Demand-driven sustainable tourism? A choice modelling analysis

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Abstract

This paper studies the preferences of tourists visiting Sardinia (Italy), using a choice modelling approach. The focus is on the evaluation of some specific 'demand-enhancing effects', which according to economic theory provide a basis for implementing sustainable tourism policies. Multinomial logit estimates reveal that strong negative effects result from the congestion of tourist attractions and transformations of coastal environments, though tourists clearly gain utility from the other components of a tourism destination. The extent of the effects related to environmental preservation seems to support planning tourism development policies that will not have strong irreversible effects on coastal areas.

Keywords: Tourism demand, green preferences, stated preferences, sustainable economic development
JEL classifications: Q56, L83, C25

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When a long-run perspective is considered, the role of tourism as a tool for economic development is a questionable issue. The economics literature outlines possible negative effects such as increased dependence to foreign capital and a volatile demand (Sinclair, 1998); disturbances in the labour market (Nowak, Sahli and Sgrò, 2005); Dutch disease effects (Nowak and Sahli, 1999); and land competition and speculation (e.g.; Giannoni and Maupertius, 2005). However, at least for those destinations whose main attraction is represented by the endowment of natural resources, several theoretical studies (e.g. Lanza and Pigliaru, 1994; Rey-Maquieira, Lozano and Gómez, 2005; Cerina, 2006) also claim that a cautionary management of natural resources can prove successful not only in ensuring an optimal long-run exploitation of resources, but also in increasing tourist willingness to pay, tourism receipts, and ultimately the growth rate of economies specialized in tourism.

In the theoretical literature on the dynamics of tourism economics, "cautionary management" may take place by policies whether for the preservation of environmental quality, or for the limitation of tourists' arrivals. This certainly contrasts with the way tourism industry is being developing in many destinations, where a major role has been played by the setting up of infrastructure, residential buildings and services, whose construction often negatively affects the original features of the very natural resources that made a given area attractive as a tourist destination.

An important matter is how to assess whether tourism economies, through such transformation of tourist sites and destinations, have been rationally meeting tourist preferences, or have been driven by market failures to a non optimal exploitation path of natural resources and consequently to a sub-optimal path of economic growth due to their failure to adequately satisfy

consumer preferences as regards the quality of environment. The political debate on the forms of tourism development has been very lively in Sardinia, where tourism is seen as a primary factor of economic growth and a major tool for reducing "historic" high unemployment rates. Sardinia is the second largest island in Italy and in the Mediterranean Sea, and has a recognised high quality environmental resources, namely its coastal landscape and sand beaches. The island also has an international reputation as an elite destination. Recently, the regional government has introduced very strict rules regarding the building of new accommodation facilities (second houses as well as hotels) all along the coast line, on the grounds that the preservation of the quality of natural marine resources and even the control of the number of tourists can improve the long-run economic performance of the tourist sector due to the increased willingness to pay for a more attractive "product".

Unfortunately, such arguments are not backed up by significant empirical evidence, mainly because it is difficult to get useful information from currently available data sets on international tourist demand. In particular, official data fail to detect the well known aspect that tourism is a "composite good", where the latter term encompasses a set of characteristics ranging from the environmental state of natural attractions, to man-made facilities such as recreational services and, at least to some extent, the ease of access to a particular site. The appeal of this composite good clearly depends on how well the mix of component characteristics is balanced.

An appropriate empirical method, also used in this paper, for the analysis of tourism demand consistent with this perspective is the discrete choice modelling technique, as originally shown by Huybers and Bennett (2000). In the last 15 years, literature on tourism economics has shown growing interest in stated preference approaches applied to the analysis of tourism demand (e.g. see the survey by Crouch and Louvière, 2000). A few recent papers have applied discrete choice

modelling to destination choice, both for international tourist demand (Huybers, 2003a), and for modelling factors that determine inbound tourism flows for short trips (Huybers, 2003b). Other studies have focused on very specific subjects, such as identifying the effects on willingness to pay (WTP) by selected characteristics that an accommodation facility or a single site should possess (e.g. Morimoto, 2005); or estimating price responsiveness of "single origin-single destination" flows of international tourist demand (Morley, 1994).

As Huibers (2005) remarks, the application of discrete choice modelling to the analysis of tourism demand has appealing properties. From a scholarly perspective, it represents a useful research method applicable to empirically testing some theoretical hypotheses on tourist-consumer behaviour (e.g., think of price sensitivity and "green preference" effects). From a more policy-oriented viewpoint, it can be a tool which policy makers and promotion agencies can use, whether to analyse the attractiveness of their existing products or tailor their tourism products to existing and new target markets.

Both arguments are very important when directed to the empirical assessment of the link between tourism and sustainability. In particular, are current development projects consistent with the actual needs of demand? Also, are "sustainable tourism policies" an optimal, or at least a satisfying strategy for areas with important (and potentially marketable) natural resources? In order to answer these questions, this paper tries to assess the importance (in relative terms) of some "characteristics which support sustainability", such as lack of overcrowding and preservation of quality in a natural environment vs. locating lodgings near to beaches and/or leisure services.

