rules laid down for the management of Ampezzo's natural heritage, preserved and defended over hundreds of years". The protected area is V-shaped, with the tip pointing northwards and wedged into the Fanes-Senes Braies Nature Park, forming within it a territory of homogeneous environmental features covering a total area of 37,000 hectares. The Park's territories are likewise homogeneous as regards the land use since neither tourist facilities, such as ski runs or lifts, nor buildings of any kind are to be found in the whole area. Some zones are dedicated to woodlands and others set aside as nature reserves. The latter are located in the best and least spoilt parts of the park and include 9 full reserves and 11 special-purpose reserves, which cover 25% of the protected area.

The Park has been recognised by the European Community as a community heritage site. Various access roads are open to visitors - from the main roads leading to the Falzarego, Cimabanche and Tre Croci passes, dozens of forest trails and paths depart

from these, creating a network 300 kilometres long. Among the tourist routes are 8 vie-ferrate and 6 equipped trails, some of which are the remains of the mountain roads used during WWI, the “Great” War.

The rich variety of habitats in the Ampezzo Dolomites - forests and grasslands, water bodies and rocks - explains the diversification found in the ecological niches where multifarious animal and floral species make their home. The geological formations existing in the Park are of sedimentary origin and date back to the Mesozoic Era, more precisely to the Middle Triassic to Lower Cretaceous period between 230 and 120 million years ago. They are made up partly of rocks like dolomia and limestone, which form detrital beds and soaring cliffs, and partly of less compact formations like clay and marl covered with more gentle wooded and grassy terrain. The main outcrop of the Ampezzo Dolomites is largely constituted of Dolomia Principale, a rock formation of the Upper Triassic derived from the sedimentation of lagoonal muds on flatlands covered with algae. The pink-orange reflection of the rocks at sunset is due to Dolomia.

### III. SURVEY AND DATA

#### *Data collection*

The data collection took place in summer 2008 in the Ampezzo Dolomites Nature Park. The survey instrument was calibrated via focus groups and a pilot study held in early summer, while the final data were collected in July, August and September, which are the most popular months for outdoor recreation in summer. Data were collected through face-to-face interviews. Respondents were selected from the population of visitors to the park and surveyed on-site at the end of their outdoor experience. Survey participants were randomly sampled within five strata based on the main purpose of the visit of the day. Interviewers were positioned at different locations in which various categories of users were likely to be intercepted. Out of X visitors transiting the area they were asked to approach one with a request to partake in the interview, the exact value of X depended on the visitor category and day of the week. The strata were defined on the basis of both the morphological characteristics of the area and the suggestions of the park management, who have years of experience and know the Park well. The most common outdoor activities suggested the following strata: (1) hikers, (2) climbers, (3) mountain bikers, (4) visitors who mainly use via-ferratas<sup>1</sup> to access vantage points in order to enjoy viewscapes and (5) visitors who were engaged in short walks and/or picnicking. The full balanced design required that 96 respondents be interviewed for each of the five strata, so that a total of 480 surveys were collected and completed to balance the design. A few incomplete surveys were eliminated and the sample was extended to substitute them with complete ones.

Attributes and attribute levels were selected on the basis of the planning aims of the park management, who were interested in having information to strategically implement management policies. Some of the attributes were expected to be more relevant to certain strata of visitors. Others were expected to be of general interest to the management and the broad population of visitors. Altogether ten attributes were included in the survey, and each of them was defined in three levels. The first attribute was the building of additional thematic itineraries, focusing on flora, fauna and historical aspects (IT\_THEMES). The area is quite well-known for endemic flower



species as well as for the historical remains of the First World War fortification and trails, since the battle front went across this area. The three levels for this attribute were 5 additional thematic itineraries (the base line), 7 (IT\_THEMES1) and 10 (IT\_THEMES2).

The second attribute concerned the network of trails and hiking paths within the Park (NET\_TRAILS), and was represented with the following levels: the current situation (350 km baseline), a proposal to decrease it to 300 km (NET\_TRAILS1), and one to increase it to 400 km (NET\_TRAILS2). To facilitate the respondent's understanding of what was involved by the proposed change, this was also expressed as a ratio (for example, describing it as 1/7 less for NET\_TRAILS1).

The third Park management attribute concerned the system of trail signs (TRL\_SIGNS). There are basically two ways to provide information about directions along Alpine trails: the vertical and the horizontal signs. Vertical signs are usually board signs placed at trail junctions and forks; whereas the horizontal signs are usually red and white paint marks on stones placed along the trails. There are two components in the description of this attribute, one is the presence of these signs and the other is the frequency with which they are encountered. The attribute levels therefore were the following. Vertical signs at the junctions only (the baseline); vertical signs at junctions plus painted signs every 200 mt along the path (TRL\_SIGNS1), and vertical signs at the junctions plus painted signs every 50 mt along the path (TRL\_SIGNS2).

The Park management was also interested to find out how visitors valued the provision of selected managed trails (MNGD\_TRAILS) in terms of technical challenge, length and effort. Accordingly, new itineraries of 1 hour, 3 hours (MNGD\_TRAILS1) and 6 hours (MNGD\_TRAILS2) were proposed and set as attribute levels. The timing combined information about both the length of the trails (in km) and the slope and terrain they would cover.

For the stratum of climbers we also included a specific policy focused on the availability of additional climbing routes. It is worth emphasizing the importance of realism in the management's proposed actions. Park visitors can both mountaineer and free-climb, because of the availability of well known rock faces and walls in the Dolomites and the various crags spread throughout the Park. Although new climbing routes on mountain faces are constantly becoming "open",<sup>2</sup> this is not something a Park can directly control because it is done by mountaineers and alpinists. What the Park management can do instead is to encourage climbers by providing new climbing itineraries along cliffs and crags (NEW\_CLIMBS). The attribute levels were therefore: 20, 40 (NEW\_CLIMBS1) and 60 (NEW\_CLIMBS2) additional climbing routes in crags.

The sixth attribute explored visitor preferences towards via-ferratas. Rather than a scenario proposing an increase in the number of via-ferratas, it seemed more plausible to propose improvements to their structural and technical aspects, such as their safety features (FERR\_SAFE). Therefore, attributes levels were: iron cable strictly necessary only along part of the path (baseline), iron cable along the whole path (FERRATA\_N1), iron cable along the whole path plus artificial holds (FERRATA\_N2).

Alpine shelters (SHELTERS) are an important aspect of Park management. These are quite common in the area and are intended to provide a place of refuge in case of sudden weather changes. They often have high quality food and local specialties. Many of these shelters are also used for an overnight sleep when two or three day excursions are planned, and an early start at altitude is necessary to complete the planned itinerary. The baseline level for this attribute was 20 alpine huts and the other two attribute levels were 3 more (SHELTERS2) or 3 less (SHELTERS1).

The perception of congestion or overcrowding is another interesting management issue for the Park management. The attribute levels were described to respondents by using the number of people met along the trails (CROWD) (i) less than 20 people, (ii) between 20 and 50 (CROWD1) people and (iii) more than 50 people (CROWD2). Visitor interest in the availability of information provided by the Park management was investigated by means of three levels describing the availability of gradually more detailed information material (INFO): (i) a leaflet with basic information about the Park area, (ii) a brochure providing additional news and info (INFO1), and a book containing an extended description of the flora, fauna and historical aspects of the protected area (INFO2).

Finally, an entrance fee was used to collect information on respondent sensitivity to the cost. This was the only attribute with four levels (2€, 5€, 7€, 10€) that was coded numerically. At present no entrance fee is required to access the Park, but this a very realistic scenario because such a fee is implemented elsewhere. A summary of all acronyms and descriptions is given in Table 1.

