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Segmenting visitors based on willingness to pay for recreational benefits: The case of Leiria National Forest

Fernanda Oliveira
School of Tourism and Maritime Technology and Tourism Research Group, Polytechnic Institute of Leiria, Portugal

Pedro Pintassilgo
Faculty of Economics and Research Centre for Spatial and Organizational Dynamics, University of Algarve, Portugal

Patrícia Pinto
Faculty of Economics and Research Centre for Spatial and Organizational Dynamics, University of Algarve, Portugal

Isabel Mendes
ISEG School of Economics and Management and CGS – Research in Social Sciences and Management, University of Lisbon, Portugal

João Albino Silva
Faculty of Economics and Research Centre for Spatial and Organizational Dynamics, University of Algarve, Portugal

Abstract

This article uses a criterion-based method to segment visitors in the context of a contingent valuation survey. The National Forest of Leiria, located in central Portugal, is used as case study. Respondents are assigned to segments through a chi-squared automatic interaction detector method according to their willingness to pay for recreational improvements. This method identifies the main socio-economic and behavioural variables that differentiate the segments. The results show that the segment with the largest willingness to pay is formed by visitors who contribute to environmental protection and rate their recreational experience in the forest as very good. Besides these 'environmentally friendly' visitors, two other segments show willingness to pay above average: 'graduates' and 'forest neighbours'. The study shows how the rich set of data provided by contingent valuation studies can be used to segment visitors, and therefore to support the planning and management of recreational facilities.

Corresponding author:
Pedro Pintassilgo, Faculty of Economics and Research Centre for Spatial and Organizational Dynamics, University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal.
Email: ppintas@ualg.pt

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CHAID, contingent valuation, recreational benefits, visitor segmentation

Introduction

The knowledge about recreational demand for open access attractions, such as forest parks, is often vague. Nonetheless, these sites may attract large numbers of tourists/visitors and represent a significant economic value. Hence, the interest to survey recreational users has become widespread (Tisdell, 2006). Among the survey-based methods used to capture the economic dimension of recreational benefits, contingent valuation is prominent (Smith, 2009). This is a stated preference method used to measure how much individuals value a hypothetical change (e.g. recreational improvements). In this article we show, through a case study on forest recreation, how a contingent valuation study can be used to segment visitors. Contingent valuation surveys on recreational benefits provide a vast data on individuals' willingness to pay and also on their socio-economic and behavioural characteristics (e.g. Brandolini, 2009; Herath and Kennedy, 2004; Keske, 2013; León et al., 2003). Usually this information is used to compute the determinants of the individual willingness to pay and the aggregate value of the recreational benefits. However, the data can also be used to segment users through a criterion-based method. In this article, we propose the use of the chi-squared automatic interaction detector (CHAID) to segment recreational users, in the context of a contingent valuation survey. This method, often called 'tree analysis', splits the respondents into subgroups or segments that differ significantly in terms of a criterion variable.

Our study is based on a contingent valuation survey addressing recreational improvements in the National Forest of Leiria (NFL, Portugal). This setting is used to segment the visitors, using their stated willingness to pay as the criterion variable. The CHAID analysis allows us to detect the socio-economic and behavioural variables that significantly differentiate the segments and to rank them according to their importance in the segmentation process (Kass, 1980).

Applying the CHAID analysis in the context of a contingent valuation survey is the main innovation of our research. To our knowledge, combining a CHAID analysis with a contingent valuation survey is novel in the tourism literature. This combination is also rare when we extend the search to all scientific areas. The only exception we found is due to Atkins et al. (2007) who combine both techniques to identify public preferences for water quality improvements in a Danish county. Regarding applications of CHAID outside the framework of contingent valuation studies, a few examples can be found in the tourism literature. For instance, Chen (2003) applies it to segment tourists regarding their willingness to recommend tourism destinations. Kim et al. (2011) uses this method to segment Japanese tourists in Korea according to their shopping preferences. Valle et al. (2012) applies it to segment sun and beach tourists according to their willingness to pay for an accommodation tax earmarked for environmental protection. Okubo et al. (2014) uses CHAID to analyse the reasons for visiting rural festivals in Japan.

