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Chapter 22

Determinants and value of outdoor recreation in Italian protected areas: a travel cost random utility approach*

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1. Introduction

The Italian territory covers sites of great natural diversity some of which have great environmental value. Protection laws for environmentally valuable sites were passed and enforced from an early time[1]. As economic development boomed in the decades after world war two the need for environmental protection became more pervasive and many locations threatened by development were protected from national, regional and provincial regulations. The existing network of Environmental Protection Areas (EPAs) affords quite an articulate scenario with 193 sites that have a differing degree of environmental protection ranging from a total ban to human access to simple development constraints around sites of outstanding scenic beauty[2]. The enforcement of this protection is costly and its economic benefits are poorly investigated. The purpose of this paper is to report on preliminary results from a study conceived to cast light on these benefits: the structure of recreational decision making with respect to EPAs and the implied economic dimensions of recreational benefits.

Following the seminal work by Bockstael *et al.* (1987) and subsequent developments (amongst

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[1] The first Italian environmental protected area (EPA), the Gran Paradiso National Park, was established in 1922. Since then the process of natural resources protection took place very slowly until late seventies when, the institutional decentralization towards peripheral public bodies, enabled Italian Regions to start their own process of environmental protection: since then more than 1.3 million hectares have been protected by regional bodies. It is, however, only in last years that the process of extension of Italian EPAs' system have been boosted: the so called Framework Law on "Parks and other Environmental Protected Areas" (Law no. 431/91), passed in 1991, increased the number of National Parks from 5 to 19, extending protected areas under National Parks regulations from 367 thousands hectares up to 1.25 millions hectares.

[2] The two extremes of the range are, respectively, the areas of "integral" conservation (that is, total preservation where no human activity is allowed), like the so-called zone A of National Parks as well as the so called Regional Integral Reserves, and areas where only some developments constraints (that is regulations which allows most of human activities) are enforced, like in the case of more peripheral zones in National Parks, surroundings of scenic beauty sites (according to Law no. 1497/39), etc.

others, Haab and McConnell 1996; Feather *et al.* 1995; Hellerstein and Mendelsohn 1993), we partitioned the recreational decision-making into three sequential choices: participation to outdoor recreation (OR) in EPAs in 1995, number of recreational visits to EPAs in 1995 and selection of site to visit across EPAs. We carried out a nation-wide telephonic survey designed to collect sufficient information to model the three decision stages which characterize this type of recreation. We then combined this information with data on EPAs attributes. The objective of the modeling exercise was to characterize the household traits that determine probability of participation, those affecting the number of trips per year taken by a household, and finally to develop a model of site choice based on site attributes. Estimation of welfare changes, as implied by different policy scenarios, is an issue of limited investigation in this paper, but of central interest in the continuation of this research. Further research will be centered on improving the link of these separate models via link functions, some of which can be nested and estimated via FIML, as well as applying augmented count data model to account for excess zeros. These will allow for inference of total welfare changes which combine per trip welfare change to the effect on number of trips and participation to outdoor recreation in EPAs (Englin and Shonkwiler, 1995).

We use a dichotomous choice logit model to estimate probability of participation conditional on household covariates. The household expected number of trips in a year is estimated via a count data Poisson model. Finally, a random utility approach implemented by a conditional logit model (McFadden, 1973) is used to estimate the probability of site selection conditional on site attributes. For the purpose of investigating a recent proposal of extending the area under environmental protection, we report also the estimated per trip welfare changes as inferred from the estimated site selection model.

The paper is articulated as follows. Section 2 briefly summarizes the structure of the models employed in this sequential structure of choices by which we model recreational travel. Section 3 describes the data collection and data statistics for this study. Section 4 presents the estimated models. Section 5 uses the estimated parameters to analyze the effects in choice probabilities and welfare changes of selected policy scenarios. We conclude with some observations in Section 6.

2. The three-stage model of choice for outdoor recreation visits to Italian EPAs

Using a top-down approach we now describe the model structure of each stage of the assumed recreation choice process.

2.1 Participation

A given household (HH) may or may not have entered the market of recreational visits to Italian EPAs in 1995. Reasons for not entering may be different, but the prevailing one, we believe, is that the experience does not enter the HH utility function. In a HH production framework it is equivalent to that experience not being in the input set. This belief is grounded on the widespread geographical distribution of EPAs across the territory, which makes them available to the vast majority of residents at a price no higher than an hour drive. We hence assume that the HH for which non participation is caused by travel distances being at the choke price (HH cannot afford the visit) are very unlikely to occur. This assumption (zero visits is not a corner solution) is convenient in that it reduces the problem of zero-counts (Haab and McConnell 1996), which in our model are totally assigned to the fraction of the HH population for which visiting EPAs is not in the consumption bundle (input set). We assume that the probability of observing a recreational trip in one year is dependent on a vector **x** of HH socio-economic attributes and of holidays/spare time habits, details of which are normally available from census data. We assume this probability to be distributed logistically according to the law:

$$Pr(\text{at least one visit to EPA}|\mathbf{x}) = \Lambda(\mathbf{x}\beta), \text{ where } \Lambda(\cdot) \text{ is the logit c.d.f..}$$

2.2 Trip generation

The trip generating model assumes that the generic number of trip t taken by a HH observed in the sample is a random variable generated by a Poisson distribution (truncated at one) with mean $\lambda = \exp(\mathbf{T}\gamma)$, where γ is a vector of parameters and **T** is a vector of variables affecting the decision which includes a measure of expected utility as predicted from the subsequent site selection model. This «link» variable is the predicted expected utility of a trip computed at the values of the conditioning variables for each particular recreationist (Parson and Kealy, 1995; Feather *et al.* 1995). From the site selection model (see below) it is possible to derive the predicted probabilities of choosing each site in the choice set. Let the predicted probability for the ith HH to choose site j be π_{ij}. Let the predicted utility associated with the ith HH to visit site j be $v(\mathbf{s}_{ij}\alpha)$. Then predicted expected utility for the single trip of the ith HH can be written as:

$$\hat{E}[v(\mathbf{s}_{ij}\alpha)] = \sum_j \pi_{ij} v(\mathbf{s}_{ij}\alpha). \tag{2.1}$$

Given participation, this approach is equivalent to treating the number of trips t as the standard count data approach. The density function for the ith observation is then equal to:

$$f(t) = \frac{\exp(-\lambda)\lambda^t}{t!} \quad \text{for } t = 1,2,3,\dots \tag{2.2}$$

The well known shortcoming of this model is that it imposes $\text{var}(t) = E(t) = \lambda$, which is quite unplausible in strongly overdispersed data.

