Valuing a Natura 2000 network site to inform land use options using a discrete choice experiment: an illustration from the Basque Country

Abstract

One of the main problems that public institutions face in the management of protected areas, such as the European Natura 2000 network, is determining how to design and implement sustainable management plans that account for the wide range of marketed and non-marketed benefits they provide to society. This paper presents an application of a stated preference valuation approach aimed at evaluating the social preferences of the population of the Basque Country, Spain, for the key attributes of a regional Natura 2000 network site. According to our results, individuals' willingness-to-pay (WTP) is higher for attributes associated with non-use values (native tree species and biodiversity conservation) than for attributes associated with use values (agricultural development and commercial forestry). The paper concludes that management policies related to Natura 2000 network sites should account for both for the importance of non-use values and the heterogeneity of the population's preferences in order to minimize potential land use conflicts.

Keywords: choice experiments; Natura 2000 network; welfare measure; native tree species; biodiversity; Basque Country

JEL: Q23; Q51; Q57

Introduction

The European Union (EU)'s biodiversity conservation policy framework follows EU Environmental Action Programmes, as well as international initiatives such as the Convention on Biological Diversity (CBD) and the Bern Convention. The main legal umbrella for the protection of nature and biodiversity in the EU consists of the Habitats Directive (92/43/EEC) and the Birds Directive (79/409/EEC), under which the European Natura 2000 network of protected areas was established. The main purpose of the Natura 2000 network (hereafter N2K) is to ensure the long-term protection of Europe's most valuable and threatened species and habitats. According to the European Natura 2000 Barometer, the N2K currently includes 5,315 Special Protection Area (SPA) sites encompassing 593,486 square kilometers, and 22,529 sites of community importance (SCI), (719,015 km^2), covering around 18% of the EU land area (European Commission, 2011).

One of the key features of the N2K is that while it does not exclude human activities therein, as most of the land is privately owned, it aims to ensure that future management is ecologically and economically sustainable. The main focus of the network is on the conservation benefits and intrinsic values of biodiversity. However, similar to other public institutions, the N2K faces the problem of determining a way to design and implement sustainable management plans that go beyond the idea of intrinsic values and thus account for both the tangible social costs and the benefits of conserving these sites.

Recently, Gantioler et al. (2010) estimated that the total cost of managing the N2K network is about 5.8 billion euro per year. The current amount of funding available to support the network is not clear, but the annual EU budget for the N2K is estimated at around 550–1150 million euro (Kettunen et al., 2011). However, while putting a monetary figure on the cost of implementing these plans is an essential prerequisite for ensuring sufficient economic resources for their management, establishing the economic benefits of N2K helps to determine its social desirability, as well as increasing awareness about the importance of N2K for human well-being. In this context, primary economic valuation studies can be considered a promising evaluation instrument for the protected N2K network, as they may contribute to managing the network by explicitly acknowledging the relevant socio-economic implications (Rojas-Briales, 2000; Halahan, 2002; Ten Brink et al., 2002) – particularly in a regional context (Getzner and Jungmeier, 2002).

Economic valuation methods are a promising tool with which to deal with this issue, especially when the non-marketed and wider non-use values are likely to be significant. This is an important issue in the management of N2K sites, because they typically combine use values such as agricultural development or recreation and non-use values such as biodiversity conservation. In this context, the use of stated preference valuation methods capable of estimating all these economic values can shed light on the economic benefits that N2K sites provide to the population locally and regionally. This may especially be the case for discrete choice experiments (DCE), given their inherent flexibility in describing environmental changes. DCEs have been argued to be ideally suited to informing both the choice and the design of multidimensional policies (Hanley et al., 2001; Horne et al., 2005).

This paper provides an empirical application of a DCE undertaken at a N2K site in the Basque Country, Spain, aimed at evaluating the social preferences for different land-use options. The valuation exercise aims at evaluating the social preferences of the wider population on the regional scale for the key attributes of the protected site, which in turn are associated with the use value of agricultural development (vineyards), commercial forestry or recreation and the non-use values linked to the conservation of the natural forest remnants and biodiversity (endangered species). The resulting evaluation of social preferences is then used to assess the social desirability of potential future management plans. The paper focuses specifically on the allocation of the economic values typically found in a natural resource among the population, and its implications in terms of public management.

Background estimates of the benefits of the European Natura 2000 network

The economic valuation of protected areas has become an important focus of analysis by environmental economists since the mid-twentieth century. A burgeoning literature with empirical applications in this field exists already, employing a number of different methods (see Nunes et al., 2003 for a review). However, economic valuation studies regarding N2K sites across Europe are scant and willingness-to-pay (WTP) estimates vary widely across studies (see Table 1 for a summary of economic valuation studies of N2K network sites).

[TABLE 1]

When comparing studies conducted at the regional/national and site levels, we expect that the economic value of a network of protected sites should be lower than the sum of the value of each protected site within that particular network. Although Pouta et al. (2000) find some insensitivity of scope in Finland, primary studies conducted at the regional/national level show, in general, lower estimates that those conducted at the site level, thus showing some scope effects. As argued by Prada et al. (2005), this implies that valuing regional/national networks may contribute to avoiding an aggregation bias, in addition to saving some operational research costs.

It is also found in the literature that non-use values account for around three quarters of the total economic value, which highlights the importance of considering these values in the management of N2K sites. For example, non-use values estimated by Pouta et al. (2000) for Finnish N2K exceed costs derived from restrictions in the forestry industry, even when both the most conservative estimates of WTP and the most restrictive method for estimating costs were used. A similar result was found by Prada et al. (2005), where individuals valued positively a change from woodland plantations (use value) to indigenous leafy woodland (non-use value). Interestingly, Li et al. (2004) and Pouta et al. (2000) found a *satiated* value function after a 3% increase in conservation area, whereby the value of nature preservation does not seem to increase after the initial 3%. In Scotland, the national welfare benefits of the N2K network were estimated at 300 million euro/year, of which 99% was associated with non-use values (Scottish Government, 2004). According to this study, the welfare benefits were seven times greater than the costs. Kuik et al. (2006) found that the overall benefits associated with the N2K in Netherlands (both non-use values and use values) were ten times greater than in Scotland in terms of WTP/year/ha. However, the use of the Benefit Transfer method in the Netherlands case may be problematic due to both the difficulty in defining the 'unit of transfer', particularly when estimating non-use values (Navrud, 2000), and the fact that the context is decisive in such studies (Barreiro et al., 2004). The study by Li et al. (2004) also outlines the divergence that the researcher may find when using WTP and WTA measures.

Economic valuation studies of N2K sites have also highlighted the importance of considering the heterogeneity of individuals when analyzing the preferences of the population. For example, in Scotland, foreigners' use values were found to be greater than locals' use values (Scottish Government, 2004). In addition, these values were strongly dependent on both the distance and the characteristics of the site. Prada et al. (2005) and Pouta et al. (2000) reported higher welfare benefits for conservation plans in urban than in rural areas. Closer to the context of the valuation study reported in this paper, Hoyos et al. (2009) highlight the importance of cultural identity when determining individuals' WTP.