The analysis of this paper is based on a sample of tourists interviewed in the airports, on completion of their holiday in Sardinia. In particular, it is examined how tourist preferences are differentially affected by high or low degrees of accessibility to the tourist attraction, by the existence of protected areas in the vicinity of the accommodation, by the quality of the natural resources, by the overcrowding of tourist destinations and by the availability of recreational services. Hence (in line with the perspective by Huybers and Bennett, 2000), it is implicitly assumed that the environment is only one component of tourists' preferences, and that a better evaluation of its role in determining tourists' destination choices is achieved by making explicit the existence of characteristics which may be in conflict with natural resource preservation. It is likely that the appeal of these characteristics varies across different destinations, but some "benefit transfer" should be possible when considering areas that are to a large degree similar.

Tourist preferences are elicited by means of the choice experiment technique. As is well known, the use of standard econometric techniques for the analysis of discrete choice data permits to generate estimates of the relative importance of the attributes, and to obtain a monetary evaluation of each of them. It is worthy to remind that stated preference approaches are often the only empirical methodology available for demand analysis, given the absence of detailed data and the need to evaluate new policies and interventions. Moreover, a stated preference analysis avoids simultaneity problems which would characterize a study based on real markets data (as a simple example, think of the bi-directional link between overcrowding and tourist demand).

The results from the econometric analysis show that the WTP for environment-friendly attributes outweighs the WTP for characteristics which are usually associated with a deterioration of natural resources. This seems to support tourism development policies that will have a low impact on coastal areas.

Econometric tools for modelling tourists' choices

This section briefly summarizes the analytical tools used for empirical analysis based on the technique of choice modelling. Here, only a basic common currency of expressions used for carrying out the estimates is recalled, given that discrete choice techniques are nowadays well established.[1] In fact, after being initially developed in transportation and marketing literature, in more recent years the technique has also found several applications in environmental economics and health economics studies,[2] and plenty of technical contributions have been made available.

The theoretical basis for the application of choice modelling methods to the demand of composite products is the Lancasterian approach to consumer analysis, in which utility for each good is defined as a weighted sum of a set of characteristics. When applied to tourism, these characteristics can be simply defined as the set of attractions and facilities which concur to define a holiday as a pleasant experience. Hence, in the case of a dataset arising from a choice experiment, the choice by the respondent should reflect, *ceteris paribus*, the combination of attribute levels which offers the highest utility for a given set of alternatives of choice (the "choice set").

Many complex estimation procedures are now available.[3] In this paper the empirical analysis is based on the estimates derived from a standard discrete choice multinomial logit model (henceforth, MNL).[4] As is well known, multinomial models enable the researcher to relate the choice made by an individual in a real or hypothetical context to some characteristics which vary across his or her choice set.

In the MNL, the data arising from the $j = 1,2, \ldots J$ alternatives of the observed choices, and taken by a sample of $h = 1,2, \ldots, H$ respondents, are described according to a random utility specification such as the following:

$$U_j^h = V_j^h + \varepsilon_j^h = \boldsymbol{\beta}' \mathbf{x}_j^h + \varepsilon_j^h, \tag{1}$$

where the vector $\mathbf{x}_j^h$ may refer to characteristics of both the choice alternatives and the respondent. The index structure $\boldsymbol{\beta}' \mathbf{x}_j^h$ implies an additive specification of indirect utility functions V_j.

The individual random components ε_j^h are assumed to be independently and identically distributed[5] (IID) with an extreme value Type 1 distribution. The IID assumption across alternatives of the unobservables leads to the well known property of independence of irrelevant alternatives (IIA). According to this property, the odds ratio of an alternative k being chosen over alternative l is independent of the availability of attributes or alternatives other than k and l (e.g., McFadden, 1984). Therefore, the exclusion of some alternatives in estimation does not affect the consistency of the estimator. This implication, and the related limitation on the values taken by cross elasticities, is clearly rather strong and difficult to maintain when highly dissimilar alternatives are inserted in the choice set.

One advantage of the above assumptions regarding the functional form is that the MNL model provides a particularly simple closed form to estimate. Namely, the likelihood that household h chooses alternative k is:

$$\mathrm{P}[y_h = i] = \frac{\exp\left(\boldsymbol{\beta}' \mathbf{x}_i^h\right)}{\sum_{j=1}^{J} \exp\left(\boldsymbol{\beta}' \mathbf{x}_j^h\right)}, \tag{2}$$

where y_h is an index of the choice made by household *h.*

Equation (2) can be directly used to estimate choice probabilities from which the market shares for the problems involved are directly obtained. The IIA hypothesis is crucial, here. In fact, if analysts believe it is valid, a choice between two alternatives can be enough for enlarging analysis to a case scenario with many possible choices (e.g., see Train, 2003, pp. 53-54). Otherwise, what needs to be done is to build choice experiments with a set of alternatives as far as possible similar to the one an individual faces in real life. However, this of course would expose the choice experiment to dramatic increases in task complexity for the respondent.