The main aim of our research is to show how the use of a segmentation method based on individual's willingness to pay can enrich the economic analysis of the recreational benefits in the context of a contingent valuation survey. In particular, by identifying the main characteristics of the segments more prone to contribute to recreational improvements.

The contingent valuation survey

This section starts by providing a brief survey on applications of contingent valuation to forest recreation. Then it presents the site where our contingent valuation survey was implemented: the NFL. This is followed by a description of the questionnaire and the sampling procedures.

Contingent valuation on forest recreation

The contingent valuation method is widely used to assess the economic value of recreational improvements. For instance, Bishop (1992) used it to evaluate the recreational benefits from a project of community forests in the outskirts of main cities in England and Wales. He concluded that recreational benefits exceeded management costs by a factor of three. Another example is the study by Chen and Liaw (2012), which applied a contingent valuation survey to estimate the recreational benefits associated with new forest trails in Taiwan. The authors concluded that both residents and visitors attribute a significant economic value to the trails.

Forests located in urban areas or its proximity usually present high recreational use values. This was concluded by studies such as Tyrväinen and Väänänen (1998) and Tyrväinen (2001), which evaluated the recreational use of urban forests in Finnish cities. Bernath and Roschewitz (2008) reach a similar conclusion for an urban forest in Zurich (Switzerland). Ezebilo et al. (2015) studied the willingness to pay for outdoor recreation near the place of residence (distances up to 100 km from home) by Swedish residents and concluded that forests are the preferred areas for outdoor recreation.

In contingent valuation studies on forest recreation the determinants of willingness to pay are usually estimated through regression models. It is usually found that income has a positive effect on willingness to pay (e.g. Chen and Liaw, 2012). Other common determinants are age and education (e.g. Dehghani et al., 2010) as well as gender (Scarpa et al., 2000). In addition to these socio-economic variables, positive effects on the willingness to pay have also been found in variables such as environmental quality of the forest, existence of protected areas (Bartczak et al, 2008; Scarpa et al., 2000) and frequency of the recreational use (Bishop, 1992; Bernath and Roschewitz, 2008). On the contrary, the distance between the place of residence and the forest, as well as the time spent on the trip (Ezebilo et al., 2015; Hörnsten and Fredman, 2000), is inversely related to the willingness to pay.

The site

The NFL is a public pinaster forest extending over 11,080 ha along the coastal line of the Leiria District, in the central western part of continental Portugal (Figure 1). The public management of this forest dates back at least to king Dinis, who ruled Portugal between 1279 and 1325. In the 15th and 16th centuries, the timber production of this forest played a crucial role in the shipbuilding industry that allowed the Portuguese maritime discoveries.

Presently the NFL is a multifunctional forest. It has areas aiming at timber production, ecological protection and recreational activities. Tree cover represents around 96% of the NFL. The remaining territory contains some basic infrastructures such as roads, forest guard houses, belvederes, campsites and sport facilities.

The NFL has an important recreational use as a picnic area, especially along the S. Pedro de Moel stream and close to the main residential areas (Marinha Grande, Praia da Vieira and S. Pedro de Moel). It is also widely used for sightseeing, walking, jogging and biking.