### *Survey design*

The overall survey design involved four separate waves for each of the five categories of visitors. At the end of waves 1-4 the data was coded and basic multinomial logit models were estimated so as to make decisions about inclusion in subsequent waves and provide priors for the efficient design of the subsequent sample wave. During these periods, which were never longer than 48 hours, data collection was paused. The first sample wave included all nine attributes and was identical for all visitor types. Subsequent waves had seven, five and three non-monetary attributes, respectively. The attributes discarded in each subsequent wave were those for which (i) either a sufficient level of significance had been obtained on the data already collected, (ii) or they were of minor interest to the specific visitor type (e.g., visitors to ferratas, for pic-nicing, for climbing and for mountain-biking). The attributes maintained were those that required either (i) a larger sample size for more accurate estimation, or (ii) were of major interest to the specific visitor type (e.g., ferratas for users of via ferrata, and climbs for climbers). In this fashion all of the eighteen parameter estimates (nine attributes times two identifiable levels for each) of Park management attributes were significantly estimated at the end of the data collection. The decision of what was of major and minor interest to each visitor group was partly evident from the results of the first wave and partly suggested by the Park management authorities and a number of previous qualitative studies.

Each sample wave used a different  $WTP_b$ -efficient fraction of the full factorial design (Scarpa and Rose 2008), developed using Bayesian priors (hence the subscript “b”) derived information collected in all previous waves following Scarpa et al. (2007),

who, instead, focused on  $D_b$ -efficiency. The first wave used priors from the pilot survey that was originally allocated an orthogonal fraction of the full factorial. Throughout the survey, each respondent was presented with 12 choice-tasks and within each wave-group, 24 visitors were surveyed which gave a balanced total sub-sample of 120 completed surveys for each wave. At the end of the fourth wave the total sample was 480 completed visitor surveys.

More specifically, attribute allocation across waves and groups varied in the following way. To obtain some initial priors, the experimental design of the first wave used all ten attributes for all five groups of recreationists. Waves 2-4 used a gradually more specialist design for each category. After the first wave, the choice tasks retained those attributes deemed more relevant for each category according to the MNL estimates obtained on the data collected thus far, and to the evaluation made by the Park management for each particular visitor category. The two attributes estimated with highest accuracy using a MNL model were also dropped. This was done so that attributes with least accurate parameter estimates could be evaluated by a larger sample size of respondents who could also dedicate more attention to their evaluation (thereby possibly inducing a higher Gumbel error scale) because the later waves had choice tasks with fewer attributes describing each alternative.

Table 2 illustrates the attributes removed from designs of different waves in each category. As each wave supplied more information about certain specialist attributes by category of recreationist, those attributes found to be estimated with sufficient accuracy were removed from the designs of later waves. The second wave had 7 attributes plus cost, the third 5 plus cost, the fourth and last three plus cost. Each wave had the same number of attributes so as to evaluate whether the various types of AN-A were dependent on the number of attributes.

The first wave had a design that consisted of 72 choice tasks blocked into 6 groups, the second had 36 choice tasks blocked into 3, the third had 24 choice tasks blocked into 2 and the fourth and last had 12 choice tasks. Each choice task comprised the no-buy option and two experimentally designed alternatives. Choice tasks were divided into separate blocks according to orthogonal, attribute and level balancing properties, so that respondents always performed 12 choice tasks in which all attribute levels appeared an equal number of times. An example of a choice task for the first wave is reported in table 3. Note that after each of the twelve choice-tasks, respondents were asked to report the attributes they ignored within each choice.

#### *Monitoring attribute attendance*

Recording attribute attendance at the choice task level was one of the salient features of this study. At the end of each choice task, respondents were invited to identify those attributes that they felt they did not pay attention to in selecting the preferred alternative. This level of recording is quite laborious, and although it had been previously considered to ask respondents to provide a ranking on the degree of attendance (e.g., ignored, somewhat attended to, .... very much attended to), this idea was abandoned during the pilot in favor of a clear-cut classification “attended to”/ “not attended to”. Serial non attendance can be reconstructed from these responses for those attributes ignored throughout the whole sequence of choice tasks evaluated by each respondent. Serial non attendance is what has commonly been used in previous studies on attribute attendance (although Puckett and Hensher (2009) is an exception).

### *Socio economics*

In the second section of the questionnaire, we collected socio-economic data and asked some information about the respondent's attitude toward mountain activities. Looking at the sample characteristics, the average age of the respondents is 41 years old. Seventy-seven percent of those interviewed are men. This is unsurprising considering that some of the activities (e.g., climbing) are practiced by males. Thirty-one percent of the sample has a university degree, which is definitely a large fraction by Italian standards. The average family size is 3.5 members and 49 percent of the respondents have dependents under 18 years of age.

## IV. DATA ANALYSIS

### *Objectives*

We are interested in three issues. First we explore the marginal effects of socio-economic determinants on the probability of exercising the two forms of AN-A. Then we explore whether accounting for choice task, rather than serial AN-A, makes a difference in terms of model fit and efficiency of welfare estimates. Thirdly, we account for scale variation (heteroskedasticity) of the Gumbel error induced by differences across types of respondents and wave of design. We tackle here in turn the econometric issues raised by each of these objectives.

### *Determinants of non-attendance*

To explain AN-A, we use a probability model estimated on the binary response indicating whether a given attribute has been attended to ( $y_{ntk}=0$ ) or not ( $y_{knt}=1$ ) for each attribute  $k$ , respondent  $n$ , and choice-task  $t$ . This probability is conditional on the attribute being presented to the respondent so that the respondent had the opportunity to evaluate it. Here we have two types of response variable: One denoting serial AN-A, another denoting choice-task AN-A.

Using a binary logit model we specify the AN-A probability as:

$$\Pr(y_{knt}=1) = [\exp(\gamma' \mathbf{z}_{knt})]^{-1} \quad [1]$$

The vector  $\mathbf{z}$  of covariates includes selected socio-economic variables and attribute-specific dummy variables to identify attribute-specific effects. Of particular interest are the marginal effects that these variables have on the probability of AN-A. These are multivariate functions and hence they depend on the values at which they are computed. We choose to compute them at the means of the other variables, and report the means of these over all observations. For dummy variables these effects are computed as the discrete difference in probability in the presence and absence of the estimated dummy coefficient. We do not have a specific expectation as to which socio-economic variables will be of significance here. Therefore this analysis is exploratory.

### *Accounting for choice-task Non-Attendance in RUMs*

We investigate whether or not including information on AN-A at the choice task level systematically affects model fit and estimates of welfare measures. To conduct this analysis we use a utility function that can account for AN-A both serially and at the choice-task level, as follows.

Multiplicative 0-1 selectors for attribute availability in the utility function were built for each attribute  $k$ , survey wave  $w$  and visitor category  $c$ , which we denote as  $\delta_{kwc}$ . Two types of similar multiplicative 0-1 attribute-attendance selectors were also

created from the attribute attendance statements recorded after each choice task  $t$ . The first referred to each attribute  $k$ , respondent  $n$ , and choice-task  $t$ , or  $\tau_{knt}$ ; while the second indicated serial AN-A and was built as  $\tau_{kn} = \prod_t \tau_{knt}$ .