2.3. Site selection

For each trip, the site selection across the EPAs considered in the study is assumed to be driven by a random utility process. Consider the following linearly additive indirect utility specification for a trip to a given site j chosen from a set of alternative site choices:

$$v_{ij} = \mathbf{s}_{ij}\alpha + u_{ij}. \tag{2.3}$$

The unobserved component u_{ij} includes idiosyncratic preferences known to the individual and not observable by the researcher. The deterministic component $\mathbf{s}_{ij}\alpha$ though, is indeed observable in the dimensions of the vector of site specific attributes $\mathbf{s}_{ij}$, and the vector α may be estimated given a quite restrictive set of assumptions on the distribution of $u|\mathbf{s}$ across the population of individuals.
Prediction of probability choices on the support of **s** could be carried out using non parametric analysis (Horowitz, 1993); however the parametric specification is necessary to allow inference

on welfare conditional on choice and individual attributes[3]. It is important to notice that (2.3) does not state that utility of a given choice is a probabilistic event, but that it is possible to model it as if it were so.

A frequently employed assumption is $u|\mathbf{s}$ being distributed i.i.d. Extreme Value Type I with scale parameter k, which has distribution function

$$F(u_{ij}) = \exp(-k\exp(-u_{ij})). \tag{2.4}$$

This assumption was shown to be consistent with an underlying population of random utilities by McFadden, 1973. The probability of choosing site k is therefore:

$$\Pr(j) = \frac{\exp(\mathbf{s}_k \alpha)}{\sum_j \exp(\mathbf{s}_j \alpha)} \qquad j = 1,2,\ldots,J. \tag{2.5}$$

The vector **s** includes a measure of wealth change, that is, a computed travel cost by car for the ith HH to reach destination site j.

3. The data

The data for this study come from two different sources: original data on socio-economic characteristics of EPAs' visitors were collected by means of a nation-wide survey of recreationists, while information on EPAs attributes came from secondary information as well as direct inquiries at protected areas administrations.

The national survey on OR in continental[4] Italian EPAs was carried out in 1996: A stratified random sample of 5,574 HH, extracted from the whole (continental) Italian population, was interviewed by telephone[5] and asked to answer three sets of questions (see Appendixes 1 and 2 for summary statistics on answers from the whole sample and from people who had visited at least one EPA in 1995, respectively):

a) HH socio-economic status, including information about gender, age, education, job and residence of each household member;
b) household leisure behavior in general, e.g. number of days devoted to outdoor activities, sites visited on holidays as well as on week-ends, preferences towards recreational activities, etc.;
c) household recreational behavior in 1995 with reference to Italian EPAs: number of visits to any EPA, visits length, size of the visiting party, season, on-site activities, trip starting location, etc.

Almost one third of contacted HH reported at least one visit to EPAs in 1995. However, only 1,474 out of these 1,615 households visited an EPA for which we had available information (see below), for a total of 3,438 visits. Comparing the whole sample with the sub-sample of people who had actually visited an EPA, we notice that the latter are generally younger, more

[3] Since derivation of welfare measures require prediction of the observed support of s, it is obvious that non parametric estimation would not help towards our final goal (see section 5).

[4] The sampling design affected only inhabitants as well as EPAs in continental Italy because of the different cost structure that islands residents face when visiting a given protected area: Island residents (i.e. the ones coming from Sardinia and Sicily) would in fact have to take a ferry or aircraft to reach most EPAs relevant for this study.

[5] Telephone calls were placed during working days between 5:30 p.m. and 8:30 p.m.: At this time households were usually meeting for evening meals and the likelihood of introducing sample selection bias is low.

educated and slightly wealthier than the former. On average, EPA visitors spend more days on recreation activities (one third more than the whole sample mean) and on the mountains (two thirds more). Despite the average visit length is 2 days, 75% of visits is a one-day outing, 13% is two-days outing and only 2.4% three-days[6]. The modal size of the visiting party amounts to 2-4 people, although some people carried out visits in larger parties.

A second data-base was built for 193 areas in continental Italy officially listed as "environmentally protected areas[7]" (Locasciulli *et al.*, 1996; Gazzetta Ufficiale, 1996). Three groups of attributes were defined for each protected area (see Appendix 3 for summary statistics on those data):

a) institutional characteristics, such as type of adopted regulations, size, etc.;
b) natural attributes, e.g. altitude, presence of flora and fauna species, etc.;
c) man-made attributes and on-site activities, like infrastructures, facilities, type of OR activities which can be performed, etc.

These attributes were coded as continuous variables whenever possible, but many of them have qualitative nature and therefore were assigned ordinal values (i.e. they are either binary or categorical variables).

Finally, a matrix of "interactions" between visitors and EPAs was built: travel costs, obtained as product of round trip distance times unit cost per kilometer, were computed per each observed trip[8].

4. Model estimation and results

4.1 A probabilistic model of outdoor recreation participation in Italy

Our first goal was the estimation of a probabilistic model of OR visits to any Italian EPAs: This model would let us know what are the household's characteristics that could play a significant role in determining the probability of a visit to any of the 193 protected areas investigated in this study.