Methodology

Choice modeling is a stated-preferences method of valuation that converts subjective choice responses into estimated parameters. DCEs were first used in marketing research during the 1970s in order to analyze consumer choices. Later, this technique was used in transport economics and health economics, and more recently it has gained considerable popularity in the fields of environmental and ecological economics (see Louviere et al., 2000; Alpizar et al., 2001; Train, 2003; Hoyos, 2010).

The classical econometric specification for estimating DCEs, the multinomial logit (MNL) model (McFadden, 1974; Louviere et al., 2000), provides the foundations for the analysis of DCE, although it contains some severe restrictions.[1] The mixed logit (MXL) model, on the other hand, can accommodate a wide range of respondents' behavior. This model extends the previous one by allowing random coefficients on observed attributes, while maintaining the assumption that the idiosyncratic error is independent and identically extreme value distributed.

The use of an MXL model involves three main specification issues: (1) the determination of which parameters should be modeled as randomly distributed; (2) the choice of mixing distribution for the random coefficients; and (3) the economic interpretation of the randomly distributed coefficients. Determination of the random parameters may be based on the *t*-statistic of the random parameters or, more formally, on the Lagrange multiplier (LM) test proposed by McFadden and Train (2000). The mixing distribution of the parameters can be

[1] The power and limitations of the MNL model can be elucidated under the following criteria (Train, 2003): (1) it can represent systematic taste variations but not random taste variations; (2) it exhibits restrictive substitution patterns (i.e. it complies with the property independence of irrelevant alternatives (IIA), which may not always reflect realistic situations); and (3) it can handle situations where unobserved factors are independent but it cannot be used when unobserved factors are generating some correlation, for example between alternatives.

discrete or continuous. If the mixing distribution is formed by a finite set of distinct values, the MXL becomes the latent-class model (LCM).[2] If the mixing distribution is continuous, a random parameters logit (RPL) model (also known as a random coefficients model) or an error component (EC) model can be derived from the MXL probability.

Following standard consumer theory, the marginal rate of substitution (MRS) between attributes can be obtained by calculating the ratio of the partial derivatives of the indirect utility function with respect to each attribute. In the presence of a linearly additive indirect utility function, compensating surplus welfare estimates for DCEs may be obtained from Hanemann (1984):

$$CS = -\frac{1}{\alpha}\left[\ln(\sum \exp(\beta X_{ij}^{0}) - \ln(\sum \exp(\beta X_{ij}^{1})\right], \qquad (1)$$

where α is the marginal utility of income (usually represented by the coefficient of the payment attribute), β is the parameter to be estimated, and X_{ij}^{0} and X_{ij}^{1} represent the vector of environmental attributes at the initial level (status quo) and after the change levels, respectively.[3] So, the Hicksian compensating variation measures a change in the expected utility due to a change in the level of provision of the attribute or attributes by weighting this change by the marginal utility of income. Therefore, the WTP for a marginal change in the

[2] LCMs are based on the idea that individual choice behaviour depends on observable attributes and on unobservable latent heterogeneity. This source of heterogeneity is represented by a model of discrete parameter variation, so that individuals are implicitly sorted into classes, but the assignment of individuals to these classes is unknown to the analyst. LCMs typically generate a few discrete types of individuals. The main advantage of this approach is its easy interpretation of the results. LCMs have long been popular in marketing and psychology (Chintagunta et al., 1991, Kamakura & Russell, 1989).

[3] It is important to bear in mind the assumptions underlying the closed-form solution for the welfare measure in equation (1) as being: additive disturbances, an extreme value distribution and constant marginal utility of income. The problem of relaxing the hypothesis of constant marginal utility of income is that it complicates the estimation of compensating surplus measures because income enters the utility function non-linearly. Some approaches to incorporating income effects into random utility models have been proposed by Morey et al. (1993) and McFadden (1995).

level of provision of each environmental attribute is obtained by dividing the coefficient of the attribute by the coefficient of the cost attribute (also referred to as the implicit price).

The case study

The increasing awareness of nature conservation across Europe is also reflected in Basque society and, as a consequence, the land area under protection has increased significantly since the 1990s through the 16/1994 Nature Conservation Act. Regarding the N2K network, 52 sites of community interest (SCI) and six special protection zones for birds (SPZB) have been designated, amounting to 147,000 hectares (20.3% of the region). These areas encompass the N2K ecological network in the Basque Country based on scientific and technical criteria. The SCIs were designated according to Annex I (habitat types) and Annex II (habitats of species) of the Habitat Directive (92/43/EEC), and the SPZBs were designated according to specifications under the Bird Directive (79/409/EEC).

Description of the N2K site

The case study is based on the SCI known as Garate-Santa Barbara (GSB), which is located in the Basque province of Gipuzkoa (see Figure 1). It covers about 142 ha of private property, distributed between the municipalities of Zarautz and Getaria. GSB was proposed as part of the N2K network in 2003 as an SCI (code: ES2120007) due to the presence of five forests and other environmentally valuable ecological habitats. According to Annex I of the Habitat Directive (code), these are: *Quercus suber* forest (9330); *Quercus ilex* and *Quercus rotundifolia* forest (9340); European dry heaths (4030); endemic oro-Mediterranean heaths with gorse (4090); and lowland hay meadows (Alopecururs pratensis, Sanguisorba officcinalis) (6510). In 2004 GSB became part of the European list of SCIs; it was then updated in 2008 (EU Commission, 2004, 2008). GSB-SCI also occupies a relevant place within the Basque Country's list of highly valuable environmental areas due to the presence of cork oak (*Quercus suber*). This species can only be found in GSB in the Basque Country, where it can self-regenerate. GSB also contains significant landscape and recreation values.

The economic activity is mostly based on agriculture and, to a lesser extent, on forestry. Also noteworthy is the production of highly valuable wine, known locally as *txakoli*, which has enhanced the relevance of the wine sector in GSB and the surrounding area. While in 1998, 90 ha of vineyards could be found, in 2008 327 ha were used for production of *txakoli*, directly employing 52 people. This increase in wine production occurred at the expense of a decline in cattle production, resulting in a change in land use from grasslands to vineyards. This change has aroused concern among conservationists, since the increased demand for vineyard land can put additional pressure on the already threatened cork oak forest remnants. In sum, the description of the site highlights the conflicting development uses (agricultural development by means of vineyard development or forestry development) and conservation uses (protection of the native cork oak forest, as well as biodiversity conservation).

[FIGURE 1]

Choice experiment survey design

The aim of this valuation survey was to determine the non-market values of the GSB N2K site's main environmental attributes. It is important to bear in mind that designing a DCE is a cyclical process involving four steps: (1) the definition of attributes and levels of provision, (2) experimental design, (3) questionnaire development, and (4) sampling strategy. Feedback from different stages is sequentially incorporated into the final design of the DCE (Hoyos, 2010).