The parameters from the previous model allow for evaluating the relative weight of an attribute in respondents' utility functions. Moreover, substitution rates between the attributes can be easily computed. If the attribute to be evaluated is discrete, what can be actually computed is a "value of level change".

A very useful kind of substitution rate to use is the "implicit price", which can be computed when there is an attribute expressed in monetary terms. In this case, given the linear specification of the indirect utility function, welfare effects of a level change are measured as follows:

(3) $$WTP = -\frac{1}{\beta_p}\left(V_0^h - V_1^h\right).$$

The subscripts (0,1) in equation (3) define the indirect utility functions before and after the policy change, whilst β_p is an approximation of the inverse of marginal utility of income, which is usually given by the estimated coefficient associated with the attribute expressed in monetary terms.[6]

As is explained, for example, in Louvière *et al.* (2000, p. 337), the expression (3) yields the compensating variation in a case where an individual chooses a particular alternative (destination) with certainty. Alternatively, it can be seen as an appropriate measure for cases where a quality variation applies to all the alternatives of the choice set (Haab and McConnell, 2002). Moreover, even though it is widely acknowledged that the marginal utility of income actually varies with income, the use of the expression is justified by hypothesising that the marginal utility of income is constant over the range of implicit income changes involved by a given policy intervention. This would be quite acceptable in cases where the cost difference of a choice alternative is small relative to individual income. In addition to pointwise estimates, confidence intervals should be computed. Generally, the Krinsky-Robb technique (which is adopted in this paper) or bootstrap methodologies are used. For other approaches, see Bateman *et al* (2002).

Survey preparation and summary data.

The survey from which the empirical section of this work derives was carried-out between early June and the end of October 2005 by means of personal interviews in the three major airports of Sardinia. It aimed to collect comprehensive information sets encompassing the personal characteristics of tourists, their chosen holiday location and average daily expenditure, and a series of opinions and observations concerning their own experience with the "Sardinian tourist product". The survey also included a choice experiment questionnaire designed to obtain original data on the tourist's perception of certain features (particularly with regard to the environment) of a standardised (and hypothetical) range of Sardinian destinations based on hotel accommodation.

The interviews were carried out on people leaving Sardinia, after holidaying in the island. Therefore, respondents were familiar with the "sea and sunshine" destinations proposed in the

questionnaire. It is clear that the elicitation of individual's preferences after making their choice of destination might involve the risk of self-selection bias, if these preferences concern the estimation of choice probabilities for different destinations.[7] Here, however, stated choices by "experienced tourists" rather than by prospective ones have the advantage of providing information by an "informed" sample of people who properly know the nature of the product in question. Moreover, no biased effects occur when the focus is on the characteristics of existing tourist demand flows to Sardinia, rather than on the estimation of the probability of attracting additional flows. Of course, a policy intervention aimed at better matching the preferences of existing tourists is likely to also have an impact on destination choices at a more general level (the effect on overall tourist expenditure would be nil only if the hypothesis of weak separability between regional destinations holds good for international tourist demand).

The first part of the questionnaire focused on socio-demographic characteristics and information regarding the holiday (mode of booking, the kind of accommodation, the main motivation for the holiday, etc). Most of these variables can be employed to check for the representativeness of the sample and perform some comparisons between subsets of the final demand.

The second part of the questionnaire presented the choice experiment, by briefly explaining the purpose of the survey and describing a basic scenario to which respondents' "stated choices" had to be referred.[8] In this scenario, tourists had to choose between various alternatives for a week's holiday (six nights) in a "good quality three star hotel". As a consequence, respondents were told by the interviewers not to consider their current accommodation and experience. The holiday proposed was a mainly "beach and sea-side" vacation, with accommodation in the vicinity of a seashore resort. This of course would not exclude the possibility of doing excursions to inland areas of the island. However, the primary tourist attraction was the sea.

The description of the hypothetical scenario was followed by presentation of the "attributes" to be considered. These attributes dealt with characteristics that varied in the choice set of the experiment according to a predefined experimental design. Each attribute could assume different levels in each profile presented for choice. Six attributes were defined and categorised on the basis of several rounds of "expert opinion" meetings carried out in February and March 2005, of a previous survey carried out in 2003 (where tourists were asked to indicate what characteristics they considered most important for tourist services in Sardinia), and a first pre-test consisting of about 50 interviews carried out during the period of the 2005 Easter holidays, when the first sizeable tourism flows usually come to Sardinia.[9] The description of attributes and their levels are shown in Table 1.

Table 1. Description of the attributes and attribute levels of the choice experiment.