We assumed that the choice of OR participation be determined by the gender (GEN) and age (AGE) of the household's head, his or her education level (EDU), household's expenditures (COM_HH), and by the number of holidays days (DAY_HM) and week-ends (NWES_HM) spent in mountainous and hilly areas. Finally, we hypothesized that more preferred are outdoor activities, e.g. outdoor non-sporting activities (ACT_3) and activities in natural environments (like trekking or hiking, ACT_9), more likely the decision to visit a protected areas[9].

We assumed that the error distribution of our dichotomous choice model of participation

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[6] The mean value was affected by a minority of people who spent vacations within the protected areas they visited.

[7] Some EPAs include smaller sites with a higher degree of protection, that is wider EPAs generally show a zoning according to the value of relevant natural resources and, therefore, they are characterized by different level of protection regulations. This is why we listed as explanatory variables in Appendix 3 the area of those smaller and stronger protected areas, as well as the ratio between the stronger protected area and EPA's total area. This means, also, that the number of destinations for OR in Italian EPAs is actually lower than the original 193 areas.

[8] Cost of traveling time as well as on-site costs in this preliminary estimation were neglected.

[9] The choice of those predictors is not only sound in terms of *a priori* expectations in terms of recreational behavior. Indeed, preliminary exploration of information from the national survey showed that most of Italian EPAs are located in hilly or mountainous regions as well as a significant difference in people behavior between who usually spent leisure time in hilly or mountainous regions and people who did not, towards the choice of visiting or non-visiting EPAs.

(visiting/non-visiting any EPAs) over the whole sample of 5,574 households were logistic, while the deterministic part is linear in the household characteristics **x**.
The parameter estimates and their relative asymptotic standard errors and probability values[10] are reported in Table 1.

Table 1. Logit Model for Participation to OR Visits in Italian EPAs

Dependent variable	VIS
Number of observations	5,574
Iterations completed	5
Log likelihood function	-2,864.278
Restricted log likelihood function	-3,355.085
χ^2	981.615
Degrees of freedom	8
P-values	0.0000000
Pseudo R^2	0.146
Percentage of corrected prediction	75.5
Probability of visiting protected areas	0.160

Variable	*Coefficient*	*St. error*	*t values*	*P-values*
Constant	-2.8272	0.18731	-15.093	0.00000
GEN	0.25011	0.66830E-01	3.743	0.00018
AGE	-0.0059065	0.21524E-02	-2.744	0.00607
EDU	0.45603	0.40361E-01	11.299	0.00000
COM_HH	0.000067575	0.28278E-04	2.390	0.01686
ACT_3	0.62019	0.73982E-01	8.383	0.00000
ACT_9	0.96809	0.72176E-01	13.413	0.00000
DAY_HM	0.016711	0.24268E-02	6.886	0.00000
NWES_HM	0.23794	0.30692E-01	7.753	0.00000

Table 2 reports the marginal effects of each variables computed at the sample means. All variables have a positive effect on the probability of visiting protected areas, except for AGE. The strongest statistical determinants of OR participation are education level of household's head (EDU) and preferences towards outdoor activities (ACT_9 and ACT_3). These activities show also strong marginal effects: A household who is routinarily involved in outdoor activities at natural resources sites (ACT_9) has a predicted probability to visit protected areas which is 0.18 higher on the margin, while practicing non-sport outdoor activities brings about a 0.12 probability increase.

Table 2: Marginal Effects of Visitors Characteristics on the Probability to Visit an Italian EPAs (Dichotomous Choice Model, Logit Specification)

Variable	$\partial P/\partial x_i$	*St. error*	*t-values*	*P-values*
Constant	-0.53667	0.33905E-01	-15.829	0.00000
GEN	0.47478E-01	0.12664E-01	3.749	0.00018
AGE	-0.11212E-02	0.40757E-03	-2.751	0.00594
EDU	0.86565E-01	0.75037E-02	11.536	0.00000
COM_HH	0.12827E-04	0.53623E-05	2.392	0.01675
ACT_3	0.11773	0.14030E-01	8.391	0.00000
ACT_9	0.18377	0.13736E-01	13.379	0.00000
DAY_HM	0.31722E-02	0.46150E-03	6.874	0.00000
NWES_HM	0.45168E-01	0.58264E-02	7.752	0.00000

4.2 A count data poisson model of household's expected number of trips to Italian EPAs

The model for trip generation was estimated by using the Poisson specification in eq. (2.2). The well known shortcoming of this model is that it imposes $\mathrm{var}(t) = E(t) = \lambda$, which is quite unplausible in strongly overdispersed data. However in our sample, only 4% of the respondents

[10] All the model estimates presented in this paper have been obtained by using Limdep v.7.0.

who visited EPAs in 1995 made more than 8 trips. Trimming the data at this trip amount produced a variance of 1.87 and a mean of 1.92, which indicates absence of overdispersion. For this reason we favored the Poisson specification over the less restrictive Negative Binomial one.

The sample employed for the estimation did not include those visitors coming from abroad and living within EPAs. A total of 1,313 HH observations were used to estimate the Poisson parameters reported in Table 3.