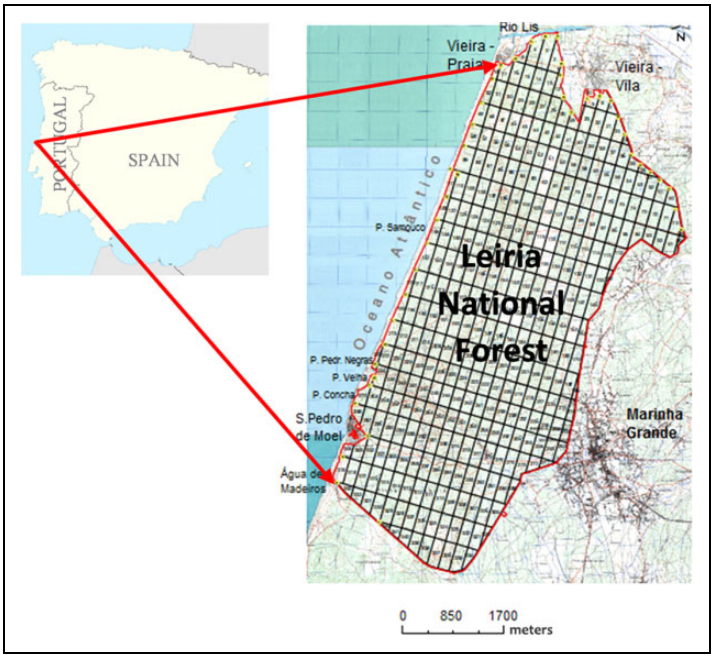

Figure 1. Location of the National Forest of Leiria.
Source: Adapted from UGF-CL (2010).

Questionnaire

In order to evaluate the economic dimension of the recreational activities in the NFL an on-site survey was implemented. The questionnaire follows a standard structure, composed of three sections (Garrod and Willis, 1999). The first aimed to identify the recreational uses of the forest, recreational experiences and attitudes towards the environment. The second presented a contingent scenario, in which respondents were asked about their willingness to pay for recreational improvements in the NFL. The third section inquired about socioeconomic characteristics.

The contingent scenario presented to the respondents consisted of an improvement in recreational facilities associated to a public project: creation of the National Forest Museum in the NFL. This includes a museum component, focused on the recovery of built heritage, and the development of recreational facilities. This scenario was presented as follows.

The Forest provides a vast open space with no cost for the user. Regarding recreation, several initiatives have taken place, such as walking paths, environmental education actions, guided visits.

There is also the possibility to create recreation facilities associated to the National Forest Museum project such as information panels, viewpoints, more walking paths, a Forest Interpretation Centre, among others (mockup with images shown).

To create and maintain these facilities, including cleaning and security, entails significant costs, which cannot be supported only by public authorities.

Suppose that a Fund was created and managed by the National Forest Museum to allow the creation and maintenance of the referred recreation facilities.

Would you be willing to contribute with a monthly value of x € (corresponding to 12x €, per year) to this Fund?

Consider your disposal income and your monthly expenses, including with other open air recreational activities.

This text was complemented with a photo mockup, which was explained to each respondent. The mockup showed two columns. The first contained photos of the status quo recreational facilities in the NFL. The second, superimposed on those photos the recreational improvements associated to the National Forest Museum project.

The willingness to pay of each individual was obtained using a dichotomous choice question with follow up, often referred as the most efficient eliciting method (Alberini et al., 1997; Hanemann, 1991; Verbič and Slabe-Erker, 2009). In case of an affirmative (negative) answer to a specific monthly value of x €, the individual was then asked if he/she would be willing to pay $2x$ € ($0.5x$ €). After this follow up, as in Nunes (2000), an open-ended question was used to obtain the maximum willingness to pay: *Then, what is the maximum monthly value you would be willing to contribute?*

The initial bid values (1, 2 and 5€), assigned randomly to each respondent, were obtained based on a pretest where the willingness to pay was asked using an open-ended format (as in Lee and Han, 2002; Mill et al., 2007). The pretest was undertaken in the NFL to a sample of 50 recreational users. A contribution to a fund was selected as the payment vehicle. This is often used in contingent valuation studies (e.g. Nunes, 2000; Sanz et al., 2003; Schläpfer et al., 2004) and especially in open spaces as the NFL. Regarding the frequency of the contribution, monthly was chosen, in order to make it easier for the respondent to answer. However, the annual amount was also referred in order to avoid overvaluation of the environmental good (Nunes, 2000; Verbič and Slabe-Erker, 2009).

Those individuals who showed no willingness to contribute to the fund were asked about the reasons for that answer. This is a common procedure in order to identify protest answers (e.g. Bateman et al., 2002; Bernath and Roschewitz, 2008). Seven options were provided: (i) I cannot pay any contribution; (ii) This issue is not a priority for me; (iii) I'm not interested in this issue; (iv) I'm willing to contribute but not to a fund managed by the National Forest Museum; (v) I need more time/information to answer; (vi) The maintenance and improvement of the forest should be undertaken by the State and (vii) Other motive (which?). Items (i) to (iii) indicate zero willingness to pay and items (iv) to (vi) protest answers. Item (vii) can be either, depending on the reason presented by the respondent.

