

TRANSFERABILITY OF RECREATIONAL BENEFITS FROM NATURAL AREAS. SPANISH EXPERIENCES

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The increase in demand for recreation services is an observable phenomenon in all developed countries, among which Spain is no exception.

The trend towards population concentration in urban areas and rising standards of living together with increased available free time and greater mobility are the causes for the growth in demand for services of this type.

However, greater pressure on these areas requires a parallel public investment in protection, conservation and even in the creation of new amenity areas (increased supply).

At the same time, the recreational services that the natural areas contribute show characteristics of public good (no rivalry, no exclusion) and free-access resource, which means that there are no market prices as indicators of social preference for recreational services. Methods such as contingent valuation (CV) have arisen in this context that have tried to estimate the value that individuals assign to the recreation experience they enjoy. The aim is to justify the level of public investment which guarantees adequate supply. However, although useful information can be gained from non-market valuation methods, such as CV, empirical studies usually involve considerable effort in both time and money. For this reason, benefit transfers have been put forward as an alternative, that is, the use of existing studies in order to find an estimate of benefits associated with a natural area without the need to design and implement a new study. There are many techniques for doing this,

ABSTRACT

This article reviews contingent valuation studies of recreation services associated with natural areas in Spain up to 1999. An econometric, meta-analytical model has been applied to identify those variables that may be influencing the differences in the results obtained. The conclusions show that these variables depend on the characteristics of the natural areas to be valued and on the recreational experience they offer and not on methodological nor application options of valuation exercises. These results allow, with due reservations because of the small sample size, a degree of optimism with respect to the use of meta-analytical models to constitute benefit transfer functions.

RÉSUMÉ

Cet article est une révision des études d'évaluation contingente de services récréatifs associés à des espaces naturels en Espagne jusqu'en 1999. Un modèle économétrique méta-analytique est utilisé pour identifier les variables qui peuvent influencer les différences entre résultats obtenus. Les conclusions montrent que ces variables dépendent des caractéristiques des espaces naturels à évaluer et de l'expérience récréative qu'ils offrent et non des options méthodologiques ou d'applications des exercices d'évaluation. Ces résultats permettent, sous réserves dues à la faible taille de l'échantillon, un certain degré d'optimisme en ce qui concerne l'utilisation de modèles méta-analytiques pour constituer des fonctions de transferts de bénéfices.

the most reliable being the use of meta-analytical models that, by using quantitative analysis methods, allow us to determine the adjustment variables needed in these transfers. The current work undertakes the application of meta-analytical models on CV studies associated with recreational services in Spain in order to use the results for the construction of a benefit transfer function and prove its potentiality. In this respect, the lines of earlier works have been followed, these include Bateman *et al.* (1995) and Santos (1999) for the United Kingdom and Portugal, and Merlo and Della Puppa (1993) for Italy. Firstly, we present an

introduction to the meta-analysis technique and benefit transfer. Then we review the experiences in Spain and select the studies that are going to form our estimation. Finally, we apply the meta-analytical model, study the error associated with benefit transfer and present some conclusions.

META-ANALYSIS AND TRANSFERABILITY OF BENEFITS

Meta-analysis is a statistical technique for comparative research, designed to compare and synthesize results from a set of empirical studies developed and applied separately (Wolf, 1986)⁽¹⁾. The technique was proposed by Glass (1976), Glass *et al.* (1981) and Wolf (1986) as an alternative to the classical review of studies, in which the design of the empirical exercise and the main results were presented in descriptive form. The application of meta-analysis is especially interesting in social sciences, where it is common to find studies on the same problem that, even applying the same technique or with exactly reproduced experimental designs, generate results that differ from each other⁽²⁾. This happens because social phenomena are associated with human behaviour and this, in turn, is based on subjective preferences, experiences, perceptions etc., which results in

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(1) This methodology arose in the medical field in order to jointly analyze the results of medical tests obtained with exactly replicated formats.