Table 3. Poisson model for trip generation to Italian EPAs

Number of observations			1.313	
Iterations completed			6	
Log likelihood function			-3196.183	
Restricted log likelihood function			-3435.812	
χ^2			479.2585	
Pseudo R^2			0.337	
Variable	*Coefficient*	*St.Err.*	*t-values*	*P-values*
Constant	10.291	0.11535	8.922	0.000
$E(v)$	0.53E-09	0.78E-10	6.777	0.000
COM_HH	-0.88E-04	0.59E-04	-1.484	0.138
COM_HH_SQ	0.15E-07	0.740E-08	2.010	0.044
NWES_HM	0.77E-01	0.555E-01	1.385	0.166
NWS_2	0.867	0.416E-01	20.873	0.000
ACT	0.172	0.476E-01	3.606	0.000
PRI	-0.234	0.484E-01	-4.831	0.000
HIG	-0.267	0.414E-01	-6.464	0.000

The main determinants[11] of number of trips taken to EPAs is the dummy NWS_2 which indicates that the HH spends on average between 10 to 20 week-ends away from home. The covariate with second largest effect is whether or not the HH carries out regular outdoor activities while on holidays (ACT). Average number of days a year spent on the hills/mountains during week-ends (NWES_HM) is also a relevant determinant. This is not surprising as most of the EPAs are located in this kind of terrain. Education level of the HH head at lower than the university degree (PRI and HIG) have a negative effects on number of trips taken to EPAs, showing that education level has a role as a determinant not only in the participation choice, but also in the expected number of trips.

The linear effect of the level of family consumption (COM_HH) is negative, but insignificant, while its quadratic term (COM_HH_SQ) is positive and significant as one would expect showing that an increasing marginal response of expected number of trips to expenditures. The effect of expected trip utility $E(v)$ is very small in magnitude, but very significant as one would anticipate.Overall this count model seem to be consistent with theoretical expectations and its parametric structure can be used to infer the effect on the expected number of trips on changes in the site attributes via the $E(v)$, so that a total welfare change could be calculated.

4.3 A conditional Logit model to estimate the probability of site selection

We can get a prediction of which EPA to visit using a model that estimates the probability of visit conditional on site's attributes and on the travel cost to reach the site. Conditioning the probability on a set of site specific attributes allows the estimation of parameters that are interpretable as coefficients of a the deterministic component of the population utility function. Furthermore, the inclusion of the cost term allows an estimation of the marginal utility of

[11] Some variables used in this estimation (NWS_2, ACT, PRI, and HIG) are obtained manipulating the original ones reported in Appendixes.

money which in turns offers a linking function to transform attributes changes into monetary measures (see section 5).

Due to the need of having at minimum cell frequency (in our case we chose a threshold of 5 visits) for the purpose of estimation the set of alternative sites was reduced to 58[12] (Table 4).

The results of this estimation are reported in Table 5. The factor with strongest negative effect on the probability to visit a given EPA is the travel cost to reach the site (TCO), which is also the most statistically significant as one would expect. The possibility of biking (BIK), skiing (SKI), as well as the presence of rare birds (BIR), outstanding trees (TRE), observation points (OBS), thermal springs (THE) and picnic facilities (PIC) all show significant negative effects on the probability of visit: These attributes seem not to attract EPAs visitors. On the contrary, EPAs visitors seem to be attracted by other attributes such as the size of the area (ARE), its altitude (ALT), its institutional status (NPK, RPK) or being a wetland (WET), and the presence of more restricted (i.e. protected) zones[13] within the EPA's boundaries (AR_TOT). The availability guided site tours (GUI) is positively valued, as well as that of horse-riding facilities (HOR); archeological remains (ARC), visitors centers (CNT), and museums (MUS) also affect positively the choice of a given area.

Table 4. Frequencies, and Predicted Probability of Visit for 58 Italian EPAs (Conditional Logit model)

Area code	*EPA's name*	*Observed absolute frequencies*	*Estimated absolute frequencies*	*Estimated probability of visiting*
1	Parco Regionale del Delta del Po	6	13	0.003
16	RNR Nazzano Tevere Farfa	20	23	0.006
17	Oasi di protezione faunistica di Ninfa	10	17	0.005
18	RNS PA Foresta di Tarvisio	22	8	0.002
24	Parco Regionale dello Sciliar	13	10	0.002
25	Parco Regionale Monti Simbruini	36	57	0.017
30	RNR Lago Pantano di Pignola	6	22	0.006
34	Parco Naturale dell'Orecchiella	57	46	0.014
35	ZU Laguna di Orbetello	6	5	0.001
38	RNR Monte Rufeno	9	2	0.001
42	Parco Regionale Maremma o Monti dell'Uccellina	61	76	0.023
43	Parco Regionale Alpi Apuane	32	41	0.012
46	RNR Tor Caldara	6	5	0.001
49	Parco Regionale Alta Val Pesio e Tanaro	79	105	0.031
50	Parco Regionale Migliarino-S.Rossore-Massaciuccoli	15	19	0.006
57	Parco Nazionale del Pollino	80	73	0.022
60	Parco Regionale Orsiera-Rocciavrè	61	56	0.017
61	Parco Regionale del Conero	13	23	0.007
62	RNS B Abetone	13	23	0.007
63	RNS B Vallombrosa	15	32	0.009
65	Parco Nazionale Cilento e Valle di Diano	40	52	0.015
70	Parco Nazionale dello Stelvio	168	186	0.056
73	Parco Nazionale del Gargano	311	271	0.081
74	Parco Regionale Pian del Cansiglio	37	48	0.014
77	Parco Nazionale delle Foreste Casentinesi	232	237	0.071
78	Parco Regionale Gran Bosco di Salbertrand	21	14	0.004

[12] These 58 EPAs accounted for 3,345 visits by sample households in 1995.

[13] This variable can be interpreted as a proxy for the presence of outstanding natural resources, which calls for more restrictive access and/or management regulations.