The environmental attributes and the level of provision are critical aspects of any choice experiment, given that the only information about preferences provided by the respondents takes the form of choices between the offered options (Hensher, 2007). Following Lancaster's (1966) theory, an environmental attribute can be considered relevant if ignoring it would change our conclusion about consumers' preferences. Hence, the construction of the choice sets included in an experiment requires a correct definition of the change to be valued and the attributes and levels to be used. The definition of environmental attributes and levels of provision was facilitated by previous studies on the environmental characteristics of GSB; expert advice derived from an interdisciplinary group of researchers that included, among others, geographers, biologists, forest managers, agronomists and economists; information derived from in-depth interviews with several key stakeholders (e.g., mayors of the council, the rural development agency, representatives from the regional authority, the Basque Environmental Ministry, labor unions, etc.); and the use of focus groups.[4]

The final version of the questionnaire started by describing the actual situation in GSB, facilitated by the provision of information and pictures. Later in the questionnaire, certain changes in the quality of the site's main attributes were described. It was stated that if the area was not protected, these environmental attributes could suffer different levels of degradation in the future. Alternative proposed management programs aimed at preventing future environmental degradation at the site were also presented to the respondents. The

[4] Focus groups are a main input for the survey design, especially in order to test all photographic materials, valuation context, payment vehicle and vector of prices.

focus group participants found the hypothesized future land use changes and the proposed protection programs both credible and understandable.

The information included in the DCE refers to the potential effects of various levels of protection in terms of the following attributes (see Table 2): (1) native tree species, represented by the percentage of land area covered by cork oak woodland (levels ranging from 2% to 30%); (2) biodiversity, based on the number of endangered species of flora and fauna (levels ranging from five to 25 species); (3) the level of conservation of recreational and cultural facilities (a qualitative level ranging from 'low' to 'very high'); (4) the percentage of land area covered by vineyards (levels ranging from 10% to 40%); and (5) exotic tree plantations represented by the land area covered by commercial pine forest plantations (levels ranging from 15% to 40%). In addition, a monetary attribute regarding the cost of the conservation program (ranging from 0 to 100 euro per capita) was included.

[TABLE 2]

A main effects fractional factorial design with second-order interactions was used to simplify the construction of choice sets (Louviere et al., 2000). The final version of the questionnaire contained 120 choice sets (blocked into 20 groups of six choice sets), each formed by the status quo or 'business as usual' option plus two alternative protection programs for GSB (program A and program B). For a better understanding of the trade-offs between the attributes and the alternatives, the choice sets included maps and percentage values (see Figure 2). The complexity of the choice task was satisfactorily pre-tested in focus groups and through pilot surveys.

[FIGURE 2]

The proposed payment vehicle was an annual contribution by all Basque citizens to a not-for-profit foundation exclusively dedicated to protecting GSB. This payment vehicle was proposed because Basque people are unfamiliar with more typical payment vehicles, such as levies on income taxes (Morrison et al., 2000). The 'don't know' option was included in order to avoid the 'yea saying' bias (Arrow et al., 1993) that could arise because of the respondents' unfamiliarity with the survey. Thereafter, the answers were eliminated from the data set, assuming that these respondents' preferences were similar to those of the rest of the sample. The questionnaire also contained the usual reminder of a budget constraint, as well as an additional 'control' choice set after the sixth choice set with a dominant alternative aimed at identifying respondents' understanding of the choice task.[5]

The survey was administered through in-person computer-aided individual home interviews. The relevant population considered was that of the Basque Autonomous Community, accounting for 1.8 million people aged at least 18. A stratified random sample of 400 individuals was selected from the relevant population. The strata used included age, gender and size of the town of residence, following official statistical information by the Basque Statistic Office (EUSTAT). In each of the locations in the Basque Country, the questionnaire was distributed using random survey routes.

Results

Basic statistics

The data analysis used 221 completed questionnaires, yielding 1,326 observations, as each respondent faced six choice sets.[6,7] Table 3 shows the descriptive statistics of the socio-

[5] In this control choice set respondents would face the same attribute levels as in the status quo but with a higher cost/price attribute, so that we would expect respondents always to choose the status quo instead of options A or B. Although it could be argued that respondents may attach other attributes to the non-status quo alternatives, we opted for this quality control approach in order to provide more reliable welfare estimates.

[6] The rest of the questionnaires were discarded, either because the respondents failed to enter into the market (protest respondents) or because they failed to pass a rationality test.

economic variables (SEV). The mean age (45.03 years), gender (46.6% male) and personal disposable income (965 euro/month) of the respondents are in line with the population of the Basque Country. The other explanatory/control variables considered in the model estimation stage were *HIncome* (for respondents' net monthly disposable income higher than €2500), *NChild* (the respondent's number of dependent children), *IdentB* (taking the value 1 if the respondent considered herself as having a Basque cultural identity at an above average level and 0 otherwise), *NVisit* (for the respondent's number of visits to the site during the last year), *Conifer* (taking the value 1 if the respondent liked pine tree plantations) and *Climber* (taking the value 1 if the respondent practiced mountaineering or climbing and 0 otherwise). Table 3 also presents the variance inflation factor (VIF) to detect potential multicollinearity, with values greater than 10 indicating high collinearity in the data. All the values are relatively low, implying that multicollinearity problems are not expected in the data.

[TABLE 3]

Model specifications and estimation results

The MNL model was first estimated including interactions with the SEV. The MNL estimations involved numerous specifications with different combinations of the attributes and the SEV in order to account for observed heterogeneity among the respondents' preferences. The indirect utility function used for the MNL specifications is presented in equation (2), with the six attributes (see Table 2) in the first row on the right-hand side and the interactions with the SEV in the following two rows.[8]

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[7] Although nearly half of the respondents were dropped for the final analysis (thus raising concerns about its representativeness, especially when aggregating individual estimates), we feel that these results are more robust in terms of their reliability. The benefit of higher reliability of the results comes at the expense of slightly reducing the representativeness of the sample. However, the final sample remained representative in terms of age, gender and disposable income.

[8] Equation (2) corresponds to the indirect utility function for the status quo option. It includes a constant term because it is considered identifiable by the respondents. The indirect utility functions of the other two alternatives do not include any constant terms, as they are produced from the same experimental design.

$$V_{nj} = \beta_1 + \beta_2 Cost_{nj} + \beta_3 Nat_{nj} + \beta_4 Vin_{nj} + \beta_5 For_{nj} + \beta_6 Bio_{nj} + \beta_7 Rec_{nj} + \beta_8 Cost_{nj}.HIncome_n + \beta_9 Nat_{nj}.IdentB_n + \beta_{10} Vin_{nj}.IdentB_n + \beta_{11} For_{nj}.Conifer_n + \beta_{12} Bio_{nj}.NChild_n + \beta_{13} Rec_{nj}.NVisit_n + \beta_{14} Rec_{nj}.Climber_n \quad (2)$$

The MNL model estimation results (see Table 4) indicate that the respondents' utility increases if the percentage of land area covered by native forest increases (with an even higher increase when the respondents' cultural identity is Basque); respondents' utility increases if their cultural identity is not Basque under an increase of the share of land area under vineyards; and utility increases for recreationalists and climbers if the level of conservation of recreational and cultural facilities increases. On the other hand, respondents' utility decreases if the area covered by non-native (exotic) tree plantations increases (unless respondents like landscapes under pine plantations) and if the number of endangered species of flora and fauna increases (with an even stronger effect if respondents have children). Finally, the negative coefficient associated with the cost attribute indicates, as expected, that the probability of accepting to pay an annual contribution for protecting the N2K site decreases as the level of the contribution increases (with the effect weakening when respondents' income increases).