1.Proximity of main tourist attraction (principal motivation for holiday choice)	- High: The main attraction (the beach) is easily reachable on foot from your accommodation - Low: From your accommodation, it requires about ten minutes by public transport or by car to reach the main attraction.
2.Risk of overcrowding in main point of attraction	- Low: Your hotel guarantees easy access to main tourist attraction (e.g. parking and sunshades reserved for hotel guests) - High: Your hotel does not guarantee easy access to main attraction (tourists rely on their own means)
3.An uncontaminated and untouched natural environment as a primary attraction	- Maximum: a site only reachable on foot, and leaving your car in a place not visible from the beach, and where there are no information and bar/restaurant services, and no buildings in the vicinity - Good: a site only reachable on foot, and leaving your car in a place not visible from the beach, but with some tourist information signs and basic services, around which there are some buildings which are, however, scarcely visible. - Discrete: a site with a nearby parking facility as well as information points and bars/restaurants available; buildings clearly visible. - Minimum: a site with ample parking and adjacent buildings; no lack of shops and kiosks or bar/restaurant services.
4.Availability of recreational services (e.g. guides, entertainment/ organised activities, shopping areas, pubs and night spots).	- Ample availability: A wide variety of all kinds of additional/complementary services in the location chosen. - Good availability: A reasonably good choice and variety of additional/complementary services in the location chosen. - Low availability: A low choice and variety of additional/complementary services in the location chosen. - Minimal availability: A scarce or total lack of additional/complementary services in the location chosen.
5.A natural reserve in the vicinity of your holiday location	- Yes: A nature reserve is within 30 minutes reach of your accommodation (for example, a marine park, a local nature reserve). - No: There are no nearby nature reserves, or at least 30 minutes is needed to reach one.
6.Daily cost per person per night (half board accommodation in a 3 star hotel)	- 50 euros - 65 euros - 80 euros - 95 euros

The motivation of the first attribute was that, since the main attraction of Sardinia is its sea and coast, a mode of measurement was needed for the disutility of the distance of accommodation from the main "attraction site", i.e. the beaches and/or the seaside scenery. Ten minutes by car or public transport on a tourist route cover a distance of about 2 km. Given that building accommodation inland rather than on coastal areas reduces environmental impact, detecting tourist aversion to distance is important for municipal and regional territorial planning policy.

The second attribute aimed to capture aversion to overcrowding. In the preparation of the survey, it became clear that respondents had some difficulty in assessing the generic concept of overcrowding . In the end, rather than trying to find an exact definition of a "perceived" carrying capacity, it was considered that what tourists particularly dislike is the "risk of overcrowding", which occurs when the availability of the main tourist attraction (access to the beach and the sea) is not guaranteed since it must be contended with other visitors. The most immediate way to elicit a valuation of this effect was to envisage the possibility of "preferential access" ensured by the accommodation. Where this preferential access was not guaranteed, tourists were faced with the risk of overcrowding (with the consequent difficulty in finding parking, the need to get to the beach early, the problems in finding comfortable spots for sunbathing, etc).

The motivation for the other attributes are easily understandable. The methodology adopted for the descriptions of the levels related to the attributes of "environmental quality" and "availability of recreational services" was that of define a reference level (untouched natural environment and ample availability of services) and then "scale down" the other levels with respect to the reference level.

The full factorial arising from all the possible combinations of attribute levels yields 512 profiles. In order to keep the number of the stated choices to be handed out at a manageable size, the level of the attributes was varied according to an orthogonal fractional factorial design which yielded 32 profiles. The choice sets were then built by means of a "shifted pairs" technique (see Louvière *et al*., 2000, ch. 5). These 32 choice sets were divided into 4 groups of 8 choice cards. Each tourist was asked to provide answers to one group of choice cards (i.e. to make 8 choices). With the purpose of limiting order bias, the 8 choice sets administered to each respondent were rotated sequentially.

No "none of these two alternatives" option was included in the choice cards. This is a debated issue. In this case, the main argument against inserting this third option was that respondents might simply have indicated this third option in those cases where it was less straightforward to make a choice between the two alternatives, or they did not like the alternatives proposed. On the contrary, giving respondents' the option not to choose any profile would make sense when the possibility of preferring not to go on holiday is made explicit.[10] The main interest of this study, however, is not the estimation of the likelihood to come to Sardinia, but rather how tourists might distribute according to the characteristics of the locations. Moreover, introducing the "no choice" option often leads to very high values of the alternative specific constants, which then become a major component of the willingness to pay estimates (e.g. Adamowicz *et al*., 1998). Of course, a rigorous comparison with a similar survey where the "none of these two alternatives" is showed to respondents would give useful indications on how to carry out this kind of studies.[11]

Main empirical results

The survey tried to respect a simple stratification of the sample according to two characters of tourists universe: nationality (mainland Italy or foreign tourist) and type of accommodation

(hotel and other categories). The survey plan was based on 2003 tourist flows (overnights), aiming also to respect the seasonality for the distribution of questionnaires.