Table 4 (continued). Frequencies, and Predicted Probability of Visit for 58 Italian EPAs (Conditional Logit model)

Area Code	*EPA's name*	*Observed absolute frequencies*	*Estimated absolute frequencies*	*Estimated proba-bility of visiting*
80	RNR Speciale Crava Morozzo	13	2	0.001
90	Parco Nazionale Gran Paradiso	269	280	0.084
92	ZU Lago di Burano	29	28	0.008
93	Parco di Bosco Romagno	8	17	0.005
99	RNR Bosco e Laghi di Palanfrè	18	13	0.004
100	Parco Regionale dell' Argentera	143	135	0.040
103	Parco Regionale Monte Subasio	23	16	0.005
106	Parco Regionale del Sirente Velino	55	79	0.024
113	Parco Nazionale dell'Aspromonte	148	161	0.048
115	RNR Lago Lungo e Ripasottile	9	6	0.002
119	RNS Castelvolturno	6	2	0.001
128	Parco Regionale Puez-Odle	8	15	0.004
131	RNR Burcina	7	1	0.000
132	Oasi del Lago di San Giuliano	7	20	0.006
138	Parco Nazionale del Circeo	107	91	0.027
141	RNS ZU Marano Lagunare e foci dello Stella	8	10	0.003
145	Parco Regionale Adamello-Brenta	103	65	0.019
151	Parco Nazionale della Maiella	60	68	0.020
156	Parco Nazionale del Gran Sasso-Laga	107	113	0.034
158	Parco Regionale Val Troncea	39	28	0.008
160	Parco Regionale Paneveggio-Pale di S.Martino	68	31	0.009
165	Parco Nazionale d'Abruzzo	450	458	0.137
166	Parco Regionale Dolomiti di Sesto	10	3	0.001
167	RNR Lago di Vico	13	10	0.003
169	Parco Nazionale della Calabria	49	31	0.009
172	Parco Nazionale dei Monti Sibillini	132	124	0.037
176	Parco Regionale della Dolomiti Ampezzane	7	3	0.001
177	RNS Cratere degli Astroni	10	6	0.002
178	Parco Regionale Monte Corno	10	7	0.002
183	RNS Pineta di Ravenna	11	3	0.001
184	Parco Regionale Fanes-Sennes-Braies	9	8	0.002
186	Parco Nazionale delle Dolomiti Bellunesi	40	47	0.014
	TOTAL	3,345	3,345	1.000

RNS = State natural reserve; RNR = Regional natural reserve; ZU = Wetland; B = Biogenetic; O = Oriented; I = Integral; PA = Animal population.

Table 5. Conditional Logit Model for the Choice of Site to Visit 58 Italian EPAs

Number of observations	3,345
Iterations completed	7
Log likelihood function	-5,277.02
Restricted log likelihood function	-13,582.18
Restricted log likelihood function with alternative specific constants	-11,243.71
Pseudo R^2 (I restricted log likelihood function)	0.61
Pseudo R^2 (II restricted log likelihood function)	0.53
Corrected pseudo R^2 (I restricted log likelihood function)	0.61
Corrected pseudo R^2(II restricted log likelihood function)	0.53
Percentage of corrected prediction	38.92

Variable	*Coefficient*	*St. error*	*t-values*	*P-values*
TCO	-0.95990E-05	0.16647E-06	-57.663	0.00000
ARE	0.43210E-05	0.76087E-06	5.679	0.00000
ALT	0.74714E-03	0.49529E-04	15.085	0.00000
NPK	0.68376	0.14841	4.607	0.00000
RPK	0.81443	0.10559	7.713	0.00000
WET	1.4215	0.19518	7.283	0.00000
AR_TOT	0.23858E-04	0.20370E-05	11.713	0.00000
BIK	-0.80648	0.10943	-7.370	0.00000
HOR	0.30991	0.89223E-01	3.473	0.00051
SKI	-0.89075	0.97725E-01	-9.115	0.00000
GUI	0.25013	0.76435E-01	3.272	0.00107
BIR	-0.32084	0.10017	-3.203	0.00136
TRE	-0.43168	0.81885E-01	-5.272	0.00000
ARC	0.44314	0.77684E-01	5.704	0.00000
CNT	1.5199	0.76808E-01	19.788	0.00000
OBS	-0.33442	0.97832E-01	-3.418	0.00063
MUS	0.48060	0.74659E-01	6.437	0.00000
THE	-1.3352	0.11450	-11.661	0.00000
PIC	-0.53740	0.91232E-01	-5.890	0.00000
IND	1.2371	0.10672	11.593	0.00000

5. Analyzing policy changes

The estimated conditional logit model provides means for inferring the probability of destination choice for each of the 58 investigated destinations. Under the set of invoked assumptions the estimates of the travel cost parameter represent marginal utility of money and they can be used to derive estimates of welfare changes per choice occasion as associated to variations of the attributes or composition of the choice set. Per choice occasion consumer surplus is (McFadden, 1981; Small and Rosen, 1981; McConnell, 1995)

$$S = \frac{J_{visit}}{\beta_{money}}, \tag{5.1}$$

where β_{money} is the parameter for the marginal utility of money and J_{visit} indicates the inclusive value of the decision to visit the protected area, and is defined as

$$J_{visit} = \sum_{visit} \exp(x_{visit}\beta). \tag{5.2}$$

In particular, under the assumption of zero income effects - which can be regarded as a standard assumption in many benefit-cost analysis - the two hicksian measures of compensating and equivalent variation coincide with the change in consumer surplus per choice occasion and have the following closed form solution:

$$\Delta S = CV = EV = \beta^{-1}\left(J^{1}_{visit} - J^{0}_{visit}\right), \tag{5.3}$$

where the superscript in the inclusive values indicate the status quo (0) and examined change (1) in the choice sets.

By employing the parameter estimates derived by maximum likelihood, point estimates of expected changes in consumer surplus associated with each visit were obtained as follows:

$$\Delta \hat{S} = \hat{\beta}^{-1}\left(J^{1}_{visit} - J^{0}_{visit}\right). \tag{5.4}$$

One policy issue of particular relevance in the designation of EPAs is the social benefit of the extension of this protection to territory adjacent to the existing protected areas. To investigate the economic benefits implied by the estimated model in the sample we hypothesized a 10% increase of protected area[14] in both the total area (ARE) of the sites and the portion of territory that is under particular environmental protection (AR_TOT) in each site.