Sampling

The recreational users of the NFL formed the target population of our survey. We found no documentation about the size of this population or its characteristics. Hence, the sample size was determined taking as reference a 95% confidence interval for a sample proportion with a 5% margin of error, using the most conservative estimate for a sample proportion. This yields a sample size 384 individuals. In order to safeguard against incomplete questionnaires, a slightly larger sample was obtained: 419 individuals.

The survey was implemented during the months of July and October 2009. Respondents were selected randomly in the main recreational facilities of the NFL: walking and bike paths and picnic areas.

The CHAID analysis

CHAID is a segmentation method developed by Kass (1980), which is particularly suitable for categorical data. This method aims to divide respondents into segments according to a dependent

variable, also called criterion variable. Instead of adjusting the data to a predefined relationship (e.g. linear), CHAID classifies respondents progressively through explanatory variables (socio-economic and behavioural). It also identifies the explanatory variables that best classify the data by dividing it into subgroups or nodes. This procedure is based on χ^2 tests of independence (Magidson, 1994).

The CHAID starts by dividing the whole sample data (root node) in two or more nodes, according to the variable which best discriminates the dependent variable (the one with the lowest p-value in the χ^2 tests). Then, the method divides the new nodes in terms of the independent variable that best discriminate each of them. The method ends when there are no more significant dependence relationships between the dependent variable and the set of explanatory variables.

This successive process of classification or division of the root node into various branches creates an inverted tree, often called the decision tree. The CHAID tree allows visualizing the variables that differentiate the segments in terms of the dependent variable. It also allows ordering them in terms of importance in the segmentation process. In order to validate the results, the estimated risk is computed, that is, the proportion of statistical units (forest visitors in our study) incorrectly classified in terms of the dependent variable.

In our study, we used as dependent variable the individual willingness to pay obtained in the contingent valuation survey. That is, the monthly contribution for a fund with the purpose of creating and maintaining recreation facilities in the NFL. The application of CHAID to classify the willingness to pay values was preceded by a careful sample treatment. The initial sample of 419 respondents was reduced to 346 by eliminating protest answers, questionnaires in which the willingness to pay question was not answered and outliers.

Results

Regarding the individual willingness to pay for the recreational benefits, an average value of 2.68€/month was obtained. In implementing the CHAID, the dependent variable, willingness to pay, was classified into three categories: 0.00€; 0.01–4.00€; >4.00€. Predictor variables found to be statistically independent to the willingness to pay were excluded a priori from the CHAID method. This decision relied on the p-value of the chi-square independence test, in which the critical value was set to 5%.

Table 1 shows the predictors variables considered in the CHAID analysis and the results of the χ^2 tests. The variable Volunteering and Environmental Causes is the most important in segmenting visitors according to the willingness to pay, as it shows the largest χ^2 value. This variable resulted from a principal component analysis applied on the agreement level to a set of 12 statements, aiming to identify respondents' opinions and attitudes towards uses of the NFL and environmental causes. High levels on the variable Volunteering and Environmental Causes indicate respondents who 'contribute to environmental protection' and would 'volunteer to clean and maintain the forest'.

The six predictor variables shown in Table 1 were used to obtain the decision tree (Figure 2). The CHAID algorithm identifies at each step the independent variable that presents the strongest interaction with the dependent variable. The visitor segments correspond to the eight final nodes: 2, 4, 6, 7, 10, 11, 12 and 13. Overall the segments are differentiated by two behavioural and four socio-economic variables. The former are visitors' engagement in volunteering and environmental causes and their evaluation of the recreational experience in the NFL. The latter are whether visitors have dependents under their care, if they have a university degree, their age and place of

Table 1. χ^2 Test between the dependent variable 'Willingness to Pay' and the predictor variables.