Table 2. Main descriptive statistics

Information regarding tourists' holidays

Official flows and sample distribution	Sample (excluding VFR and Farmhouse)			Official data (ISTAT, 2003)		
	National	Foreign	Total	National	Foreign	Total
5 and 4 stars	17%	17%	34%	22%	9%	31%
3 stars and holiday residence	16%	8%	24%	30%	10%	40%
2 and 1 stars	1%	1%	2%	3%	2%	5%
Camping or village resort	9%	3%	12%	13%	6%	20%
Rented villa or 2nd home	12%	8%	20%	3%	1%	3%
B&B and other accomodation	7%	1%	8%	0%	0%	1%
Total	62%	38%	100%	72%	28%	100%

Socio-demographic characteristics

Gender	
Male	57%
Female	43%
Total	**100%**

Age	
Average (years)	40,1
Median	39
15-30 years	26%
31-45 years	43%
46-60 years	23%
Over 60 years	8%
Total	**100%**

Personal Income	
Mean	€ 42,572
Median	€ 30,000
< € 10,000	11%
€ 10,000 - € 20,000	17%
€ 20,000 - € 30,000	19%
€ 30,000 - € 40,000	15%
€ 40,000 - € 50,000	9%
€ 50,000 - € 60,000	7%
€ 60,000 - € 75,000	7%
€ 75,000 - € 100,000	5%
> € 100,000	10%
Total	**100%**

i. A few descriptive statistics

The main characteristics of the sample are shown in the Table 2. As for the information regarding tourists' holidays, over half of the respondents indicated that they had made use of hotel facilities, in particular 4 or 5 stars hotel (34% of sample). One fifth of respondents stayed in rented houses for their own vacation or at friends/relative's home (official data fail to detect most of these flows, which mainly feed a black rental market). Not considering the category "friends

and relatives", (which is not recorded in official statistics), nor the quota of rented villa not registered, the sample distribution is generally in line with the distribution of tourist flows according to nationality and kind of accommodation. Only the 3 star hotel category quota in the sample is underrepresented compared to official flows. What is most striking in the descriptive statistics is the very high average income, especially for foreign tourists (euros 50,788) but also for the Italians (39,053).[12] Even tourists not lodging in 4 and 5 star hotels actually declared a quite high income (mean 35,662; median 25,000). relative to the national average income. In fact, the average per capita disposable income in Central and Northern Italy (the areas from which the vast majority of Italian tourists originate) is about € 16,000.

ii. Econometric results

The econometric estimates, as can be seen in Table 3 below, have been carried out by making use of two sub-samples. The first one, encompassing all the observations arising from the 715 completed questionnaires, and the second one involving only tourists who had not stayed in 4 or 5 star hotels. The reason for sampling out the high-spending tourists was to detect a potential different sensitivity by customers of luxury hotels to the various attributes, especially the accommodation costs used in the choice experiment, which were specified as being for half board accommodation in a 3 star hotel.

The estimates based on the entire sample are reported in the first half of the table. All the levels of the attributes are inserted as dummies.[13] Also an alternative specific constant (ASC) was inserted, in order to check for the robustness of the results and the absence of systematic bias by respondents towards one of the two alternatives. In fact, no changes occur when the ASC is excluded. The "t statistics" values indicate the general high significance of most attribute levels. Moreover, in all cases the signs are in line with economic intuition. As an indication of overall

goodness of fit, the pseudo R-squared statistics displays a value of 0.12, which can be considered a bit low, when compared to choice modelling literature on environmental valuation, though it is fairly acceptable.[14]

Table 3. Multinomial logit estimations

	MNL model (*all observations*)			**MNL model** *(respondents in 4 and 5 star hotels excluded)*		
Variable	**Coeff.**	**t-stat**	**Prob**	**Coeff.**	**t-stat**	**Prob**
Proximity of the beach (0 low, 1 high)	0.3633	10.70	0.000	0.3481	8.85	0.000
Risk of overcrowding (1 if no guarantee of access)	-0.5433	-16.53	0.000	-0.4944	-12.98	0.000
Good quality of natural environment (excluding dummy "maximum quality")	-0.0762	-1.40	0.161	-0.0819	-1.30	0.195
Discrete quality of natural environment (excluding dummy "maximum quality")	-0.3237	-4.96	0.000	-0.3085	-4.08	0.000
Minimal quality of natural environment (excluding dummy "maximum quality")	-0.6226	-10.59	0.000	-0.5633	-8.26	0.000
Low availability of recreational services (excluding dummy minimum availability)	0.0423	0.76	0.449	-0.0183	-0.28	0.779
Good availability of recreational services (excluding dummy minimal availability)	0.3426	5.11	0.000	0.2612	3.36	0.001
Ample availability of recreational services (excluding dummy minimal availability)	0.3806	6.52	0.000	0.4085	5.98	0.000
Protected natural area in the surroundings (1 if present)	0.4202	12.92	0.000	0.4361	11.52	0.000
Daily cost of half board accommodation	-0.0044	-3.57	0.000	-0.0087	-5.94	0.000
Alternative specific constant	-0.0052	-0.13	0.893	0.0100	0.23	0.821
Diagnostic statistics and tests	**Value**			**Value**		
Log likelihood function	-2839.95			-2099.66		
Pseudo R-squared	0.1195			0.1151		
Number of observations	4,653			3,423		