[TABLE 4]

An RPL model was also estimated. Random parameters were selected according to the LM test (McFadden and Train, 2000). Although random parameters can also be selected using the t-statistic of the deviation of the random parameters, the LM test has been found to be more reliable (Mariel et al., 2010). This procedure concludes that the coefficients associated with the native forest (*Nat*) and biodiversity (*Bio*) are random.

Since the LM test does not provide information about the distribution that these parameters should follow, the next step is to choose an appropriate mixing distribution for these coefficients. For this purpose, we use a semi-nonparametric test proposed by Fosgerau and Bierlaire (2007).[9] Based on this procedure, uniform, normal, triangular, and lognormal distributions of the random parameters were tested as shown in Table 5, using the free software package Biogeme (Bierlaire, 2003; 2008). According to the test's results, the lognormal distribution was chosen for the two random parameters**.**

[TABLE 5]

The estimation results of the RPL model obtained using the software packages Biogeme and Nlogit (see Table 4) are very similar in terms of the magnitude and significance levels to those obtained in the previous MNL estimation. The main difference can be found in the value of the random coefficients, although they are not directly comparable because of the use of a lognormal distribution.

Welfare measures

We now present the unconditional simulation of the WTP results as these are generated from out-of-sample populations by randomly sampling each individual from the full distribution (Krinsky and Robb, 1986). Table 6 presents the WTPs for the RPL model in which both the random nature of the two parameters and the effect of the SEV were included.[10]

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[9] This procedure tests whether a random parameter of a discrete choice model follows an a priori postulated distribution. Given that the true distribution may differ from the postulated distribution, this procedure expresses the true distribution in a semi-nonparametric fashion using Legendre polynomials (also known as SNP terms). The number of SNP terms must be chosen in advance and a higher number of SNP terms makes the alternative hypothesis more general at the expense of a higher computational demand. These authors argue that two or three SNP terms give a large degree of flexibility, sufficient for most empirical applications.

[10] These welfare measures should be taken into account with caution due to the significant number of discarded respondents.

The simulated WTPs were estimated taking into account both the observed and the unobserved heterogeneity. As the values of the SEV variables entered into the WTP formula, a baseline scenario had to be defined to be used as a benchmark for WTP comparisons. In such baseline scenario all the SEV dummy variables were set to zero and, by setting the values of these variables to one, their effect was examined. In the case of the four dummy variables, the analyzed effect on WTP is associated with: (1) having high income (*HIncome*); (2) having Basque cultural identity (*IdentB*); (3) liking pine tree plantation landscapes (*Conifer*); and (4) being fond of climbing (*Climber*). The other effects are related to having dependent children (*NChild*) and having visited the site at least once during the last year (*Nvisit*). Hence, the WTP of the base scenario for the *Bio* attribute with its coefficient distributed as lognormal distribution was defined as:

$$\mathrm{WTP}_{\mathrm{BIO}} = \frac{-\exp(\hat{\beta}_6 + \hat{\sigma}_{\beta_6} * v) + \hat{\beta}_{12} * NChild}{\hat{\beta}_2 + \hat{\beta}_8 * Hincome} \qquad (3)$$

where *v~N(0,1)*. The variables *NChild* and *HIncome* appear in Equation (3) because of their interactions with the attributes *Bio* and *Cost*. The WTP for the other attributes is computed in a similar way. As stated before, in equation (3) the variables *NChild* and *HIncome* are set to zero in the base scenario. In the case of non-random parameters, i.e., *Vin, For* and *Rec*, to determine the effects of the SEV on their WTP, the term $-\exp(\cdot)$ is substituted by the estimation of the corresponding non-random parameter.

[TABLE 6]

As can be seen in Table 6, the mean annual WTP for a 1% increase in the land area covered by native forest is estimated at 2.55 euro per person, in 2008 values. The weights used for this mean are the corresponding proportions of each group in the population (individuals with high income and Basque identity, respectively). The WTP increases to 3.43 euro if the respondent has a high income level and 6.08 euro if her cultural identity is Basque. These results suggest that the mean annual WTP to increase the land area under the ecologically valuable cork oak woodland is estimated at 1.80 euro/ha. Regarding the value of endangered species' protection, associated with the notion of biodiversity here, the mean annual WTP for a unit increase in the number of endangered species is estimated at -1.39 euro per person, -2.57 euro if the respondent has a high income level and -1.80 euro if she has children. It is important to denote that these negative WTP estimates suggest that individuals are WTP to prevent an increase in the number of endangered species.

The mean annual WTP to improve the recreation and cultural facilities of the N2K site is estimated at 1.98 euro per person. Although the general population seems indifferent to this attribute, recreationalists have a WTP of 1.46 euro per year while climbers have a WTP of 3.32 euro per year. These results concur generally, in terms of population heterogeneity, with those obtained in a previous valuation study in the Basque Country (see Hoyos et al., 2009). As in that case, the influence of Basque cultural identity on the WTP to protect natural resources is highlighted in this empirical application. The mean annual WTP for a 1% increase in the land area covered by vineyards is estimated at 0.50 euro. However, the preferences also differ among the population in this case: Respondents with a higher income have a WTP of 1.84 euro while the WTP of respondents with a Basque cultural identity is negative (-0.44 euro). Similarly, the mean annual WTP for a 1% increase in the land area covered by exotic conifer plantations is estimated at 0.66 euro per person. However, the model suggests that people with high incomes have a negative WTP of -2.34 euro per year while those people stating that they like pine trees have a WTP of 1.94 euro per year.

Two interesting insights are obtained from these results: firstly, the environmental attributes associated with non-use values (conservation of native forest and species-level biodiversity) are valued more highly than those associated with use values (land under vineyard, exotic fast growing tree plantations and recreation).[11] In line with the valuation literature, non-use values account for 58–75%, while use values account for 25–42% of the total economic value. Secondly, preference heterogeneity provides a deeper understanding of the distribution of these values among the population: non-use values are associated with families with children and those whose cultural identity is Basque, while use values mainly correspond to climbers and recreationalists.

Illustration of the welfare effects of alternative land use management options

Here we illustrate the welfare changes due to different land use management options. For this purpose, four alternative future scenarios were developed based on GIS information and taking into account ecologically feasible land use changes: (1) enhancement of vineyard activity causing the area of vineyard plantations to increase; (2) moderate enhancement of ecological values; (3) high enhancement of ecological values; and (4) maximum enhancement of ecological values. Table 7 presents these scenarios in a qualitative manner, while Table 8 quantifies them in terms of the share of land use area implied in each scenario.