Set of predictor variables	Relevant categories			χ^2 tests	
				χ^2 value	*p*-value
Volunteering and Environmental Causes	< −0.022	[−0.022; 1198]	>1198	17,910	0.005
Recreational Experience	<= Good	> Good		8436	0.007
Dependents?	Yes	No		5792	0.016
University Degree	Yes	No		5230	0.022
Age	26–40 years	Other		5038	0.025
Place of Residence	Marinha Grande + Leiria	Other		4997	0.025

residence. The model presents a reasonable predictive power: the overall proportion of cases correctly classified is 68.5% which means a risk estimate of 31.5%.

Node 0 shows that out of the selected sample of 346 visitors, only 8.4% are not willing to pay for the recreational improvements, 66.5% are willing to pay a monthly value in the range 0.01–4.00€ and 25.1% are willing to pay a higher value. The first variable in the segmentation process is Volunteering and Environmental Causes, which leads to three groups: nodes 1, 2 and 3.

Node 1 includes 39.9% of visitors, who show the lowest levels in terms of Volunteering and Environmental Causes. This node is further segmented through the variable University Degree. Those who have a university degree (node 4) form a terminal node. This segment is characterized by a proportion of visitors with positive willingness to pay (97.4%) higher than the average over the whole sample (91.6%). The visitors who do not have a university degree (node 5) are split according to the age. Those with age between 26 and 40 (node 8) are further segmented according to residence. Individuals residing near the forest (node 11), in the Marinha Grande or Leiria councils, form a terminal node. This segment shows proportions of individuals with positive willingness to pay (92.9%) and larger than 4€ (32.1%) above average. The opposite occurs for visitors residing in other places (node 10).

Individuals with ages outside the 26–40 range (node 9) are split taking into account if they have dependents (node 12) or not (13). In both terminal nodes, the proportion of individuals willing to pay a positive amount is below the overall sample proportion. Nonetheless, individuals with dependents are more prone to pay a positive amount (85.3%) or more than 4€ (17.6%) when compared to those without dependents (71.9% and 0%, respectively).

Node 2 is composed of 50.3% of visitors, showing an intermediate level in terms of Volunteering and Environmental Causes. This is a terminal node/segment, in which the proportions of visitors willing to pay a monthly value in the range 0.01–4.00€ (67.8%) and more than 4.00€ (27%) are above the average values over the whole sample: 66.5 and 25.1%, respectively.

Node 3 is formed by the individuals with the highest levels in terms of Volunteering and Environmental Causes. This group is further divided according to the variable Recreational Experience. From this procedure two terminal nodes emerge. Node 7 corresponds to a very good recreational experience. In this segment, all visitors showed a positive willingness to pay and the large majority (70.6%) referred a value above 4€. In node 6, the recreational experience is rated as good or below. This segment shows lower willingness to pay than segment 7. However, the proportion of individuals showing a positive willingness to pay (94.1%) is still above average.

Overall we found five segments with willingness to pay above average. Three segments correspond to visitors in which the level of the variable Volunteering and Environmental Causes is