The sample statistics of the predicted implied welfare measures are reported in Table 5. The average compensating variation per visit is almost 3,300 Lit, which expanded to the whole Italian peninsular population[15] yield a total value of 78.7 billion Lit. (approx. 45 million US$) in the case of a 10% increase of the total area; a 10% increase of the area placed under more stringent protection within the existing boundaries of Italian EPAs yields a more conservative estimate of 26.6 billion Lit. for the relevant population (approx. 15.2 million US$).

Table 6. Welfare Change of an Increase of Protected Area in Italian EPAs (Lit)

	Per visit Mean	*Standard deviation*	*Minimum*	*Maximum*	*Population Total (mln)*
ΔS=CV=EV for a 10% increase of ARE	3,279	1,975	725	8,684	78,666.7
ΔS=CV=EV for a 10% increase of AR_TOT	1,108	1,944	0.28	20,471	26,582.1

Similar estimates can be derived for exclusions of particular sites from the visitors choice set, making it possible to determine the economic flow of recreational benefits produced in 1995. Furthermore, the benefits of each individual visit are available from the sample, enabling the analyst to identify the economic benefits of the single visit.

6. Conclusions

The establishing of EPAs has allowed the preservation of natural capital and has provided recreational opportunities for Italian households. While the cost to society of the implied constraints due to environmental regulations can be calculated in terms of foregone development opportunities, little is known about the economic dimensions of the stream of benefits associated with the recreational opportunities afforded by this policy, and its

[14] This is more than a hypothetical issue. Italian Ministry of the Environment has in fact formally declared that Government's target is to extend the environmental protected areas system from current 10.5% up to 12% of the Italian area.

[15] The total Italian peninsular population in 1995 was 57.3 million inhabitants; the relevant population (age 18 and more) for the study was slightly less than 40 million and carried out almost 24 million visits in 1995.

determinants. This study pioneers the application of OR modeling, mainly developed and applied in the US, in the Italian context. We provide a revealed preference economic analysis of the benefits of OR by investigating a large sample of Italian households. We develop a conceptual framework based on a sequence of models of probabilistic choice which can cast some light on the household characteristics that determine participation to OR in these areas. Then, we also explore the impact of site attributes on the probability of choice of visit. By including an estimate of the travel cost we provide a means to derive an estimate of marginal utility of money and through this we show how to carry out scenario evaluations in terms of per trip welfare changes. Total welfare changes will also include the scenario impact on trip generation and will be the objective of future analysis.
The parametric structure of this inference relies on quite restrictive behavioral assumptions such as specific parametric error term distributions and IIA assumptions (Horowitz, 1993). Nevertheless, we think that the dimension of the welfare gains implied by the proposed model of choice are quite plausible. Given the coarseness and heterogeneity of the little data available for all the EPAs under analysis, we point out how more reliable estimates could possibly be achieved by collecting a more refined data-set on this areas. This preliminary study affords encouraging results and might pave the way for a more widespread adoption of OR modeling and policy assessment by means of travel cost methods in the Italian system, building on the well-established US experience.

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APPENDIX 1

Table A1.1. National Survey on Outdoor Recreation in Italian EPAs: Whole Sample Summary Statistics (5,574 Households, year 1996)

a) *Socio-Economic Characteristics*						
Variable	*Meaning*	*Type of variable*	*Min*	*Max*	*Mean*	*St. Dev.*
GEN	Gender	Dummy	0	1		
AGE	Age	Continuous	18	93	43.59	17.39
EDU	Attainment Level	Categorical	0	4		
NUM	Number of HH Members	Continuous	1	12	3.21	1.40
JOB_H	Head of HH's Job	Categorical	1	8		
JOB_I	Respondent's Job	Categorical	1	8		
JOB_1 JOB_2 JOB_3	Other HH Members' Job	Categorical	1	8		
INC_HH	Household Income	Continuous	732	10,784	3,457.179	1,383.257
INC_PC	Percapita Income	Continuous	358	4,109	1,256.947	502.842
COM_HH	Household Consumption	Continuous	598	9,059	3,130.677	1,242.723
COM_PC	Percapita Consumption	Continuous	324	3,568	1,110.079	430.463

Table A1.2. National Survey on Outdoor Recreation in Italian EPAs: Whole Sample Summary Statistics (5,574 Households, year 1996)

b) *Recreational Behavior in General*						
Variable	*Meaning*	*Type of variable*	*Min*	*Max*	*Mean*	*St. Dev.*
DAY_T	Total leisure days	Continuous	0	365	28.52	34.34
LOC_HS	Holidays at sea	Dummy	0	1		
LOC_HH	Holidays on hills	Dummy	0	1		
LOC_HM	Holidays on mountains	Dummy	0	1		
LOC_HC	Holidays in cities	Dummy	0	1		
DAY_HS	Days of holidays at sea	Continuous	0	240	12.20	15.55
DAY_HH	" " on hills	Continuous	0	250	1.85	9.20
DAY_HM	" " on mount.	Continuous	0	210	4.16	10.71
DAY_HC	" " in cities	Continuous	0	90	1.36	5.78
LOC_WS	Week-ends at sea	Dummy	0	1		
LOC_WH	Week-ends on hills	Dummy	0	1		
LOC_WM	Week-ends on mountains	Dummy	0	1		
LOC_WC	Week-ends in cities	Dummy	0	1		
NWES_S	Number of WEs at sea	Categorical[(a)]	0	3	0.37	0.76
NWES_H	Number of WEs on hills	Categorical[(a)]	0	3	0.27	0.70
NWES_M	Number of WEs on moun.	Categorical[(a)]	0	3	0.42	0.81
NWES_C	Number of WEs in cities	Categorical[(a)]	0	3	0.41	0.96
DAY_HHM	Days of holidays on hills or mountains	Continuous	0	250	6.01	13.84
NWES_HM	Number of week-ends on hills or mountains	Categorical	0	6	0.69	1.04
ACT_1	Recreation at home	Dummy	0	1		
ACT_2	Indoor Recreation	Dummy	0	1		
ACT_3	Outdoor non-sport act.	Dummy	0	1		
ACT_4	Sport events' attendance	Dummy	0	1		
ACT_5	Indoor sport	Dummy	0	1		
ACT_6	Footing and jogging	Dummy	0	1		
ACT_7	Biking	Dummy	0	1		
ACT_8	Seashore activities	Dummy	0	1		
ACT_9	Natural environments act.	Dummy	0	1		
ACT_0	Other activities	Dummy	0	1		
ACT_567	At least one activity among activities 5, 6 or 7	Dummy	0	1		

[(a)] 0=no week-ends; 1=1-10 week-ends; 2=11-20 week-ends; 3=more than 20 week-ends.