[TABLE 7]

[TABLE 8]

Based on these scenarios, Table 9 shows the annual compensating surplus (CS) for different land uses, using equation (1).

[TABLE 9]

[11] For comparison purposes, the negative WTP to prevent an increase in the number of endangered species has been reinterpreted as a positive WTP to protect endangered species (i.e. biodiversity conservation).

It is estimated that the annual welfare associated with a development scenario that promotes an increase in the land under vineyards is around 1.13 million euro. This can now be readily compared with the wider social benefits of implementing different conservation policies. A moderate, high and maximum enhancement of the ecological values of the N2K site would involve a welfare benefit of 57.37 million euro, 112.04 million euro and 264.93 million euro, respectively. This indicates that, according to the social preferences in the Basque Country, the N2K site ought to be managed in a way that enhances its ecological attributes. Whether this management option would pass a cost–benefit analysis would depend on the cost of implementing a given conservation management option. However, it seems unlikely that the costs of management would be higher than the benefits it provides to society.[12] It is unclear, though – due to a lack of data – which of the management options would show the highest cost–benefit ratio.

Finally, it is important to note that policy is not just about passing benefit–cost standards. Land use policy decisions also critically depend on nuanced conflicts that may arise through proposed land use changes. In the case of the N2K site under study, it is shown that the Basque population holds heterogeneous preferences regarding various land use options which need careful attention by policy makers. Given the elicited preferences, the general population of the Basque Country seems to support the conservation of environmental attributes when these have important intangible values which, in turn, are strongly culturally dependent. Furthermore, biodiversity conservation seems to be closely related to having children, thus showing some concern for future generations. Other land use options, such as agricultural development (vineyard activity) are a locally supported activity; the same can be

[12] The management costs of the entire N2K in Europe are estimated at around 5.8 billion euro per year (Gantioler et al, 2010), which amounts to a cost of about 11.5 euro per capita per year for the average European citizen. Based on a back-of-the-envelope calculation and assuming a similar order of magnitude for the cost of the N2K site per resident of the Basque Country, this figure can be compared to the per capita benefits of the different conservation management options considered: 26.6 euro, 51.9 euro and 122.9 euro.

said for recreation, including climbing. Therefore, the management policies related to N2K sites in the Basque Country and elsewhere ought to account for such scale dependent preferences in order to minimize potential land use conflicts. Potential conflicts could be reduced if stakeholders are aware of the preferences of different segments of the population, and if conservation funds are channeled through proper economic incentive mechanisms so that local farmers can be compensated if the proposed management plans significantly affect their activity.

Discussion

One of the hotly debated questions in the European Union is the economic rationale behind investing in protecting ecologically valuable natural areas, as in the context of the Natura 2000 network. The main political issue is usually financing the costs of such investments; not enough empirical data exist to demonstrate the social welfare benefits that different management options of N2K sites would involve. Demonstrating the social benefits, on the regional scale, of protecting N2K sites could raise awareness and influence local stakeholders' attitudes towards supporting the network. It could ultimately help leverage funding for conservation management plans in N2K sites by positioning well-informed land-use options from an economic viewpoint.

This paper illustrates and provides a specific valuation analysis that emphasizes non-marketed values, on the regional scale, of different conservation management options that are typical of N2K sites and of places where a tension between agricultural development and ecological restoration features high on the local stakeholders' agenda. Using a case study from the Basque Country, Spain, and by taking into account the social preferences of its population, we estimate the mean marginal WTP to increase the share of the land area of an

N2K site under native forest trees by 2.55 euro per person per annum, compared with 0.66 euro for commercial pine forest plantations and 0.50 euro for land under agricultural use through vineyards. Finally, the annual per capita median marginal WTP to prevent an increase in the number of endangered species is estimated at -1.39 euro, and the mean marginal WTP to enhance recreational and cultural facilities is estimated at 1.98 euro.

A further exploration of the heterogeneity of social preferences through an RPL model helps to allocate these values among the population. This model indicates that besides the effect of disposable income on people's values of environmental conservation (something to be expected from economic theory), a strong cultural identity is identified as a main explanatory variable for higher values. Interestingly, biodiversity appears to have an identifiable bequest value, given that families with children value biodiversity as an ecological feature of the N2K site more than those without children. It is also noteworthy that the social preferences for commercial pine tree plantations are mixed. About 43% of the population dislikes this form of land use, attested to by the significantly negative willingness to pay estimates. Finally, while the majority of individuals are indifferent about the use value associated with the recreational and cultural facilities of the N2K site, unsurprisingly, recreationalists and climbers show a significantly positive WTP for such features.

This information is useful for evaluating the social desirability of alternative management plans of a N2K site. We estimate that the welfare benefits associated with the promotion of vineyards by the population at large amount to 1.13 million euro per year. This compares to the social welfare derived by the regional population from various conservation management plans with differing levels of restoration efforts: between 57.37 million euro in the case of implementing moderate promotion of ecological values and 264.93 million euro if ecological values are promoted at the maximum level, given the bio-geographical characteristics of the N2K site.

These large differences in social welfare estimates indicate that the use value of the site through agricultural development is significantly lower than the benefits that would be derived from its competing land use based on increased environmental protection levels. Similar situations are likely to occur in N2K sites that share agricultural, commercial forestry and natural forest conservation land uses. It is likely that a policy that supports further investment in conservation in such sites would need to identify compensatory measures through economic incentives to reduce potential conflicts with local stakeholders, who traditionally support agricultural development paths for these sites. This study shows that from a demand-side perspective there is definitely scope to channel conservation funds on the regional scale into the N2K sites, which, through proper economic incentive mechanisms – such as payment for environmental conservation – could transfer some of these funds to compensate for the losses that local farmers could experience due to more stringent conservation plans. While complementary analysis would be needed to assess the opportunity costs of agricultural land use, this study shows that the scope for reaching a win-win solution in N2K sites is likely to be the case, so that conservation funds can be channeled both to invest further in management plans and to compensate local land users for the associated economic sacrifices.

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References

Alpizar, F., F. Carlsson and P. Martinsson, Using choice experiments for non-market valuation. *Economic Issues*, **8** (2001), pp. 83–110.

Arrow, K., R. Solow, P. Portney, E. Leamer, R. Radner and H. Shuman, Report of NOAA Panel on contingent valuation. *Federal Register*, **58** (1993), pp. 4601–4614.

Barreiro, J., F. Soler and L. Pérez y Pérez, How much does it cost to include a marginal rural area as a Natura 2000 site? Social costs and expenditures for compensation schemes. *Spanish Journal of Agricultural Research*, **2** 3 (2004), pp. 287–300.

Bierlaire, M., 2003. BIOGEME: A free package for the estimation of discrete choice models. In: Chevroulet, T., Sevestre, A. (eds.), Proceedings of the 3rd Swiss Transportation Research Conference, March 19–21, 2003, Monte-Verita, Ascona, Switzerland.

Bierlaire, M., 2008. An Introduction to BIOGEME Version 1.7. Available at: biogeme.epfl.ch.