(2) Even the repetition of the same study generally generates different results.

there being no stable laws to govern the social phenomena in the way that such laws exist for natural phenomena⁽³⁾ (Van den Bergh *et al.*, 1997). Therefore, it is of special interest for any social discipline to know which variables are influencing or determining the differences between results. In Environmental Economics, direct or survey methods, such as contingent valuation, have undergone rapid expansion that, although not free from debate, has resulted in the consolidation of these techniques and their widespread acceptance by courts, governments and international agencies. CV is a technique which provides values for non-market goods, through the simulation of a hypothetical market (questionnaire), with the aim of obtaining the willingness to pay (WTP) (or to accept compensation) of individuals for some environmental goods or proposed environmental changes⁽⁴⁾. For studies using this method, the application of the econometric meta-analytical model allows us to explore those factors which may be explaining the variation in the estimates of consumer surplus, and whose detection allows conclusions to be drawn with respect to the validity and reliability of the estimates obtained. In general, the number of meta-analytical studies in the field of environmental economics is not great although it is increasing (Van den Bergh *et al.*, 1997). One possible use for the results of meta-analysis is *benefit transfer*, which consists of extrapolating results from existing studies in order to obtain values for other environmental goods with similar characteristics, without the need to define and implement a new study. Although some degree of accuracy is lost, the main advantage of benefit transfer is that it avoids carrying out new exercises for valuation of environmental costs and benefits each time estimates are needed in order, for example, to define economic policy measures or justify investments, and it reduces the costs of these estimates in terms of time, human and monetary resources employed (Desvousges *et al.*, 1992). It is, therefore, a cost-effective alternative to carrying out new valuation studies on non-market goods.

Existing literature on meta-analysis gives us an indication of the variables that are potentially integral to the benefit function⁽⁵⁾ that is, explanatory of the differences

between the WTP results. These variables may relate to the valuation method employed (Walsh *et al.*, 1989; Carson *et al.*, 1996); the statistical specification of the valuation function (Smith and Kaoru, 1990; Sturtevant *et al.*, 1995); population characteristics (Smith and Huang, 1995); the type of place or recreational activity (Brouwer *et al.*, 1997; Bateman *et al.*, 1995); and definition and application characteristics for the empirical study (Walsh *et al.*, 1989; Brouwer and Spaninks, 1999). In general, the more information obtained about the factors influencing the valuation results, the better will be the benefit transfer between populations and places both in terms of feasibility and associated error. Given its interest in terms of cost saving, the possibility of carrying out benefit transfers is currently being widely debated and tested, mainly in the United States. In 1992, the Water Resources Research Journal devoted a special issue to this question⁽⁶⁾. In this issue Desvousges *et al.*, (1992) and Boyle and Bergstrom (1992) established the criteria for an adequate selection of studies when carrying out benefit transfer. These criteria recommended homogeneity in the type of goods valued, the characteristics of the users and the quality of the studies. With respect to the validity of the transfers, there is little written on the subject. Worthy of note are the works by Loomis (1992), Parsons and Kealy (1994) and Loomis *et al.* (1995), using travel cost data, or those by Bergland *et al.* (1995), Downing and Ozuna (1996), Kirchhoff *et al.* (1997) and the most recent by Brouwer and Spaninks (1999), based on contingent valuation studies. In general, the study of recreational benefits associated with natural areas has led to many applications since the origins of contingent valuation techniques. However, reviews of studies related to recreation have consisted of more or less detailed summaries with discussion about the advantages and problems of each contribution.

The only⁽⁷⁾ experiences so far of meta-analysis of CV studies associated with natural areas are those by Bateman *et al.*, (1995) and Santos (1999), both for studies applied to the U.K. The current meta-analysis provides a novel contribution by applying multiple regression techniques to valuation studies of recreational services associated with natural areas in Spain that use direct valuation methods.

CONTINGENT VALUATION AND RECREATION SERVICES IN SPAIN

With an area of 505,000 km² and a coastline of 6,120 km, Spain is among the most extensive European countries and also those with greater biological diversity, helped by the great variety in geography and climate that exists within the country.

Thus, the OECD Environmental Performance Reviews, Spain (1997) points out that more than half of all the species in Europe can be found in Spain and that the

(3) This is why we can only talk of quasi-experiments in social sciences.

(4) For a review of method characteristics, see Mitchell and Carson (1989), Freeman (1993), Riera (1994) and Bjornstad and Khan (1996).

(5) There are several ways of carrying out benefit transfer. The first is direct use of the specific values obtained in the original study, fitted or not for possible income differences (purchasing power) between the areas being considered. An alternative is the transfer of benefit functions, obtained for the place of origin, which allows us to make adjustments for possible differences in the values of the explanatory variables between the place of origin and the destination. A third possibility for transfer is based on benefit functions constructed from data supplied by the meta-analysis technique.