Table A1.3. National Survey on Outdoor Recreation in Italian EPAs: Whole Sample Summary Statistics (5,574 Households, year 1996)

c) *Recreation Behavior in Italian EPAs in 1995*						
Variable	*Meaning*	*Type of variable*	*Min*	*Max*	*Mean*	*St. Dev.*
VIS	Visits to any EPA	Dummy	0	1		
DBS	Visits to any EPA included in our data-base	Dummy	0	1		
VIS	Visit length in days	Continuous[(a)]	n.a.	n.a.	n.a.	n.a.
PTY	Number of party's people	Continuous[(a)]	n.a.	n.a.	n.a.	n.a.
SEA	Visits season	Categorical[(a)]	n.a.	n.a.		
RAC_1	Main activity performed on-site	Categorical[(a)]	n.a.	n.a.		
RAC_2	Second activity performed on-site	Categorical[(a)]	n.a.	n.a.		
RAC_3	Third activity performed on-site	Categorical[(a)]	n.a.	n.a.		

[(a)] Not available because only respondents included in Appendix 2 went to any EPA

APPENDIX 2

Table A2.1. National Survey on Outdoor Recreation in Italian EPAs: Sample Respondents Who Had Visited at Least One EPA in 1995 Summary Statistics (1,615 Households, year 1996)

a) *Socio-Economic Characteristics*						
Variable	*Meaning*	*Type of variable*	*Min*	*Max*	*Mean*	*St. Dev.*
GEN	Gender	Dummy	0	1		
AGE	Age	Continuous	18	90	39.61	14.65
EDU	Attainment Level	Categorical	0	4		
NUM	Number of HH Members	Continuous	1	12	3.33	1.41
JOB_H	Head of HH's Job	Categorical	1	8		
JOB_I	Respondent's Job	Categorical	1	8		
JOB_1 JOB_2 JOB_3	Other HH Members' Job	Categorical	1	8		
INC_HH	Household Income	Continuous	732	10,784	3,722.583	1,318.004
INC_PC	Percapita Income	Continuous	358	4,109	1,291.822	529.218
COM_HH	Household Consumption	Continuous	598	9,059	3,368.600	1,178.952
COM_PC	Percapita Consumption	Continuous	324	3,568	1,140.154	449.512

Table A2.2. National Survey on Outdoor Recreation in Italian EPAs: Sample Respondents Who Had Visited at Least One EPA in 1995 Summary Statistics (1,615 Households, year 1996)

b) *Recreational Behavior in General*						
Variable	*Meaning*	*Type of variable*	*Min*	*Max*	*Mean*	*St. Dev.*
DAY_T	Total leisure days	Continuous	0	365	33.55	36.57
LOC_HS	Holidays at sea	Dummy	0	1		
LOC_HH	Holidays on hills	Dummy	0	1		
LOC_HM	Holidays on mountains	Dummy	0	1		
LOC_HC	Holidays in cities	Dummy	0	1		
DAY_HS	Days of holidays at sea	Continuous	0	240	13.64	15.26
DAY_HH	" " on hills	Continuous	0	250	2.21	10.93
DAY_HM	" " on mount.	Continuous	0	210	7.73	14.23
DAY_HC	" " in cities	Continuous	0	90	1.77	6.85
LOC_WS	Week-ends at sea	Dummy	0	1		
LOC_WH	Week-ends on hills	Dummy	0	1		
LOC_WM	Week-ends on mountains	Dummy	0	1		
LOC_WC	Week-ends in cities	Dummy	0	1		
NWES_S	Number of WEs at sea	Categorical[(a)]	0	3	0.45	0.83
NWES_H	Number of WEs on hills	Categorical[(a)]	0	3	0.33	0.77
NWES_M	Number of WEs on moun.	Categorical[(a)]	0	3	0.75	1.00
NWES_C	Number of WEs in cities	Categorical[(a)]	0	3	0.46	0.99
DAY_HHM	Days of holidays on hills or mountains	Continuous	0	250	9.94	17.40
NWES_HM	Number of week-ends on hills or mountains	Categorical	0	6	1.09	1.17
ACT_1	Recreation at home	Dummy	0	1		
ACT_2	Indoor Recreation	Dummy	0	1		
ACT_3	Outdoor non-sport act.	Dummy	0	1		
ACT_4	Sport events' attendance	Dummy	0	1		
ACT_5	Indoor sport	Dummy	0	1		
ACT_6	Footing and jogging	Dummy	0	1		
ACT_7	Biking	Dummy	0	1		
ACT_8	Seashore activities	Dummy	0	1		
ACT_9	Natural environments act.	Dummy	0	1		
ACT_0	Other activities	Dummy	0	1		
ACT_567	At least one activity among activities 5, 6 or 7	Dummy	0	1		

[(a)] 0=no week-ends; 1=1-10 week-ends; 2=11-20 week-ends; 3=more than 20 week-ends.