The linear utility index for alternative  $i$  in choice-task  $t$  for respondent  $n$  is defined compactly as:

$$U_{int} = V_{kint} + \varepsilon_{kint} = \sum_k \tau_{knt} \delta_{kwc} \beta_{knt} x_{kint} + \varepsilon_{kint}, \quad [2]$$

which leads to the following multinomial logit probability for the selection of alternative  $i$ :

$$\Pr(i) = \exp(\lambda_{wc} V_{kint}) / \sum_j \exp(\lambda_{wc} V_{kjnt}), \quad [3]$$

where the scale parameter  $\lambda_{wc} = \exp(\boldsymbol{\theta}' \mathbf{s}_{wc})$  to ensure non-negativity, and  $\boldsymbol{\theta}$  is a vector of parameters of variables  $\mathbf{s}_{wc}$  affecting the relative scale of the Gumbel error, such as dummy variables for sampling waves  $w$  with different experimental designs and type of attribute combinations for different visitor categories  $c$  in the choice set. This multiplicative scale makes the model a heteroskedastic multinomial logit with the scale parameter of the Gumbel error varying across respondent types exposed to different designs, which implies high nonlinearity of the sample log-likelihood. This recognizes that choices may be more or less probabilistic depending on whether the Gumbel error has lower or higher scale, as first described in Hausman and Ruud (1987) for rank-ordered exploded logit models, but also addressed in Swait and Louviere (1993), De Shazo and Fermo (2002), and Scarpa et al. (2003), amongst others, in the context of multinomial logit models. Attribute levels, which were dummy-coded, have the three levels of all non-monetary attributes coded as (0,0) for the base level, (1,0) for the first level and (0,1) for the highest level. The access fee was coded numerically. The estimation was conducted with BIOGEME (Bierlaire 2003) using the CFSQP algorithm to handle local maxima (Lawrance et al. 1997).

## V. RESULTS

### *What explains the probability of Attribute Non-Attendance?*

Figure 1 reports the number of respondents (in percent) that reported serial AN-A (light shade) and choice-task AN-A (darker shade). Each of the ten investigated attributes has a dedicated panel describing the frequency of those non-attending by visitor category and by wave (w1, w2, w3 and w4). The result of relevance here is the high frequency of dark coloured segments observed that indicate the fraction of respondents exhibiting AN-A at the choice task level only. We note that these tend to dominate the light coloured areas indicating serial AN-A behaviour, especially in early waves, which were those with a higher number of attributes. This result suggests that monitoring this behaviour at the choice-task level is particularly informative in multi-attribute choice contexts. Choice-task AN-A is also frequently observed for some technical attributes by visitor types who are expected to be interested in them. This is evident in the case of “climbing routes” by climbers, and of “ferratas” by those stating that using ferratas was the main purpose of their visit on the day of the interview. Interestingly, the cost attribute is ignored in up to 20 percent of choice-tasks, while it never exceeds 5 percent in terms of serial AN-A. Choice-task AN-A may be triggered by particular attribute *levels*, or combinations of levels of one attribute in one alternative and the absence/presence of levels of other attributes in other alternatives. Serial AN-A cannot tease these effects out. We tried to explore this speculation practically, by explaining the probability of choice-task AN-A with

various quantitative measures accounting for these causes. For example, Cameron and DeShazo (2008) propose a theory of attention allocation to attributes in which attendance is dependent on the ability of an attribute to make a given alternative in the choice task the “clear winner”. This theory predicts a number of measures that can be built from the data and estimates of taste-intensities in the indirect utility functions. We computed a number of these measures using individual-specific estimates (conditional on observed choice) of taste-intensities. We then used them as explanatory variables in binary logit regressions explaining the probability of stated attendance for each attribute. We were only able to find one measure (termed by the authors “own-lead”) that was consistently significant and with the expected positive sign in nine out of the 10 attributes.<sup>3</sup>

Note that for some categories of visitor some attributes were only used in earlier waves. So that, for example, *thematic itineraries* (IT\_THEMES) was omitted from all but the first wave of visitors interested in either climbing (climbers) or in ferratas, as well as in the fourth wave of Mountain Bikers. However, it was included in all four waves for hikers and picnickers, who are obviously interested in this attribute. To prevent these omissions from interfering with the test for AN-A the estimated logit regressions were all conditional on the attribute being evaluated by respondents because it had been presented to them in their choice situations.

Table 4 reports the results of the logit model explaining the probability of AN-A from the pooled sample, as well as the estimated marginal effects of each explanatory variable on such probability, or  $\partial P/\partial x$ . To ease interpretation we also report the estimated marginal effects on the probability of attendance obtained by computing the arc-difference suitable for dummy-coded variables. The alternative specific constant (ASC) for an entrance fee was omitted to allow model identification. Non-attendance to cost is hence to be considered the baseline in interpreting the signs of the other attributes. As can be seen all the significant ASCs have a negative sign. This suggests that all else being equal, the entrance fee was the most frequently non-attended attribute in both probability regressions according to these self-reports. This might be due to the fact that the range of levels used was sufficiently small to present little relevance to many respondents (for example, it was not of a magnitude to be perceived as pivotal by many) and/or to the hypothetical nature of the payment (for example, many might have thought an entrance fee to be not applicable in real life to a public Park land).

Comparatively high proportions of non-attendance to cost have also been found in other contexts (e.g., Scarpa et al. 2009). All else being equal, new climbs (NEW\_CLIMBS) and number of ferratas (FERRAT\_N) were attributes with the highest probability of being serially attended to, while theme-based itineraries (IT\_THEMES), information provision (INFO) and extending the network of trails (NET\_TRAILS) were the most serially non-attended after cost.

The results explaining AN-A at the choice-task level, on the other hand, tell quite a different story. We note that theme-based itineraries (IT\_THEMES) and trail signs (TRL\_SIGNS) are the attributes most likely to be attended to, while the entrance fee, new climbs (NEW\_CLIMBS) and crowding (CROWD) are those least frequently attended to in choice-task AN-A (within the attribute range considered). There are strong differences between serial and choice-task non-attendance also in terms of the effects of socio-economic variables. For serial AN-A only log of income (LN\_INCM)

and family size (FAMILY\_SZ) do not significantly affect the probability of AN-A. For choice-task AN-A—instead—these two variables are amongst the most significant, along with age, which enters the function with a squared non-linear effect.

The effect on AN-A of visitor types is to be evaluated with reference to the missing type, which is that of hikers. All four visitor types have a significant difference from hikers for the logit model on serial AN-A. This results in small marginal probability effects of varying directions. With respect to hikers, visitors going on ferratas (FERRATA) and mountain bikers (MT\_BIKE) show a higher propensity to serially AN-A, while climbers (CLIMBER) and picnic (PICNIC) visitors show a relatively lower propensity. For the logit on choice-task AN-A, instead, visitors going on ferratas are not significantly different from hikers, while the other three groups are. They consistently show a lower propensity to attend than hikers, with much higher marginal probability effect estimates than those for serial AN-A. Finally, the wave effect is always significant in both models and it is measured against the fourth and last wave. These effects account for the number of attributes, the higher the wave the lower the number of attributes. Wave effects also differ in terms of both signs and magnitudes between serial and choice task. In both models the results suggest that in waves 3 and 4, with respectively 6 and 4 attributes, the propensity to state AN-A was higher than in waves 1 and 2, with respectively 10 and 8 attributes. This might be due to the respondents' relative inability to identify exactly which attributes are being considered when there are many used in describing alternatives. However, this effect might also be in part a consequence of the fact that attributes with low significance coefficient estimates in early waves were retained in subsequent waves so as to increase sample size and achieve overall model significance. Higher frequency of non-attendance in later waves might be induced by low relative relevance of the attributes maintained in the design.

The inclusion of indicators of order in the sequence of choice amongst the regressors for choice-task AN-A was never significant. In the presence of either learning or fatigue, one could expect that as respondents progress over the sequence of choice tasks, the probability of attendance might decrease. The result suggests that in our case there appear to be no obvious systematic effect on AN-A by fatigue or learning.