Chintagunta, P., D. Jain, and N. Vilcassim, Investigating heterogeneity in brand preference in logit models for panel data, Journal of Marketing Research **28** (1991), pp. 417–428.

De la Cruz, A. and J. Benedicto, J., 2009. Assessing Socio-economic Benefits of Natura 2000 – a Case Study on the ecosystem service provided by SPA Pico da Vara/Ribeira do Guilherme. Output of the project Financing Natura 2000: Cost estimate and benefits of Natura 2000 (Contract No: 070307/2007/484403/MAR/B2).

European Commission, 2011. Natura 2000 Barometer. Available at: http://ec.europa.eu/environment/nature/natura2000/barometer/index_en.htm (accessed 01.07.2011).

Fosgerau, M. and M. Bierlaire, A practical test for the choice of mixing distribution in discrete choice models. *Transportation Research Part B: Methodological*, **41** (2007), pp. 784–794.

Gantioler, S., M. Rayment, S. Bassi, M. Kettunen, A. McConville, R. Landgrebe, H. Gerdes and P. ten Brink, Costs and Socio-Economic Benefits Associated with the Natura 2000 Network, Report to the European Commission, DG Environment, Institute for European Environmental Policy/GHK/Ecologic, Brussels (2010).

Getzner, M. and M. Jungmeier, Conservation policy and the regional economy: the regional economic impact of Natura 2000 conservation sites in Austria. *Journal of Nature Conservation*, **10** (2002), pp. 25–34.

Halahan, R., 2002. Socio-Economic Benefits of Natura 2000 in the UK, WWF UK. Available at: http://www.wwf.org.uk/filelibrary/pdf/N2Kuk.pdf.

Hanemann, W.M., Discrete/continuous models of consumer demand. *Econometrica* **52** (1984), pp. 541–561.

Hanley, N., S. Mourato and R.E. Wright, Choice modelling approaches: a superior alternative for environmental valuation? *Journal of Economic Surveys*, **15** (2001), pp. 435–462.

Hensher, D.A., 2007. Attribute processing in choice experiments and implications on willingness to pay. In: Kanninen, B.J. (ed.), Valuing Environmental Amenities using Stated Choice Studies. A Common Sense Approach to Theory and Practice. Springer, The Netherlands, pp. 135–158.

Horne, P., P.C. Boxall and W.L. Adamowicz, Multiple-use management of forest recreation sites: a spatially explicit choice experiment. *Forest Ecology and Management*, **207** (2005), pp. 189–199.

Hoyos, D., The state of the art of environmental valuation with discrete choice experiments. *Ecological Economics*, **69** (2010), pp. 1595–1603.

Hoyos, D., P. Mariel and J. Fernández-Macho, The influence of cultural identity on the WTP to protect natural resources: some empirical evidence. *Ecological Economics*, **68** (2009), pp. 2372–2381.

Kamakura, W. A. and G. Russell, A probabilistic choice model for market segmentation and elasticity structure. *Journal of Marketing Research*, **26** (1989), pp. 379–390.

Kettunen, M., D. Baldock, S. Gantioler, O. Carter, P. Torkler, A. Arroyo Schnell, A. Baumueller, E. Gerritsen, M. Rayment, E. Daly and M. Pieterse, Assessment of the Natura 2000 Co-Financing Arrangements of the EU Financing Instrument. A Project for the European Commission – Final Report, Institute for European Environmental Policy (IEEP), Brussels, Belgium (2011).

Krinsky, I. and A. Robb, On approximating the statistical properties of elasticities. *The Review of Economics and Statistics*, **68** (1986), pp. 715–719.

Kuik, O., L. Brander and M. Schaafsma., Globale Batenraming van Natura 2000 gebieden. Instituut voor Milieuvraagstukken, Amsterdam (2006).

Lancaster, K., A new approach to consumer theory. *Journal of Political Economy*, **74** (1966), pp. 132–157.

Li, C.-Z., J. Kuuluvainen, E. Pouta, M. Rekola and O. Tahvonen, Using choice experiments to value the Natura 2000 nature conservation programs in Finland. *Environmental and Resource Economics*, **29** (2004), pp. 361–374.

Louviere, J., D.A. Hensher and J. Swait, Stated Choice Methods: Analysis and Applications, Cambridge University Press, Cambridge (2000).

Mariel, P., A. De Ayala, D. Hoyos and S. Abdullah, 2010. Selecting random parameters in discrete choice experiment for environmental valuation: a simulation experiment. In: International Choice Modelling Conference 2011, July 4–6, 2011, Oulton Hall, Leeds.

McFadden, D., Conditional logit analysis of qualitative choice behaviour. In: Zarembka, P. (ed.), Frontiers in Econometrics, Academic Press, New York (1974).

McFadden, D., Computing willingness-to-pay in random utility models (1995). Working Papers _011, University of California at Berkeley, Econometrics Laboratory Software Archive.

McFadden, D. and K. Train, Mixed MNL models for discrete response. *Journal of Applied Econometrics*, **15** (2000), pp. 447–470.

Morey, E., R. Rowe and M. Watson, A repeated nested-logit model of Atlantic salmon fishing. *American Journal of Agricultural Economics*, **75** (1993), pp. 578–592.

Morrison, M.D., R.K. Blamey and J.W. Bennett, Minimising payment vehicle bias in contingent valuation studies. *Environmental and Resource Economics*, **16** (2000), pp. 407–422.

Navrud, S., Valuation techniques and benefit transfer methods: strengths, weaknesses and policy utility. In: OECD: Valuing Rural Amenities, Organisation for Economic Co-Operation and Development, France (2000).

Nunes, P.A.L.D.; van den Bergh, J.C.J.M. and Nijkamp, P. (2003): The Ecological Economics of Biodiversity. Methods and Policy Applications. Edward Elgar, Cheltenham.

Pouta, E., M. Rekola, J. Kuuluvainen, O. Tahvonen and C.-Z. Li, Contingent valuation of the Natura 2000 nature conservation programme in Finland. *Forestry*, **73** 2 (2000), pp. 119–128.

Prada, A., M.X. Vázquez and M. Soliño, Beneficios y costes sociales en la conservación de la red Natura 2000, CIEF, Fundación Caixa Galicia (2005).

Rojas-Briales, E., Socio-economics of nature protection policies in the perspective of the implementation of Natura 2000 network: the Spanish case. *Forestry*, **72** 2 (2000), pp. 199–207.

Scottish Government, 2004. An Economic Assessment of the Costs and Benefits of Natura 2000 Sites in Scotland, Final Report, Scottish Executive 2004, Environment Group Research Report 2004/05 (2004).

Ten Brink, P., C. Monkhouse and S. Richartz, Promoting the Socio-Economic Benefits of Natura 2000, Institute for European Environmental Policy, Brussels (2002).

Train, K., Discrete Choice Methods with Simulation, Cambridge University Press, New York (2003).