The estimates based on the sub-sample of tourists not staying in luxury accommodation are reported on the right hand side of the table. As for the relative importance of the qualitative attributes, no noticeable differences emerge with respect to the entire sample. On the contrary, there is a notable difference in the sensitivity to the price of the half board accommodation, which in fact doubles. This finding confirms the utility of carrying out a separate regression on the abovementioned sub-sample, although it is difficult to identify a univocal explanation for this

difference. One may argue that the budget of people who stay in luxury hotels (usually the richest) is relatively less affected by a given variation in accommodation prices, and that 3-star accommodation could be considered as an irrelevant characteristic which does not apply to the holiday needs of richer tourists. To the extent that this conjecture is true, it is to be expected that the cost coefficient estimated on the sub-sample of respondents not lodging in luxury accommodation provides a more reliable measure of the marginal utility of income for most tourists.

Having a model with only categorical variables (apart from the cost attribute), the estimated coefficients make it easily viable to carry out a relative evaluation of the importance not only of the attributes themselves, but also of each attribute level. An intuitive way to proceed is to arbitrarily choose an attribute as a reference basis. For example, if we normalize to one the parameter regarding the availability of hotel accommodation near the sea, we get for the entire sample (*respectively, the restricted sample*) a value of -1.50 (*-1.42*) for risk of overcrowding and of 1.16 (*1.25*) for the existence of a protected area, of -0.89 (*-0.89*) for a shift in environmental quality to a discrete level, -1.71 *(-1.62*) for a shift to the lowest level of environmental quality , and of 1,05 (*1.17*) for a shift from minimal to ample availability of recreational services.[15]

Overall, it appears that what the sample of interviewed people mostly dislike is a high risk of overcrowding and a shift from maximum to minimal environmental quality. An interesting observation on this latter attribute is that tourists do not seem to be particularly perturbed by slight modifications of the original environment, given that the coefficient is quite low and only slightly significant. Respondents show to be averse to substantial modifications of an untouched environment (i.e. from very high to low quality levels). Similar remarks can be made for the availability of recreational services, although with smaller values in absolute terms. There is a

dichotomy between low and substantial endowment of services, so that only good and ample availability seem likely to affect the choice probability of a given destination. Finally, the vicinity of a natural protected area shows a quite relevant effect. This result has obvious important policy implications, both for a proper distribution of new accommodation services, and for the purpose of assisting a destination in difficulties. Nonetheless, this high value could be partly determined by an option value effect, that is tourists appreciate *the possibility to choose to visit* a protected area, rather than the direct use they actually make of it. As a note of caution, however, it could be considered that at least part of the estimated effect could depend on effects that contingent valuation analysts call "symbolic bias" and "part-whole bias", i.e. a tendency by respondents to express their support to environmental protection in general, rather than a precise evaluation of the benefit arising from a specific environmental good.[16]

One property of the previous "main effects" estimation is that of ensuring a constant marginal utility of income. In order to check if our results are robust to this condition, the cost attribute can be related to respondents' income. A common solution for that is to divide the cost attribute by the individual's income so that the coefficient of cost depends on income. Parameters' estimates were robust to this alternative specification. So these results are not reported here.[17]

iii. Implicit price estimates for the main attributes and levels

Let us now turn to the comment of implicit prices for differences between the various attribute levels. Table 4 below was constructed using expression (3), whilst 95% confidence intervals (whose width roughly depends on the MNL estimate of the standard errors of parameters), were estimated by means of the Krinsky-Robb (1986) procedure. The results must be evaluated with the usual *caveat* that we are dealing with discrete variations, though the hypothesis of constant marginal utility of income is mostly reliable when small level changes are considered.

For the calculation of welfare measures, the estimates presented on the right hand side of Table 4 were used. Limiting the choice to tourists not staying in 4-5 star hotels is motivated by the sizeable difference in the estimate of the cost coefficient, which is to be used as an indicator of marginal utility of income.[18] The table was mainly built by reporting partial WTP values for "improvements" in individual utility functions. However, it must be remembered that, with a constant marginal utility of income, the estimates obtained with a discrete choice modelling yield the same result when the willingness to accept (WTA) case is considered (e.g., in the table this is the case for the levels of the environmental quality). This feature of the choice modelling approach therefore neglects the fact that WTA statements in contingent valuation surveys are usually much larger than WTP ones.