To ease comparison between serial and choice-task AN-A regressions we report (in the last column to the right) the ratios of the marginal probability effects at the sample means (the ratios of the values are in the eighth and fourth columns from the left). These have an average value of 7.7. So, the regression results vary greatly in both ranking and magnitude from the serial to the choice-task AN-A.

#### *Accounting for AN-A at the choice task level in RUMs*

Scale (or variance) heterogeneity may be induced by variation in attribute inclusion and exclusion as well as changes in the experimental design across sample waves and visitor types. To explore this we estimated three sets of models going from (A) which was used as the baseline and had a scale parameter set equal to 1, to (B) a specification where scaling is only associated with visitor categories, to (C) where scaling is associated with visitor categories *and* experimental design type. For each of these we explored the effect of AN-A by moving from (1) no knowledge of AN-A (i.e.  $\tau_{knt} = 1, \forall k, n, t$ ), to (2) only serial AN-A (equivalent to Campbell et al. 2008 and Carlsson et al. 2008), to (3) choice-task AN-A. Table 5 reports the statistics of model fit to the data of the resulting 3×3 set of specifications. As can be seen from the values

of the criteria for model fit, accounting for scaling effect by category (row B.) and category and wave (row C.) matters. Serial AN-A (columns 4-6), instead, provides a worsening of fit with respect to the conventional model where attendance is ignored (columns 1-3). The best fitting specifications are provided by the unrestricted model under the utility specification accounting for choice-task AN-A statements (columns 7-9) with scale parameter expressed as function of both visitor categories *and* wave of experimental design (columns 7-9, row C.). We hence conclude that information on AN-A at the choice-task level improves model fit.

*Effect on the magnitude of WTP estimates*

Of practical importance are the differences in the magnitudes of marginal WTP estimates across model types. Table 6 reports these estimates for the 9 models, while Table 7 reports separately the estimates for  $\theta$  concerning the effects on the scale parameters of the Gumbel errors. Unlike utility coefficients, WTP estimates of discrete choice models are directly comparable across models because they are not confounded by the scale parameter of the Gumbel error. Examining Table 6, it can be seen that the attribute levels with the highest WTP estimates are for avoiding the highest levels of crowding (CROWD2), avoiding a decrease in the extension of the network of trails (NET\_TRAILS1) and obtaining the highest increase of thematic itineraries (IT\_THEMES2), independent of the model examined. These results are robust to specification choice, at least over our range of models. The results for specifications of models accounting for scale variation also tend to suggest that the highest level of provision of new climbing routes (NEW\_CLIMBS2) is quite highly valued, and so is the avoidance of even the lower of the two proposed degree of crowding increases (CROWD1). In general, though, accounting for serial AN-A suggests higher values than when accounting for choice-task AN-A. For many attributes, more elaborate heteroskedasticity models (C.) deliver higher WTP estimates. Whether accounting for attribute processing heuristics, such as serial or choice-task AN-A, is going to affect WTP estimates systematically in a given direction remains mostly an empirical question. A similar statement can be made for the issue of accounting for variance differences across designs and visitor types in estimation via heteroskedastic models. To assess this issue in our estimates, we report a table (Table 8) with ratios between the WTP estimates in € from models with serial and choice-task AN-A. Such proportions are reported for all three treatments of heteroskedasticity. Negative signs in this table indicate that the estimates of the two models have opposite signs, but this happens in relatively few instances. We focus on the best performing models reported in the last two columns on the right and note that there are four sign changes for serial/ignored and one for choice-task/ignored. The number of ratios greater than one is 5 out of 17 for choice-task/ignored and 10 out of 14 for the serial/ignored. So, choice-task AN-A tends to imply smaller WTP estimates than in models where AN-A is either ignored, or only accounted for when it is serial. The most important issue to all types of visitors seems to be avoiding high levels of congestion (CROWDS2), as well as avoiding a decrease in the network of trails (NET\_TRAILS1). The latter is a particularly important practical finding since the exploration of the multi-dimensionality of demand for trails was one of the main issues of interest to the Park management. This is an instance in which multi-attribute stated-choice approaches show their advantage over contingent valuation. The demand for trails appears to be strongest for the physical length of the network (NET\_TRAILS2) according to the best performing models and for the degree of physical challenge that the trails offer to visitors (MNGD\_TRAILS2). Upgrading



from the cultural viewpoint (IT\_THEMES2) and avoiding a decrease in the number of Alpine shelters (SHELTERS2), also seem to be strong preferences. Respondents of all types seem to manifest a high WTP for these attributes when expressed at the highest policy level investigated here. The value of the information policies explored here seems to be low, and sometimes not significantly different from zero (INFO1 and INFO2). Low interest is also displayed for additional signals along the trails (TRL\_SIGNS1 and TRL\_SIGNS2). Amongst the specialist attributes, we note that the management policy offering the highest level of creation of new climbs is indicated as highly valued by the best performing models.

Another cross-model comparison of special interest in non-market valuation relates to the size of the approximate asymptotic  $t$ -values, which in our case relates to the efficiency of marginal WTP estimates. The larger the approximate  $t$ -value, the larger the accuracy in WTP estimation. We computed  $t$ -values for WTPs using standard errors approximated by the delta method (Goldberger, 1993) and in Table 9 we report the number of cases in which the resulting  $t$ -values have higher values than those in the MNL model un-scaled with ignored attribute attendance. As can be seen there is an improvement in efficiency delivered by both scaling and accounting for AN-A.

## VI. CONCLUSIONS

In multi-attribute studies with stated preferences, respondents are presented with choice tasks containing alternatives that are succinctly described by attributes and their levels. The selection of attributes to include in the scenario is normally partly imposed by the objectives of the study, and partly derived from the outcome of focus groups and pilot studies. However, the degree of attendance that each respondent displays during the process of evaluating alternatives to provide an indication of a favorite one often goes unmonitored. Attendance is likely to be varied across respondents because personal relevance and cognitive ability also vary. However, there are reasons that can motivate a variation in attendance to attributes, even within the sequence of choices made by the same respondent. For example, respondents may learn that some attributes have a satisfying range of levels so that they are considered to be non-pivotal. Or, respondents can rationally evaluate that the expected cost of attribute evaluation exceeds the expected benefits during a rational allocation of attention to tasks (Gabaix et al. 2003, Cameron and DeShazo (2008)). A limitation of our study is its limited ability to clearly differentiate between the potential sources of AN-A. While these issues are left as topics for future research in non-market valuation, our study provides some substantive findings in this regard. While across-respondent variation of attribute attendance has been previously studied and found to affect WTP estimates, attendance was poorly explained by socio-economic covariates (Carlsson et al., 2008). In contrast, we find that AN-A is significantly explained by socio-economic variables as well as visitor and attribute types. We also find that these determinants imply very different effects in choice-task and serial AN-A.

This study is amongst the first to explicitly focus on intra-respondent variation of attribute attendance at the single choice-task level and to find this variation to be of substantive importance. In this survey we value nine park management attributes in the North Eastern Alps in Italy, and find that accounting for effects of “choice task” AN-A appears to improve the statistical model performance. Our results show that addressing both choice-task AN-A and heteroskedasticity due to differences in

experimental design and to visitor types separately improves both model fit and the efficiency of marginal WTP estimates.

Altogether the investigation illustrates well the methodological advantage of (a) monitoring for AN-A at each choice task in the sequence, rather than only at the end of the whole sequence of responses (as implied by serial AN-A), and (b) adequately accounting for obvious sources of heteroskedasticity. The efficiency gains obtained in WTP estimation may be seen by many as sufficiently high to justify the extra-time required to collect AN-A statements from respondents at the choice-task level. The WTP estimates obtained from the model incorporating such statements would also appear to be of a magnitude more consistent with the expectation of the Park management.