TABLES

Table 1. Economic valuation studies of Natura 2000 sites

Author(s)	Year	Natura 2000 site	Area (ha)	Method	Economic value	Result (WTP/WTA)	WTP/year/ha
Studies at the regional/national level							
Pouta et al.	2000	Finnish N2K network	4,855,200 ha	CV	Non-use value	€231.1 m /year	€48 /year/ha
Li et al.	2004	Finnish N2K network	4,855,200 ha	DCE	Non-use value	WTP: €301.2 m/year	WTP: €62 /year/ha
Li et al.	2004	Finnish N2K network	4,855,200 ha	DCE	Non-use value	WTA: €1,318 m /year	WTA: €271.4 /year/ha
Scottish Government	2004	N2K network in Scotland	732,580 ha	CV	Non-use value; use value	€300.7 m /year	€410.5 /year/ha
Prada et al.	2005	N2K network in Galicia (Spain)	344,440 ha	DCE	Non-use value; use value	€266.2 m /year	€772.8 /year/ha
Kuik et al.	2006	N2K in Netherlands	1,012,500 ha	BT	Non-use value; use value	€4,050 m /year	€4,000 /year/ha
Studies at the site level							
Barreiro et al.	2004	Peñadil, Montecillo and Monterrey SCI (Navarra, Spain)	2,922 ha	BT	Non-use value; use value	€49,085 /year	€16.8 /year/ha
De la Cruz and Benedicto	2009	Pico da Vara / Ribeira do Guilherme SPA (Azores, Portugal)	6,067 ha	CV	Use value	€3 m /year	€495 /year/ha
Hoyos et al.	2011	Jaizkibel Mountain SCI (Basque Country, Spain)	2,434 ha	DCE	Non-use value	€8.9 m/year	€3,600 /year/ha

(1): 1 euro corresponded to 5.94573 Finnish markka in 1998. (2): 1 euro corresponded to 0.7033 British pounds in 2004. (3): Methods: CV (contingent valuation), DCE (discrete choice experiment), BT (benefit transfer)

Table 2. Attributes and levels of the dichotomous choice model

Attributes	Levels					
Native forest (*Nat*)	2%*	10%	20%	30%		
Biodiversity (*Bio*)	25*	15	10	5		
Recreation (*Rec*)	Low*	Medium	High	Very High		
Exotic tree plantations (*For*)	40%*	30%	25%	15%		
Vineyard (*Vin*)	40%*	30%	20%	10%		
Cost (*Cost*)	€0*	€5	€10	€30	€50	€100

(*) Levels with asterisks represent the status quo scenario.

Table 3. Summary statistics of the socio-economic variables

Variable	Mean	Std Dev.	Min.	Max.	Cases	Missing	VIF
NVISIT	0.21	1.04	0	10	3978	0	0.93
CONIFER	0.57	0.49	0	1	3978	0	4.04
CLIMBER	0.50	0.50	0	1	3978	0	4.23
AGE	45.03	18.73	18	89	3978	0	0.02
GENDER	0.46	0.49	0	1	3978	0	4.14
NCHILD	0.30	0.65	0	4	3978	0	2.36
PINCOME	965.00	1018.45	0	8000	2340	1638	0.01
HINCOME	0.03	0.18	0	1	3978	0	0.02
IDENTB	0.23	0.42	0	1	3978	0	5.82

Table 4. Estimated models

	MNL			MXL		
Variable	Coeff.		*t*	Coeff.		*t*
Constant	0.18982		0.74	-0.05338		-0.18
Cost	-0.01778	***	-13.51	-0.02214	***	-10.18
Nat	0.04223	***	7.91	-3.49054	***	-10.77
Bio	-0.03999	***	-4.07	-3.76038	***	-6.55
Rec	-0.01591		-0.57	-0.02510		-0.73
Vin	0.01290	**	2.42	0.01622	**	2.50
For	-0.01722	**	-2.36	-0.02062	**	-2.42
*Hincome*Cost*	0.00943	*	1.76	0.01334	**	2.29
*Identity*Nat*	0.01993	**	2.17	0.02030	*	1.80
*Identity*Vin*	-0.02163	**	-2.43	-0.02594	**	-2.41
*Nchild*Bio*	-0.01582	**	-2.15	-0.01797	**	-1.92
*Conifer*For*	0.01835	**	2.57	0.02251	***	2.72
*Nvisit*Rec*	0.02943	*	1.79	0.03246	*	1.80
*Climber*Rec*	0.05219	*	1.79	0.06934	**	2.03
Std Dev. Nat				1.25407		3.21
Std Dev. Bio				1.43062		2.96
Log likelihood	-1184.71			-1177.09		
Pseudo R2	0.15			0.19		
AIC	1.8080			1.7995		
BIC	1.8628			1.8622		
Observations	1326			1326		
Sample size	221			221		

Notes: ***, **, * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 5. Fosgerau and Bierlaire's (2007) test for the choice of mixing distribution

Uniform distribution					Normal distribution				
	Nat		*Bio*			*Nat*		*Bio*	
SNP terms	LR	p-value	LR	p-value	SNP terms	LR	p-value	LR	p-value
1	137.23	<0.001	69.03	<0.001	1	81.54	<0.001	41.76	<0.001
2	157.35	<0.001	70.00	<0.001	2	103.92	<0.001	43.08	<0.001
Triangular distribution					Lognormal distribution				
	Nat		*Bio*			*Nat*		*Bio*	
SNP terms	LR	p-value	LR	p-value	SNP terms	LR	p-value	LR	p-value
1	30.89	<0.001	19.38	<0.001	1	16.06	<0.001	3.34	0.07
2	42.89	<0.001	27.42	<0.001	2	24.52	<0.001	3.29	0.19

Table 6. Simulated WTP based on the random parameter model (RPM) with heterogeneity, in €/person/year (standard deviations in parenthesis)

	***Nat* Median WTP**	***Bio* Median WTP**	***Rec* Mean WTP**	***Vin* Mean WTP**	***For* Mean WTP**
Base scenario	1.4	-1.13	0	0.73	-0.93
	(*4.48*)	(*2.79*)			
High income	3.43	-2.57		1.84	-2.34
	(*15.85*)	(*22.83*)			
Basque identity	6.08			-0.44	
	(*15.33*)				
Child		-1.80			
		(*2.51*)			
Conifer					1.94
Number of visits			1.46		
Climber			3.32		
Weighted means	***2.55***	***-1.39***	***1.98***	***0.50***	***0.66***

Table 7. Scenarios based on alternative land use management plans

LAND USE	SCENARIOS				
	Status quo [E0]	Promotion of vineyards [E1]	Moderate promotion of ecological values [E2]	High promotion of ecological values [E3]	Maximum promotion of ecological values [E4]
Meadows, gardens and crops	=	↓	=	=	↓
Vineyard	=	↑	=	=	↓
Tree plantations	=	↓	↓	↓↓	↓↓↓
Other native tree species	=	=	↑	↑	↑↑
Cork oak tree	=	=	↑	↑↑	↑↑↑
Heathland and bushes	=	=	=	↑	↓
Access	=	=	↑	↑	=
Recreational/ cultural areas	=	=	↑	↑	=

Notes: =: equal or similar level; ↑/↓: moderate increase/decrease compared with the status quo; ↑↑/↓↓: high increase/decrease compared with the status quo;

↑↑↑/↓↓↓: very high increase/decrease compared with the status quo.