Table A2.3. National Survey on Outdoor Recreation in Italian EPAs: Sample Respondents Who Had Visited at Least One EPA in 1995 Summary Statistics (1,615 Households, year 1996)

c) Recreation Behavior in Italian EPAs in 1995						
Variable	*Meaning*	*Type of variable*	*Min*	*Max*	*Mean*	*St. Dev.*
VIS	Visits to any EPA	Dummy	1	1		
DBS	Visits to any EPA included in our data-base	Dummy	0	1		
VIS	Visit length in days	Continuous	1	100	2.11	7.59
PTY	Number of party's people	Continuous	1	150	6.33	8.69
SEA	Visits season	Categorical	1	15		
RAC_1	Main activity performed on-site	Categorical	1	20		
RAC_2	Second activity performed on-site	Categorical	1	20		
RAC_3	Third activity performed on-site	Categorical	1	20		

APPENDIX 3

Table A3.1. Attributes of Italian EPAs: Summary Statistics (193 areas, year 1996)

a) *Institutional Attributes*						
Variable	*Meaning*	*Type of variable*	*Min*	*Max*	*Mean*	*St. Dev.*
NPK	National park	Dummy	0	1		
RPK	Regional park	Dummy	0	1		
SRE	State reserve	Dummy	0	1		
RRE	Regional reserve	Dummy	0	1		
WET	Wetland	Dummy	0	1		
OTH	Others protected area	Dummy	0	1		
PKS	Parks (nat. or reg.)	Dummy	0	1		
RES	Reserves (nat. or reg.)	Dummy	0	1		
OPR	EPAs others than parks and reserves	Dummy	0	1		
AR_OSR	Area of "oriented" State reserve included in the EPA	Continuous	0	10,991	131.39	1,114.01
AR_BSR	Area of "biogenetic" State reserve included in the EPA	Continuous	0	4,059	40.89	334.48
AR_ISR	Area of "integral" State reserve included in the EPA	Continuous	0	973	13.10	94.48
AR_OSR	Area of other types of State reserve included in the EPA	Continuous	0	20,286	247.50	1,883.82
AR_ORR	Area of "oriented" Regio-nal reserve included in the EPA	Continuous	0	6,444	64.79	545.59
AR_SRR	Area of "special" Regio-nal reserve included in the EPA	Continuous	0	82	0.42	5.90
AR_WET	Area of wetlands included in the EPA	Continuous	0	22,742	136.36	1,645.16
AR_OTH	Area of any other type of protected area included in the EPA	Continuous	0	77,000	434.21	5,547.26
AR_TOT	Total area of stronger protected sites included in the EPA	Continuous	0	91,391	7,066.18	19,946.26
AR_PCT	Percentage of total area of stronger protected sites and EPA's area	Continuous	0	0.467	0.02	0.07
YR1	Establishing year	Continuous	1922	1992	1979.67	9.58
YR2	Difference between EPA's establishing year and the one of the youngest EPA	Continuous	0	70	11.33	9.58
ARE	EPA's area in hectares	Continuous	44	227,052	13,832.34	35,320.80
LN_ARE	Natural logarithm of EPA's area	Continuous	1.10	12.33	7.20	2.41

Table A3.2. Attributes of Italian EPAs: Summary Statistics (193 areas, year 1996)

b) *Natural Attributes*						
Variable	*Meaning*	*Type of variable*	*Min*	*Max*	*Mean*	*St. Dev.*
ALT	Maximum altitude	Continuous	0	4,559	1,080.34	1,085.47
LN_ALT	Natural logarithm of maximum altitude	Continuous	0	8.42	5.75	2.38
MAM	Mammals	Dummy	0	1		
BIR	Birds	Dummy	0	1		
TRE	Outstanding trees	Dummy	0	1		
ARC	Archeological remains	Dummy	0	1		

Table A3.3. Attributes of Italian EPAs: Summary Statistics (193 areas, year 1996)

c) *Man-Made Attributes*						
Variable	*Meaning*	*Type of variable*	*Min*	*Max*	*Mean*	*St. Dev.*
WAL	Walks	Dummy	0	1		
BIK	Biking	Dummy	0	1		
HOR	Horse-riding	Dummy	0	1		
SKI	Skiing	Dummy	0	1		
BOA	Boating	Dummy	0	1		
GUI	Guided visits	Dummy	0	1		
BWA	Bird-watching	Dummy	0	1		
BGA	Botanical garden	Dummy	0	1		
MUS	Museum	Dummy	0	1		
LIB	Library	Dummy	0	1		
HER	Herbarium	Dummy	0	1		
CNT	Visitors' center	Dummy	0	1		
PIC	Picnic areas	Dummy	0	1		
THE	Thermal springs	Dummy	0	1		
CAM	Campings	Dummy	0	1		
HOT	Hotels and/or shelters	Dummy	0	1		
CAM_HOT	Camping, hotels or shel-ters	Dummy	0	1		
SPO	Possibility of sports[(a)]	Continuous	0	1	0.23	0.24
ANI	Presence of animals[(b)]	Continuous	0	1	0.50	0.30
LMA	Presence of landmarks[(c)]	Continuous	0	1	0.29	0.32
FAC	Presence of facilities[(d)]	Continuous	0	1	0.15	0.21
BED	Presence of camping, hot-els or shelters[(e)]	Continuous	0	1	0.16	0.30
IND	Attraction index[(f)]	Continuous	0.05	1	0.26	0.19

[(a)] Normalized weighted sum of BIK, SKI, HOR, BOA and GUI values; [(b)] Normalized sum of MAM and BIR values; [(c)] Normalized sum of TRE and ARC values; [(d)] Normalized sum of BGA, MUS, LIB, HER, CNT, PIC and THE values; [(e)] Normalized sum of CAM and HOT values; [(f)] Normalized weighted sum of all variables from WAL to HOT (BGA and GUI were assigned a weight of 3, according to previous studies on outdoor recreation preferences in protected areas, see Bernetti and Romano, 1996).