Important conclusions can be drawn for the management of the Alpine Park of Cortina d'Ampezzo. The attributes we explored included both management attributes of general interest and more specific policies for certain groups. The choice experiment allowed us to explore the multi-dimensionality of value for policies addressing the length of and improvements to the network of trails, as well as the length of climbing routes and the number of alpine shelters. Avoiding high levels of crowding emerged as the highest concern in this population of visitors, something that might suggest the need to regulate access in future, perhaps via the inclusion of access fees which may be efficiently calibrated to visitor types according to figures suggested by our findings.

## REFERENCES

- Bierlaire, M. 2003. "BIOGEME: A Free Package for the Estimation of Discrete Choice Models." Paper presented at the 3rd Swiss Transport Research Conference Monte Verita, Ascona, March 2003.
- Cameron, T.A. and DeShazo J.R. 2008. "Differential Attention to Attributes in Utility-theoretic Choice Models" Forthcoming in *Journal of Choice Modeling*.
- Campbell, D., W. G. Hutchinson, and R. Scarpa. 2008. "Incorporating Discontinuous Preferences into the Analysis of Discrete Choice Experiments." *Environmental and Resource Economics*, 41:401-417.
- Caparros, A., J. L. Oviedo and P. Campos. 2008. "Would you Choose your Preferred Option? Comparing Choice and Recoded Ranking Experiments." *American Journal Agricultural and Resource Economics*, 90:843-855.
- Carlsson, F., M. Kataria and E. Lampi. 2008. "Ignoring attributes in choice experiments." Proceedings of EAERE Conference, 25-28 June 2008, Gothenburg, Sweden.
- Danalet, A. 2009. "An empirical investigation of the determinants of attention to attributes in choice experiments." MSc Thesis, EPFL, Lausanne.
- DeShazo, J.R. and G. Fermo. 2002. "Designing choice sets for stated preference methods: the effects of complexity on choice consistency." *Journal Environmental Economics and Management*, 44:123-143.

- Ferrini, S. and R. Scarpa. 2007. "Designs with a-priori information for nonmarket valuation with choice-experiments: a Monte Carlo study." *Journal of Environmental Economics and Management*, 53:342–363.
- Gabaix, X. Laibson D., Moloche G. And Weinberg S. 2003. "The Allocation of Attention: Theory and Evidence." Working Paper 03-31 Massachusetts Institute of Technology, Department of Economics.
- Gilbride, T. J., Allenby, G. M. and Brazell, J. D. 2006. "Models for heterogeneous variable selection." *Journal of Marketing Research*, 43:420–430.
- Goldberger, A. 1993. *A Course in Econometrics*. Harvard University Press, Chicago
- Hausman, J. and P. Ruud 1987. "Specifying and Testing Econometric Models for Rank-Ordered Data." *Journal of Econometrics*, 34:83-103.
- Hensher, D.A. and J.M. Rose 2009 "Simplifying choice through attribute preservation or non-attendance: implications for willingness to pay." Forthcoming in *Transportation Research E*.
- Hensher, D.A., J.M. Rose and W.H. Greene. 2005. "The implications on willingness to pay of respondents ignoring specific attributes." *Transportation* 32: 203–222.
- Hess, S. and Hensher, D.A. 2009. "Using conditioning on observed choices to retrieve individual-specific attribute processing strategies." Forthcoming in *Transportation Research B*.
- Holmes, T. and K. Boyle. 2005. "Dynamic Learning and Context-Dependence in Sequential, Attribute-Based Stated-Preference Valuation Questions." *Land Economics*, 81:114-126.
- Lawrence, C., J. Zhou, and A. Tits. 1997. "User's Guide for CFSQP Version 2.5: A C Code for Solving (large scale) Constrained Nonlinear (minimax) Optimization Problems, Generating Iterates Satisfying all Inequality Constraints." *Technical Report TR-94-16r1*, Institute for Systems Research, University of Maryland, College Park, MD 20742.
- Puckett, S. and D.A. Hensher 2009. "Revealing the extent of process heterogeneity in choice analysis: An empirical assessment." *Transportation Research A*, 43 (1):117-126
- Rigby, D. and Burton, M. 2006. "Modeling Disinterest and Dislike: A Bounded Bayesian Mixed Logit Model of the UK Market for GM Food." *Environmental and Resource Economics*, 33:485-509
- Scarpa, R., A. Drucker, S. Anderson, N. Ferraes-Ehuan, V. Gomez, C. R. Risopatron and O. Rubio-Leonel. 2003. "Valuing Animal Genetic Resources in Peasant Economies: The Case of the Box Keken Creole Pig in Yucatan." *Ecological Economics*, 45:427-443.
- Scarpa, R. and J. M. Rose. 2008. "Design efficiency for non-market valuation with choice modelling: how to measure it, what to report and why." *Australian Journal of Agricultural and Resource Economics* 52:253-282.
- Scarpa, R., D. Campbell and W. G. Hutchinson. 2007. "Benefit estimates for landscape improvements: sequential Bayesian design and respondents' rationality in a choice experiment study." *Land Economics*, 83(4):617-634.

- Scarpa, R., T. J. Gilbride, D. Campbell and D. A. Hensher. 2009. "Modelling attribute non-attendance in choice experiments for rural landscape valuation." Forthcoming in *European Review of Agricultural Economics*, 36(2)
- Swait, J. and J.J. Louviere. 1993. "The role of the scale parameter in the estimation and comparison of multinomial logit models." *Journal of Market Research*, 30:305–31.

## Tables

### TABLE 1

ATTRIBUTES DESCRIPTION.

Acronym	Attribute description
IT_THEMES1	Building of 5 additional thematic itineraries, focusing on flora, fauna and historical aspects
IT_THEMES2	Building of 7 additional thematic itineraries, focusing on flora, fauna and historical aspects
NET_TRAILS1	Decrease the network of trails and hiking paths to 300 km
NET_TRAILS2	Increase the network of trails and hiking paths to 400 km
TRL_SIGNS1	Vertical signs at junctions plus painted signs every 200 mt along the path
TRL_SIGNS2	Vertical signs at junctions plus painted signs every 50 mt along the path
MNGD_TRAILS1	New challenge itineraries of 3 hours
MNGD_TRAILS2	New challenge itineraries of 6 hours
NEW_CLIMBS1	New 40 climbing itineraries along cliffs and crags
NEW_CLIMBS2	New 60 climbing itineraries along cliffs and crags
FERRATA_N1	Iron cable along the whole path
FERRATA_N2	Iron cable along the whole path plus artificial holds
SHELTERS1	Decrease of 3 alpine shelters
SHELTERS2	Increase of 3 alpine shelters
CROWD1	Number of people met along the trails (20-50)
CROWD2	Number of people met along the trails (more than 50)
INFO1	Brochure providing a little more than basic information of the area
INFO2	Book containing an extended description of the floristic, historic aspects and the wildlife of the protected area
COST	Entrance fee

TABLE 2.  
EXCLUDED ATTRIBUTES IN THE EXPERIMENTAL DESIGN FOR GROUP AND WAVE.

Outdoor group	Second wave	Third wave	Fourth wave
Hikers	Climbing routes, vie-ferrate	Trails, challenging excursions	Trail signs, alpine huts
Picnickers	Climbing routes, vie-ferrate	Trails, challenging excursions	Alpine huts, congestion
Mountain Bikers	Climbing routes, vie-ferrate	Trails, trail signs	Thematic itineraries, alpine huts
Vie-ferrate users	Thematic itineraries, climbing routes	Vie-ferrate, trails	Challenging excursions, information
Climbers	Thematic itineraries, challenging excursions	Trails, climbing routes	Vie-ferrate, alpine huts

TABLE 3.  
EXAMPLE OF CHOICE TASK IN CHOICE EXPERIMENT OF THE FIRST WAVE.