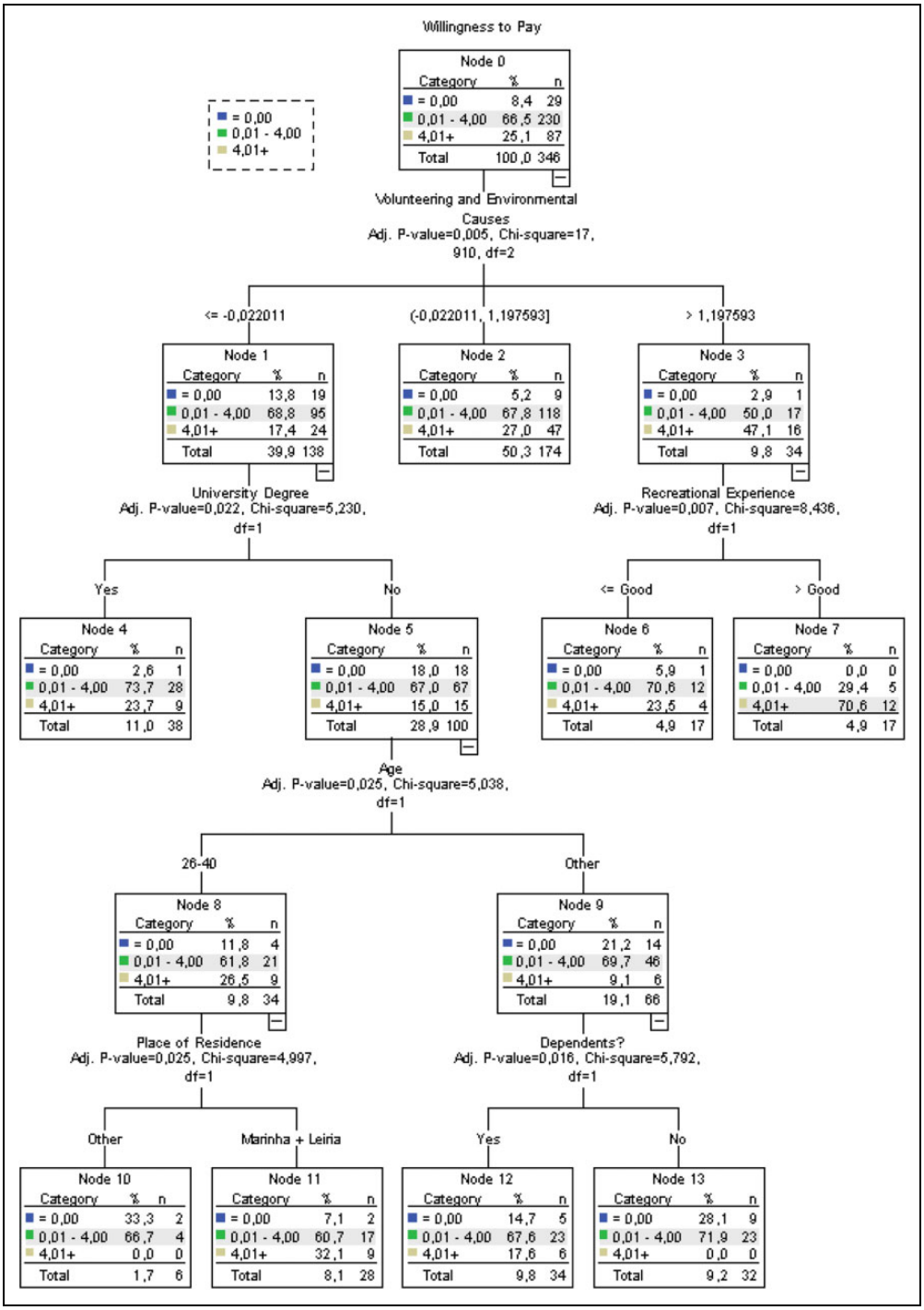

Figure 2. Decision tree – CHAID analysis. CHAID: chi-squared automatic interaction detector.

intermediate or high (nodes 2, 6 and 7). These three segments can be labelled as 'environmentally friendly'. Node 4 is another segment with willingness to pay above average. This corresponds to visitors with low levels in terms of Volunteering and Environmental Causes who have a university degree. We term this segment as 'graduates'. Finally, the segment represented by node 11 also shows willingness to pay above average. These visitors present a low level regarding Volunteering and Environmental Causes, do not have university degrees, are middle aged (26–40 years old) and live close to the forest. We called this segment 'forest neighbours'.

Discussion and conclusion

Forests are characterized by multi-dimensional attributes, which generate multi-recreational benefits associated with activities such as walking, biking, picnicking, bird-watching and environmental education. The diversity of recreational activities undertaken in forests poses an important challenge for forest managers. Hence, the knowledge of visitors' willingness to pay for recreation benefits and their attitudes and preferences is a valuable tool for forest managers.

In this article, we showed how a contingent valuation survey, a stated preference method used to estimate individuals' willingness to pay for non-market benefits, can also be used to segment visitors. For this purpose, we adopted the CHAID, a criterion-based segmentation method. Combining a contingent valuation survey and the CHAID method, a marketing management tool, is novel in the tourism literature. This approach enhances the usefulness of a contingent valuation survey by also allowing to segment visitors based on their willingness to pay and their socio-economic and behavioural characteristics. Moreover, as a non-parametric method, CHAID may be applied as a complement to a multiple regression, the standard statistical method used in contingent valuation studies. CHAID has the advantage of being easy to interpret and providing the main characteristics of the visitor segments. This can help managers to allocate the scarce recreational resources, namely by providing the required facilities to the visitor segments that show higher valuation.