The monetary values reported in the table are quite large. Though broadly comparable to those obtained in previous literature (e.g. Huybers and Bennett, 2000; Huybers, 2003), they should be mainly considered in relative terms rather than as concrete market values. As is presumable on account of Sardinia's international reputation, a particularly highly evaluation is assigned to the preservation of the environmental quality of the seaside resorts. The mean implicit price for the difference between an uncontaminated and a fully urbanised site is € 64.7. Broadly speaking, where the conditions of the environment have deteriorated, only a substantial fall in holiday prices would maintain the competitiveness of a given destination. Regarding the implicit prices of one-level differences of this attribute, the values vary from € 9.3 for a shift from maximal to good, to € 29.3 for a shift from discrete to minimal. This means that tourists' preferences display increasing marginal aversion to environmental deterioration.

Table 4. Value of level changes for the various characteristics of the holiday locations

Level Changes	*Marginal WTP/WTA* (*in Euros*)	*95% Krinsky-Robb confidence intervals*	
Proximity of the main attraction	40.01	27.27	62.40
No risk of overcrowding	56.83	40.97	87.08
Variations in natural environmental quality			
From maximal to minimal	-64.75	-103.43	-4.60
From maximal to discrete	-35.46	-62.54	-17.81
From maximal to good	-9.33	-26.06	4.74
From discrete to minimal	-29.29	-59.25	-6.09
From good to discrete	-26.05	-54.82	-3.94
From good to minimal	-55.33	-93.57	-31.69
Variations in available recreational services			
From minimal to ample	46.95	28.93	76.23
From minimal to good	30.02	11.83	55.13
From minimal to low	Not significantly different from 0		
From good to ample	16.93	-6.39	44.12
Existence of a protected natural area in the surroundings	50.13	35.73	75.97

The second highest partial WTP refers to "risk of overcrowding", evaluated at €56.8. Though Sardinia is not yet an over-crowded destination, respondents have appeared particularly sensitive to this factor. A probable explanation for this result is that many tourists currently choose Sardinia because of its image as an exclusive holiday destination , and therefore are particularly scared of not having guaranteed access to what the sea offers.

As a summarising comment on other attributes, it can be noted in general that the WTP for environmental-friendly attributes outweighs those for characteristics which are more likely to bring about a deterioration of natural resources. In this sense, existing theories on sustainable tourism based on "demand-driven" effects seem to find an empirical validation. This paves the way to the simple policy indication that cautious management of tourist coastal sites is likely to maximize the economy's revenues from tourism; and that the incompleteness of recreational services or the ban of new hotel accommodation in coastal areas may be offset by policies aimed at ensuring the availability of untouched and protected areas and at limiting overcrowding.

Discussion and conclusions

This study has aimed to assess the potential of the discrete choice modelling approach in the analysis of international tourism preferences for a destination characterised by important natural resource endowments. Namely, the focus was on the demand-side economic effects of some broad characteristics of tourism supply which, according to a growing stream of theoretical research, is likely to make the development of tourist destinations more sustainable from an environmental as well as an economic point of view.

The analysis was carried out on a sample of tourists interviewed when leaving Sardinia after their holiday. Therefore, in the first place, a note of caution is needed about the external validity of the results, as is generally the case for the outcome of choice experiments. As was pointed out in section 2, interviewers got in touch with a rather rich niche of tourists that went beyond original expectations. Moreover, the name “choice experiments” must remind the analyst that the results are the outcome of a “laboratory tool”, where not all features of sites and accommodation can be modelled and captured.

Nevertheless, interesting indications about the relationship between the analysed attributes and location choice have emerged. Results were all in accordance with economic theory, but what is even more important is the relative size of the various characteristics in determining consumer utility. It appears that what tourists appreciate most is lack of overcrowding, described as being sure of having fair access to the main attraction that motivated their holiday destination choice. Equally, environmental quality is also extremely important, but real sensitivity seems to be clearly evident where there are substantial losses with respect to original conditions . On the contrary, only high levels of accessory recreational facilities seem to be a relevant determinant of destination choice.

Useful policy indications emerge from such clear-cut effects. There is a fair consensus that an almost necessary condition for ensuring the physical carrying capacity of a site is that the concentration of accommodation and buildings near the main attractions (i.e. near the beaches and the coast) should be limited. The previous results show, as expected, that giving up the proximity of the sea is not a "free lunch". In fact, the estimates indicate a quite relevant effect. However, this is not a predominant one. Coming back to the debate in Sardinia on the management of coastal areas, tourists seem well disposed to not having beach-front accommodation, if they are guaranteed access to the natural environment, or if environmental quality is only slightly affected by tourism activities. Therefore, compensating effects in the form of granting access to the main areas attraction or ensuring the conservation of high standards of environmental quality seem to be feasible.