Which of the following alternative would you choose?	Alternative A	Alternative B	Neither
Thematic itineraries (n.)	5 in addition	5 in addition	
Trails (km)	350 (baseline)	300 (1/7 less)	
Trail signs	vertical + horiz. 200m	vertical only	
Excursions (hours)	6	1	
Climbing routes (n.)	40 in addition	20 in addition	
Vie-ferrate	Complete iron cable	Complete iron cable + artif. holds	
Alpine huts (n.)	23 (3 in addition)	17 (3 in addition)	
Congestion (n. of people)	between 20 e 50	more than 50	
Information	leaflet	brochure	
Entrance fee (€)	2	2	
Choice			

Which of the following attributes have you ignored? Environmental itineraries , trails , trail signs , excursions , climbing routes , vie-ferrate , alpine huts , congestion , information , entrance fee

TABLE 4.  
ESTIMATES OF PROBABILITIES OF AN-A AND MARGINAL EFFECTS.

Non-attendance	Serial				Choice-task				C-T/Serial
	coeff.	t-val.	$\partial P/\partial x$	t-val.	coeff.	t-val.	$\partial P/\partial x$	t-val.	ratios $\partial P/\partial x$
Constant	1.37	(0.5)	0.015	(0.5)	2.31	(6.8)	0.290	(6.8)	19.4
<i>ASCs</i>									
IT_THEMES	-0.90	(2.1)	-0.007	(2.7)	-1.82	(29.2)	-0.137	(49.4)	19.5
NET_TRAILS	-1.37	(2.1)	-0.009	(3.3)	-1.71	(22.8)	-0.129	(40.8)	14.3
TRL_SIGNS	-1.84	(3.3)	-0.012	(4.7)	-2.05	(34.5)	-0.153	(57.3)	13.3
MNGD_TRAILS	-1.73	(2.8)	-0.010	(4.3)	-1.27	(22.2)	-0.110	(33.0)	10.5
NEW_CLIMBS	-2.06	(2.0)	-0.010	(4.1)	-1.12	(14.0)	-0.098	(21.5)	9.3
FERRAT_N	-2.32	(2.2)	-0.011	(4.6)	-1.29	(18.1)	-0.108	(28.6)	9.5
SHELTERS	-1.80	(3.2)	-0.011	(4.6)	-1.51	(28.5)	-0.127	(42.7)	11.3
CROWD	-1.79	(3.6)	-0.012	(4.7)	-0.98	(22.6)	-0.096	(28.8)	8.2
INFO	-1.27	(3.1)	-0.009	(3.8)	-1.39	(29.5)	-0.123	(41.2)	13.2
<i>Socio economic covariates</i>									
UNI_DEGREE	-0.38	(1.3)	-0.004	(1.2)	-0.06	(1.8)	-0.007	(1.8)	1.6
FAMILY_SZ	-0.06	(0.5)	-0.001	(0.5)	-0.03	(2.6)	-0.004	(2.6)	6.8
NMBR_KIDS	-0.56	(2.3)	-0.006	(2.4)	0.03	(1.7)	0.004	(1.7)	-0.7
WOMAN	0.37	(1.2)	0.004	(1.1)	0.01	(0.4)	0.002	(0.4)	0.4
AGE	-0.08	(2.4)	-0.001	(2.3)	0.02	(3.9)	0.002	(3.9)	-2.4
AGE_SQ	6.91	(2.9)	0.075	(2.7)	-0.56	(1.7)	-0.070	(1.7)	-0.9
ALP_CLUB	0.50	(1.7)	0.006	(1.6)	0.05	(1.5)	0.006	(1.5)	1.0
LN_INCM	-0.17	(0.5)	-0.002	(0.5)	-0.34	(9.5)	-0.043	(9.5)	23.8
<i>Visitor type</i>									
FERRATA	0.26	(0.6)	0.003	(0.6)	-0.02	(0.4)	-0.002	(0.4)	0.7
CLIMBER	-0.31	(0.7)	-0.003	(0.7)	-0.18	(4.0)	-0.022	(4.1)	7.1
PICNIC	-0.37	(0.9)	-0.004	(1.0)	-0.11	(2.5)	-0.014	(2.6)	3.8
MT_BIKE	0.27	(0.7)	0.003	(0.6)	-0.23	(5.1)	-0.027	(5.3)	-8.6
<i>Wave</i>									
WAVE2	-0.26	(0.7)	-0.003	(0.7)	0.25	(6.3)	0.033	(6.1)	-12.1
WAVE3	0.39	(1.1)	0.005	(0.9)	0.81	(19.9)	0.118	(17.5)	25.0
WAVE4	0.53	(1.4)	0.007	(1.2)	0.89	(20.3)	0.139	(17.2)	19.6
<i>Predicted</i>									
	<i>Actual</i>	<i>Y = 0</i>		<i>y = 1</i>		<i>Predicted</i>			
	<i>y = 0</i>	3,293		2		<i>y = 0</i>		<i>y = 1</i>	
	<i>y = 1</i>	65		0		32,900		539	
	<i>Total</i>	3,358		2		6,388		493	
						39,288		1,032	
<i>Diagnostics</i>									
Observations		3,360				40,320			
Observations		3,360				40,320			
lnL		-278.41				-16,703.33			
Mean lnL		-0.08286				-0.4142			



TABLE 5.  
INDICATORS OF MODEL PERFORMANCE

<u>Scaling</u>	Parameters	Non-attendance								
		1. Ignored			2. Serial			3. Choice-task		
		log-L	BIC	AIC	log-L	BIC	AIC	log-L	BIC	AIC
A. Unscaled	20	-5690.2	11553.6	11420.4	-5865.1	11903.4	11770.2	-4373.8	8920.8	8787.6
B. Scaled by category	24	-5656.5	11520.7	11360.9	-5849.5	11906.8	11747.0	-4369.5	8946.8	8787.0
C. Scaled by wave and category	39* -30**	-5611.9	11561.4*	11301.7*	-5627.3	11514.4**	11314.6**	-4178.3	8616.4**	8416.7**

TABLE 6.  
MARGINAL WTP ESTIMATES.