The results showed that Volunteering and Environmental Causes is the main variable that segments visitors of the NFL in terms of their willingness to pay for environmental benefits. This is in line with findings from previous contingent valuation studies. For instance, Verbič and Slabe-Erker (2009) found that the attitude of respondents towards environmental goods was an explanatory variable for the willingness to pay. Christie (1999) and Bernath and Roschewitz (2008) found that members of environmental organization revealed higher willingness to pay.

As expected, the quality of the recreational experience also plays a role in the segmentation process, with very good experiences leading to higher willingness to pay. Another relevant variable in the segmentation process is whether visitors have dependents or not. We found that visitors with dependents present a higher willingness to pay. This result is in line with Tyrväinen (2001) and Bernath and Roschewitz (2008), who found that dependents may influence positively the valuation of forest recreation.

Education also plays a role, with university degree holders being more prone to pay for recreational benefits. The positive effect of education on willingness to pay is common in contingent valuation surveys (e.g. Scarpa et al., 2000; Treiman and Gartner, 2006). Age is another predictor variable. We found that middle-aged people are more prone to pay. Finally, the place of residence is also a relevant variable. People living close to the site present larger willingness to pay for recreational benefits, which is in line with the findings by Hanley and Knight (1992). It should be stressed that no dependency relation was found between the individual net monthly income and

the willingness to pay. This result was also found by Valle et al. (2012) in the context of a CHAID analysis and by Lee and Han (2002) using a contingent valuation.

The CHAID analysis resulted in eight segments, five of which presenting willingness to pay above average. In this latter group, three segments represent individuals with intermediate or high levels in terms of Volunteering and Environmental Causes and therefore were clustered together as environmentally friendly. It should be emphasised that among all segments, the one with the highest willingness to pay is composed by the individuals characterized by a high level Volunteering and Environmental Causes and a very good recreational experience.

The two other segments with willingness to pay above average are graduates and forest neighbours. Both include individuals with low level of Volunteering and Environmental Causes. The former is composed of graduates and the latter by non-graduates who are middle aged and live in the vicinity of the forest.

The results obtained have important policy implications. First, the large majority of individuals (91.6%) are willing to contribute to the creation and maintenance of recreational facilities in the NFL. Therefore, even in a context of financial restrictions by public authorities it can be possible to raise funds for the required investment. Second, recreational benefit valuation and segmentation analysis provides useful insights to support planning and management of the recreational facilities. In particular, cost–benefit analyses on recreational facilities could be improved by using the willingness to pay values, as monetary measures of non-market recreational benefits.

Forest managers should give special attention to the preferences of the segments that present higher valuation. The results show that environmentally friendly visitors present the highest valuation for new recreational facilities. Thus, managers of the NFL should prioritise financial means to conserve and rehabilitate the natural forest ecosystem. Moreover, educational and volunteering activities should be designed to target this segment. Regarding graduates, activities in the NFL that appeal to this segment should be organised, namely in the sports and education domains. Finally, forest neighbours should be involved in the management of the NFL, namely local organizations. Local initiatives, such as sports events, fairs and festivals, could be used to provide information about the NFL and the project to improve recreational facilities. These aspects could also be underlined in the local school programs (including visits and activities in the forest) in order to make children more aware of the need to preserve and improve the NFL.

This research showed how the rich set of data provided by a contingent valuation survey can be used to segment respondents. One of the limitations of the segmentation method used, CHAID, is that all continuous variables are converted into classes, which implies a loss in precision. Another limitation of our research is that it is based on a case study and hence the segments obtained cannot be generalized to other similar multi-purpose forests located near urban areas.

A natural avenue for further research would be to assess the validity of the segments obtained by applying the CHAID method to other contingent valuation studies. Another avenue would be to apply the CHAID based on a different criterion, such as attitudes or perceptions. Finally, it would be important to replicate our analysis with larger samples. With more individuals, CHAID can offer a more detailed tree diagram and thus identify other important variables in the segmentation process.

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