From this perspective, interest in this kind of approach for the analysis of tourism demand seems evident, both from the practitioner's and the academician's point of view. On the one hand, policy-makers and specialised agencies need to stay better informed about the determinants of tourists' behaviour, given the growing level of competition nourished by new tourist destinations, and the necessity to limit the market failures usually associated with a *laissez faire* management of natural resources. On the other hand, theoretical contributions can probably offer new useful insights on the topic. Particularly, if these contributions would partially change the way how environmental quality effects are framed in demand functions. No longer only as a simple upwards shift of consumer's willingness to pay, but more as a trade-off where the utility from the environment is in explicit conflict with the other component characteristics of tourism supply. As far as matching economic and environmental sustainability is concerned, one has to

"hope" that utility from the environment friendly characteristics of tourist services outweighs the utility from characteristics which conflict with the environment.

The results reported in this paper give cause for some optimism, but additional research is certainly required, also on the empirical side. First, as the results reported have made clear, it seems important to try to detect by means of an appropriately designed survey, the size, nature and typology of tourists staying in luxury accommodations (who incidentally also have a higher impact on the local economies). Secondly, it would be worthwhile undertaking new research to assess the robustness of the results to a possible inadequacy of the MNL specification and of the consequent IIA hypothesis. For this reason, random parameter logit specifications and semiparametric techniques (Cf. Fox, 2006) appear to be a promising way forward.

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[1] Recent reference books are Louvière *et al*, 2000; Train (2003); Bateman *et al* (2002).

[2] E.g., see the surveys by Hanley, Mourato, and Wright (2001), Mazzanti (2003), and Ryan and Gerard (2003), referred respectively to environmental economics, evaluation of cultural goods, and health economics literature.

[3] See for example Train (2003).

[4] This model is also referred as the "conditional logit" (e.g. Greene, 2003). Here it is followed the terminology adopted by Mc Fadden (1984) and Louvière *et al.* (2000).

[5] The IID hypothesis implies that $\text{cov}\left(\varepsilon_j^h, \varepsilon_i^h\right) = 0$ and $Var\left(\varepsilon_j\right) = \sigma^2 = \pi^2/6\mu^2, \forall j$, so that on the whole the variance – covariance matrix of the MNL is constant and simply equal to $\Sigma = \sigma^2 I$.

[6] Alternatively, an estimate of income marginal utility of can be obtained from the coefficient of a regressor defined as the difference between respondent's income and the cost of the alternative.

[7] In particular, and in order to avoid the potential for incidental truncation with surveys of tourists at their destinations, an analysis based on *potential tourists* at their origin is to be recommended when the focus is on the forecast of the variation of choice probabilities. (e.g., see Morley 1994; Huybers and Bennett, 2000; Huybers, 2003a).

[8] The complete questionnaire which was prepared for the survey is available on request.

[9] The pre-test was particularly useful for assessing if the attributes were presented in a clear and understandable manner, i.e. whether the attribute labels and the wording of each attribute level were valid.

[10] This is the case, for example, of the studies by Huybers (2003a,b).

[11] In order to check if this format of the choice experiment constitutes a strong limitation, we carried out a test on a subsample of respondents by introducing a follow-up question which allowed them to confirm the choice made or to say "neither of these two alternatives". We find that the inclusion or exclusion of these answers does not change the quality of the results.

[12] The highest recorded income was 500,000 euros. Hence the result on average income is not affected by the presence of particularly high values.

[13] The cases excluded so as to avoid any singularity in the variance-covariance matrix are "low proximity of the accommodation to the main attraction", "low risk of overcrowding", "maximum level for the quality of natural environment", "minimal availability of recreational services", and "absence of a nature reserve in the vicinity of the holiday location".

[14] See, for example, the set of studies presented in Bennett and Blamey (2001), where most of regression results display a R-squared values above 0.15. It must be pointed out that acceptable pseudo R-squared values for ML regressions are lower than R-squared for linear regression analyses. As reported for example in Huybers (2003), a value above 0.20 would indicate an extremely good fit of the data.

[15] It is well known that the parameters of the models with categorical dependent variables are identified up to scale. Hence, one can arbitrarily normalize the estimated parameters with respect to one of the coefficients. If we label the "proximity" parameter as b_0, the numbers above are therefore calculated as b_1/ b_0, b_2/ b_0, etc.

[16] On this issue, see for example Bateman and Willis (1999).

[17] Results are available on request. Given that a share of the respondents refused to answer the related question, this approach also involves a reduction of the estimation sample. Moreover, problems of measurement error, mainly due to rounding effects, cannot be ruled out. Finally, as Train (2003) remarks, if the cost coefficient depends on income, there is a violation of the assumptions needed for deriving welfare measures of the type expressed by equation (3). The violation may not be important for small level changes, but certainly relevant for large changes.

[18] With the estimates from the whole sample, it is easy to verify that implicit prices would be more or less doubled.