Non-attendance Parameters	A. MNL unscaled			B. MNL scaled by visitors category			C. MNL scaled by (selected)		
	1. Ignored <sup>+</sup>	2. Serial	3. Choice-task	1. Ignored <sup>+</sup>	2. Serial	3. Choice-task	1. Ignored <sup>+</sup>	2. Serial	3. Choice-task
	WTP  t-val.	WTP  t-val.	WTP  t-val.	WTP  t-val.	WTP  t-val.	WTP  t-val.	WTP  t-val.	WTP  t-val.	WTP  t-val.
IT_THEMES1	0.43 (1.4)	0.83 (2.0)	0.76 (4.9)	0.20 (0.7)	0.74 (1.9)	0.73 (4.8)	0.38 (1.2)	3.74 (6.9)	1.03 (6.7)
IT_THEMES2	2.08 (7.1)	3.84 (8.7)	1.72 (12.1)	1.80 (7.0)	3.60 (8.9)	1.70 (12.0)	2.59 (8.3)	7.51 (10.9)	2.29 (15.4)
NET_TRAILS1	-4.47 (10.3)	-5.34 (8.3)	-1.85 (9.2)	-3.73 (9.4)	-5.50 (8.5)	-1.84 (9.2)	-7.31 (10.6)	-16.47 (7.9)	-2.53 (9.3)
NET_TRAILS2	-1.25 (3.7)	0.35 (0.8)	-0.11 (0.7)	-0.98 (3.1)	0.61 (1.4)	-0.07 (0.5)	-1.19 (2.3)	1.74 (1.4)	0.05 (0.2)
TRL_SIGNS1	1.36 (4.8)	1.75 (4.7)	0.95 (7.1)	1.06 (4.2)	1.36 (3.7)	0.95 (7.1)	1.44 (4.8)	2.62 (8.2)	0.94 (7.7)
TRL_SIGNS2	1.25 (4.2)	1.04 (2.9)	0.80 (5.8)	1.19 (4.3)	0.83 (2.3)	0.78 (5.7)	1.95 (5.8)	1.48 (6.1)	0.67 (5.8)
MNGD_TRAILS1	-0.53 (1.6)	-0.48 (0.9)	0.41 (2.5)	-0.63 (1.9)	-0.11 (0.2)	0.42 (2.6)	0.59 (1.5)	0.84 (2.7)	0.88 (5.6)
MNGD_TRAILS2	1.14 (3.8)	1.92 (4.0)	0.90 (6.1)	1.00 (3.4)	2.21 (4.6)	0.90 (6.0)	4.28 (10.9)	2.26 (6.1)	1.24 (7.9)
NEW_CLIMBS1	-1.17 (2.7)	-0.43 (0.7)	0.12 (0.5)	-1.01 (2.5)	-0.81 (1.2)	0.09 (0.4)	-1.77 (2.4)	-1.99 (1.0)	-0.09 (0.3)
NEW_CLIMBS2	1.05 (2.5)	3.82 (6.2)	1.37 (6.6)	0.92 (2.3)	3.50 (5.6)	1.34 (6.6)	1.32 (1.8)	10.76 (5.8)	1.69 (6.0)
FERRATA_N1	-0.02 (0.1)	0.50 (0.9)	0.65 (3.6)	0.12 (0.3)	0.46 (0.8)	0.64 (3.6)	-2.50 (3.5)	2.05 (4.2)	1.06 (5.5)
FERRATA_N2	0.22 (0.6)	0.95 (1.7)	0.52 (2.7)	0.14 (0.4)	0.15 (0.3)	0.48 (2.5)	0.01 (0.1)	-3.66 (5.4)	0.59 (2.5)
SHELTERS1	-1.62 (5.5)	-1.88 (4.1)	-1.19 (8.1)	-1.45 (5.2)	-1.98 (4.3)	-1.21 (8.3)	-2.55 (6.4)	-2.64 (4.6)	-1.60 (10.2)
SHELTERS2	0.40 (1.3)	0.17 (0.4)	0.23 (1.6)	0.51 (1.8)	0.17 (0.4)	0.22 (1.6)	0.64 (1.6)	0.74 (1.6)	0.31 (2.5)
CROWD1	-2.18 (7.9)	-3.18 (5.8)	-1.38 (10.9)	-2.06 (7.9)	-3.04 (5.7)	-1.38 (10.9)	-2.95 (9.3)	-3.21 (7.2)	-1.50 (12.3)
CROWD2	-4.01 (12.1)	-7.29 (9.7)	-3.81 (20.5)	-3.85 (12.5)	-7.50 (10.0)	-3.82 (20.5)	-5.30 (13.8)	-10.27 (7.7)	-4.12 (20.1)
INFO1	-0.08 (0.3)	0.86 (2.5)	-0.36 (2.9)	-0.17 (0.7)	0.79 (2.4)	-0.36 (2.9)	-0.05 (0.2)	0.17 (0.8)	-0.39 (3.4)
INFO2	-0.11 (0.4)	0.56 (1.5)	-0.16 (1.2)	-0.15 (0.6)	0.42 (1.2)	-0.16 (1.2)	-0.43 (1.6)	-0.17 (0.8)	-0.19 (1.7)
Status quo	-8.12 (22.6)	-1.62 (6.4)	-4.16 (28.2)	-7.81 (23.4)	-1.74 (7.0)	-4.18 (28.4)	-8.00 (22.6)	-1.00 (6.1)	-3.92 (28.2)

(<sup>+</sup>) This indicates that full attendance was assumed.

1  
2  
3  
4

TABLE 7.  
SCALE PARAMETERS OF THE ESTIMATED MODELS

<i>Scale parameter</i>	B. MNL scaled by visitors category					
	1. Ignored		2. Serial		3. Choice-task	
$\theta$	Beta	t-val.	Beta	t-val.	Beta	t-val.
Hikers	fixed		fixed		fixed	
Via-ferratas recreationists	0.74	(3.26)	0.51	(6.28)	0.93	(1.08)
Climbers	0.97	(0.35)	0.85	(1.50)	1.12	(1.54)
Picnickers	1.42	(3.42)	0.98	(0.24)	1.06	(0.86)
Mountainbikers	0.68	(3.88)	0.95	(0.51)	1.07	(0.92)
	C. MNL scaled by (selected)					
	1. Ignored		2. Serial		3. Choice-task	
$\theta$	Beta	t-val.	Beta	t-val.	Beta	t-val.
<i>Wave 1</i>						
Hikers	fixed		fixed		fixed	
Via-ferratas recreationists	0.55	(2.82)	fixed		fixed	
Climbers	0.78	(1.25)	fixed		fixed	
Picnickers	0.96	(0.22)	fixed		fixed	
Mountainbikers	1.04	(0.21)	fixed		fixed	
<i>Wave 2</i>						
Hikers	1.01	(0.03)	fixed		fixed	
Via-ferratas recreationists	0.83	(1.05)	fixed		fixed	
Climbers	0.55	(2.92)	fixed		fixed	
Picnickers	1.19	(0.86)	fixed		fixed	
Mountainbikers	0.77	(1.37)	fixed		fixed	
<i>Wave 3</i>						
Hikers	1.11	(0.42)	4.63	(4.14)	1.44	(3.03)
Via-ferratas recreationists	0.87	(0.67)	3.69	(2.91)	1.38	(2.70)
Climbers	0.00	(2.E+7)	8.31	(4.81)	2.53	(5.94)
Picnickers	2.41	(2.97)	3.06	(3.53)	2.11	(5.42)
Mountainbikers	0.63	(1.93)	3.41	(3.90)	2.09	(4.80)
<i>Wave 4</i>						
Hikers	2.17	(2.54)	5.16	(4.91)	2.26	(5.25)
Via-ferratas recreationists	1.07	(0.27)	9.44	(4.74)	3.69	(6.08)
Climbers	2.49	(3.08)	14.8	(5.62)	2.77	(5.86)
Picnickers	2.52	(3.27)	6.19	(4.80)	2.32	(6.07)
Mountainbikers	2.48	(2.25)	14.4	(4.59)	3.48	(6.48)

TABLE 8.  
RATIOS OF MARGINAL WTP ESTIMATES ACROSS MODELS.