Table 8. Management scenarios based on the share of land use area

Land use	Status quo [E0]	Scenario [E1]	Scenario [E2]	Scenario [E3]	Scenario [E4]
Cork oak tree	11.59%	11.59%	14.71%	19.81%	36.10%
Heathland and bushes	17.13%	17.13%	17.13%	18.48%	2.09%
Other native tree species	13.09%	13.09%	15.12%	17.03%	29.19%
Tree plantations	15.99%	14.91%	10.83%	2.47%	0.00%
Meadows, gardens and crops	31.00%	29.39%	31.00%	31.00%	23.85%
Vineyard	11.21%	13.90%	11.21%	11.21%	8.78%
Total	100.00%	100.00%	100.00%	100.00%	100.00%

Table 9. Social benefits per year under different scenarios (million €, 2008)

	SCENARIOS			
Attributes	Promotion of vineyards [E1]	Moderate promotion of ecological values [E2]	High promotion of ecological values [E3]	Maximum promotion of ecological values [E4]
Native forest	0.00	23.34	45.91	166.19
Biodiversity	0.00	16.51	33.75	49.28
Recreation	0.00	23.52	48.10	70.22
Vineyards	2.39	0.00	0.00	-2.16
Plantations	-1.26	-6.00	-15.72	-18.59
Total	1.13	57.37	112.04	264.93

FIGURES

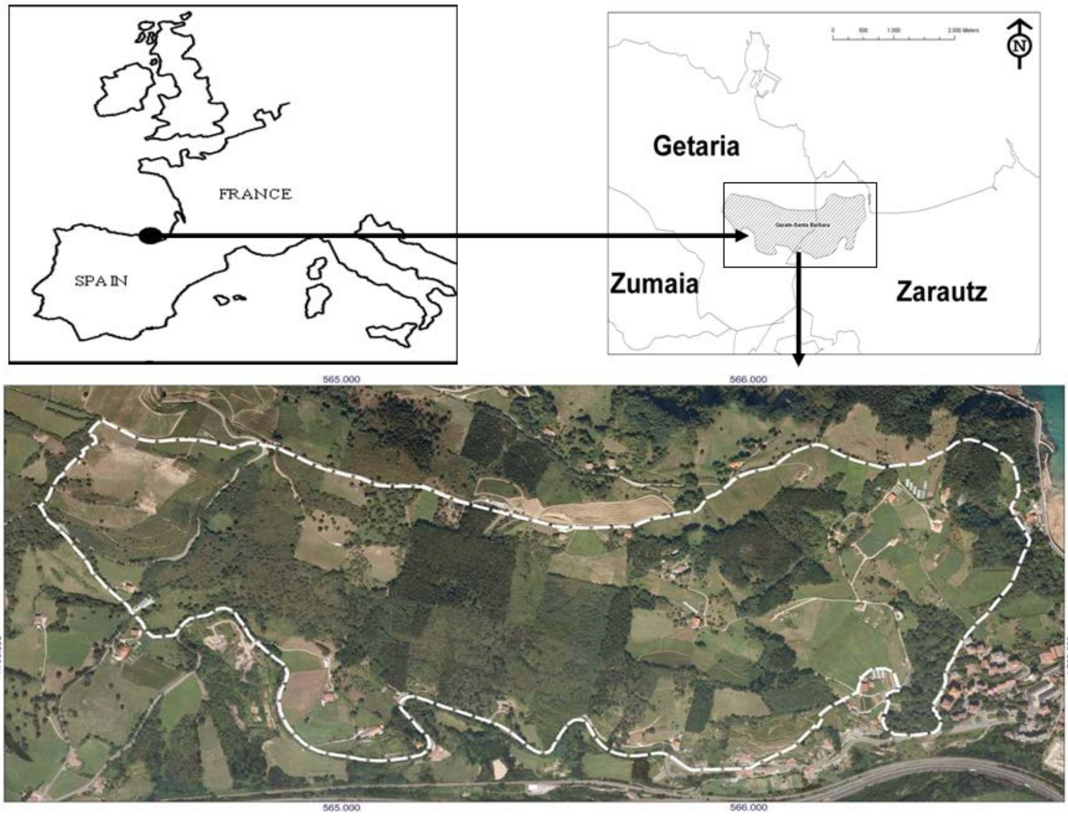

Figure 1. Location of the Garate-Santa Barbara N2K site in the Basque Country

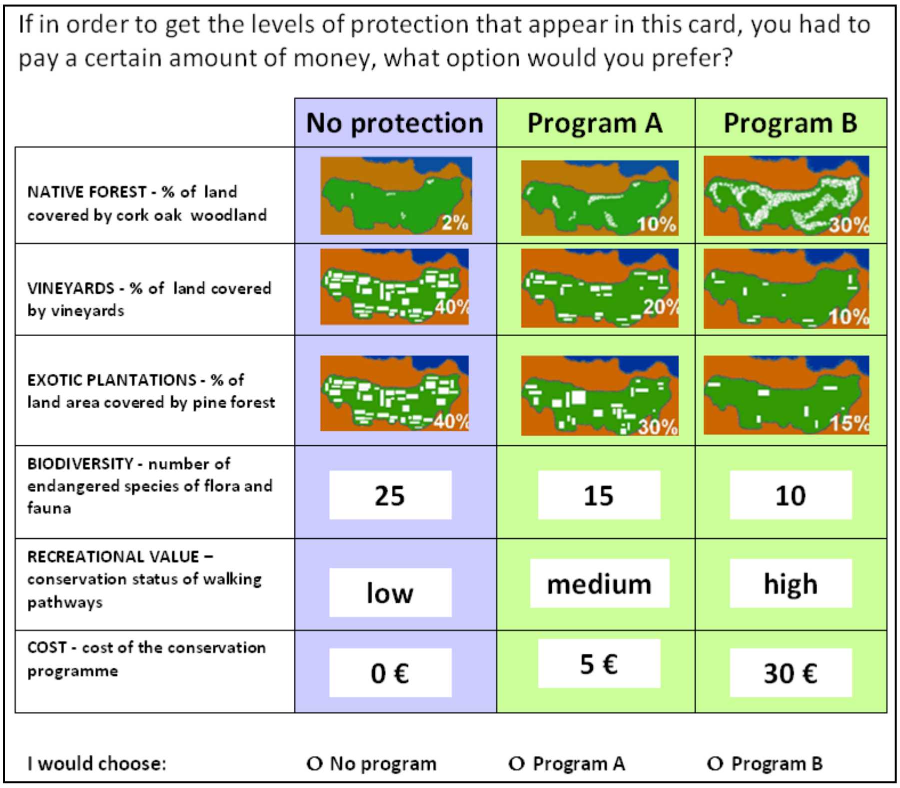

Figure 2. Example of a choice set with different protection alternatives used in the valuation exercise (translated into English)