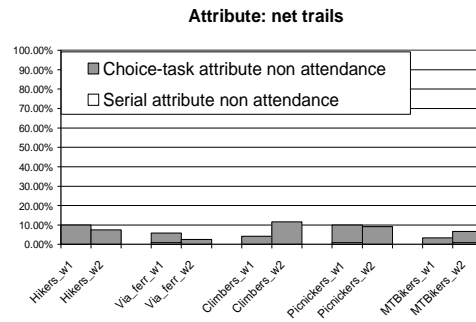
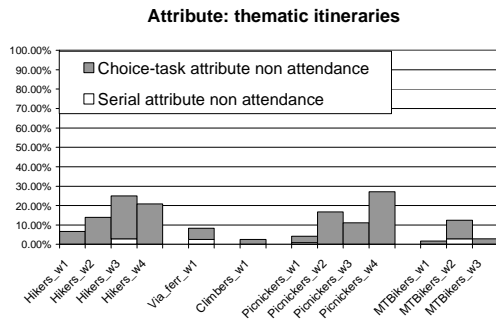
Parameters	A. Unscaled		B. Scaled by category		C. Scaled by category and wave	
	Serial/Ignored	ChT/Ignored	Serial/Ignored	ChT/Ignored	Serial/Ignored	ChT/Ignored
IT_THEMES1	1.9	1.8	3.6	3.6	9.7	2.7
IT_THEMES2	1.8	0.8	2.0	0.9	2.9	0.9
NET_TRAILS1	1.2	0.4	1.5	0.5	2.3	0.3
NET_TRAILS2	-0.3	0.1	-0.6	0.1	-1.5	0.0
TRL_SIGNS1	1.3	0.7	1.3	0.9	1.8	0.7
TRL_SIGNS2	0.8	0.6	0.7	0.7	0.8	0.3
MNGD_TRAILS1	0.9	-0.8	0.2	-0.7	1.4	1.5
MNGD_TRAILS2	1.7	0.8	2.2	0.9	0.5	0.3
NEW_CLIMBS1	0.4	-0.1	0.8	-0.1	1.1	0.0
NEW_CLIMBS2	3.6	1.3	3.8	1.5	8.2	1.3
FERR_SAFE1	-20.3	-26.3	3.8	5.3	-0.8	-0.4
FERR_SAFE2	4.3	2.3	1.1	3.4	-265.8	42.9
SHELTERS1	1.2	0.7	1.4	0.8	1.0	0.6
SHELTERS2	0.4	0.6	0.3	0.4	1.2	0.5
CROWD1	1.5	0.6	1.5	0.7	1.1	0.5
CROWD2	1.8	1.0	1.9	1.0	1.9	0.8
INFO1	-10.5	4.4	-4.7	2.1	-3.6	8.2
INFO2	-5.2	1.5	-2.8	1.0	0.4	0.4

TABLE 9.

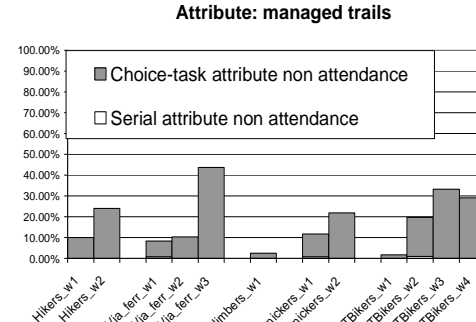
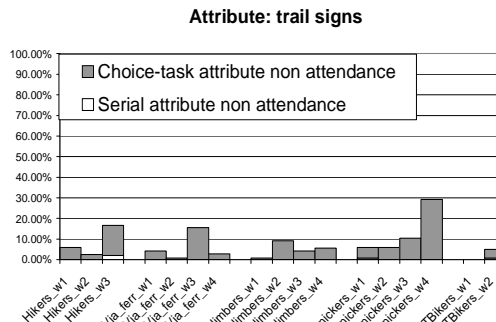
NUMBER OF MARGINAL WTP ESTIMATES WITH APPROXIMATED T-VALUES LARGER  
THAN THE ONE FOR THE BASELINE MODEL.

	1. Ignored	2. Serial	3. Choice-task
A. MNL unscaled	baseline	8	16
B. MNL scaled by visitors category	9	7	16
C. MNL scaled by wave	12	12	16

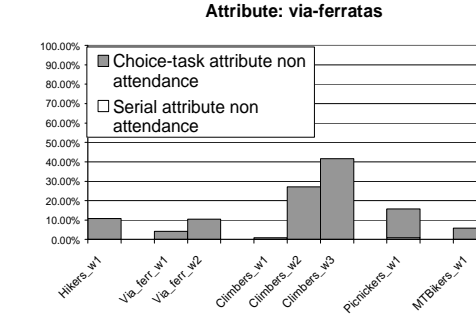
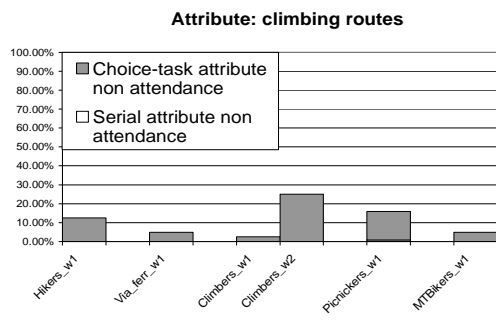
20



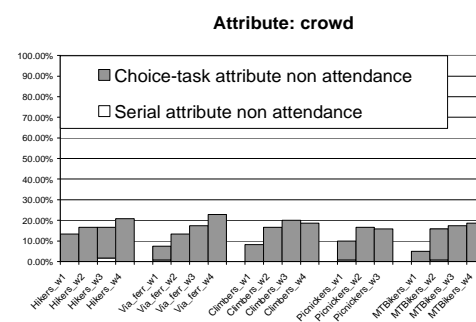
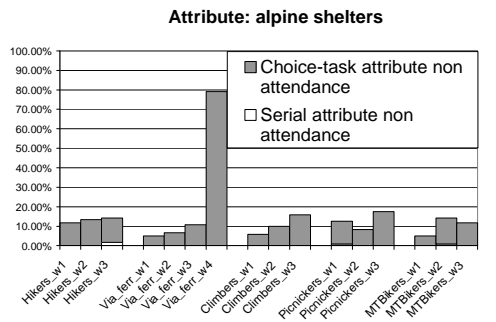
21



22



23



24

25

26

27

28

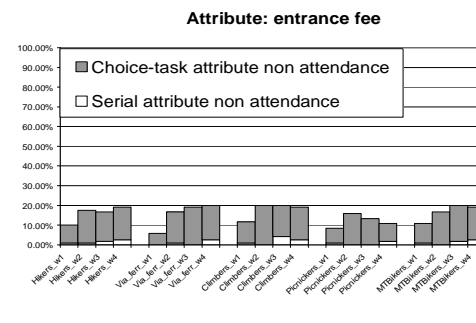
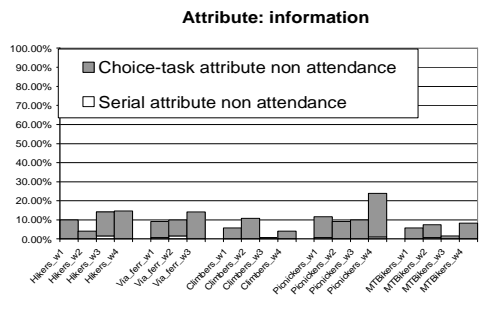


FIGURE 1.

PROPORTION OF RESPONDENTS DISPLAYING SERIAL (LIGHT) AND CHOICE-TASK (DARK) ATTRIBUTE NON-ATTENDANCE BY ATTRIBUTE VISITOR TYPE AND WAVE OF DESIGN.

29

**Endnotes**

30 <sup>1</sup> Via-ferratas are challenging trails usually characterized by a prominent slope  
31 allowing people to reach the top of a mountain or other vantage points. Because of the  
32 steepness of the slopes along which they are developed, special equipment is needed  
33 to go along via-ferratas. This equipment involves gear to fast oneself to an iron-cable  
34 anchored to the rock or other secure places. In terms of skills required of the visitor,  
35 this type of activity can be placed between sport climbing and the traditional hiking.

36 <sup>2</sup> With this term climbers indicate the realization of new itineraries on a mountain  
37 face, meaning it was climbed for the first time.

38 <sup>3</sup> We do not report the ten logit regressions here, but these are available from the  
39 authors and in the MSc thesis by Antonin Danalet (2009).

40