(6) Within the context of recreational benefits associated with improvements in water quality.

(7) We could add, although it does not carry out an econometric analysis similar to those quoted, the work by Merlo and Della Puppa (1993) as they undertook a review and detailed comparison of studies existing for Italy.

proportion of protected land in this country is amongst the largest in Europe, reaching 8.4% of the country area.

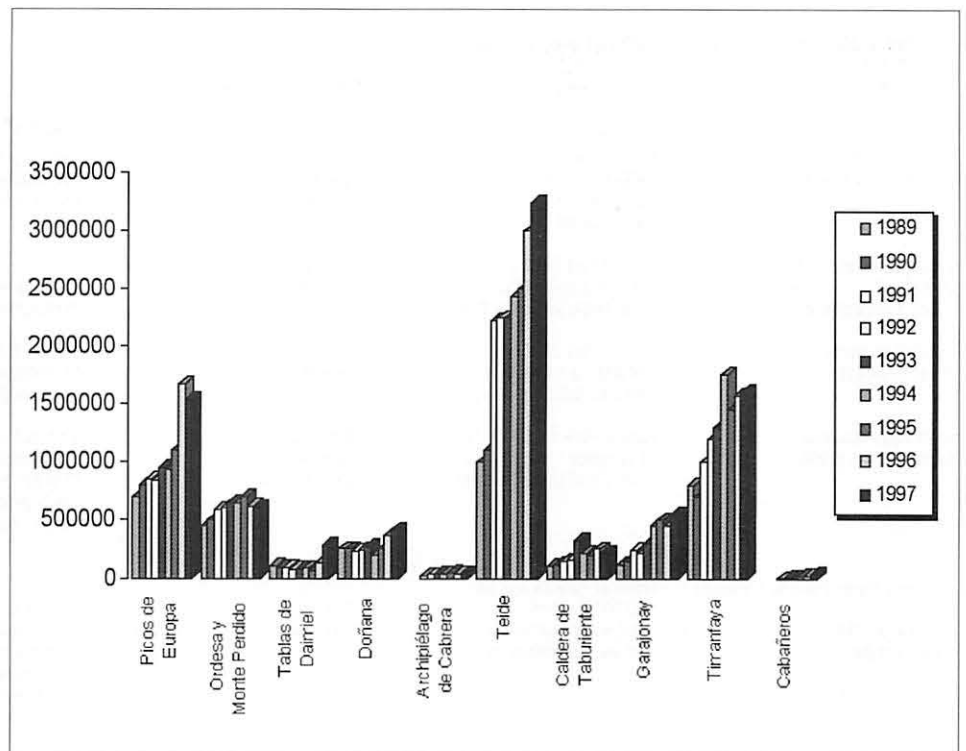
However, as in any developed country, pressures on natural spaces are many, with one of the most notable being demand from leisure services and enjoyment of nature. The tendency of the population towards concentration in large urban centers, coupled with economic growth and improving living standards are behind this increase in demand for recreational services associated with natural areas. Thus, as can be seen in **graphic 1**, the number of visits to Spanish National Parks went from 2.6 million half way through the 80s to 8.5 million in 1997.

This increase in demand has required a response from the state in the shape of increased expenditure and investment in conservation. According to data from the Ministerio de Medio Ambiente (1997), both public environmental spending and investment doubled between 1987 and 1995, of which roughly 80% went to environmental protection.

For 1998 (Ministerio de Medio Ambiente, 1999) investment made solely by the autonomous National Parks body came to 4,091 million ptas (24.6 million euros)^(*), of which 60% went to conservation, that is, 2,456 million ptas (14.8 million euros).

With figures of this scale and the tendency towards increasing budgets for environmental protection, conservation and recovery, it is not surprising that the need has arisen to justify the social use of this expenditure, that is, to analyze whether the social benefits associated with these areas outweigh the quantities put into them. Within this context the first contingent valuation studies appeared in Spain at the beginning of the 90s. Since then their number has increased considerably (reviews in Kriström and Riera, 1993, 1997; León, 1997; Azqueta and Pérez, 1996) and, therefore, it is currently of interest to make an effort to recompile, synthesize and analyze comparatively these exercises, making the most of the advantages that the meta-analysis technique offers us against traditional study reviews and with the aim of undertaking an approach that, although not free from limitations, provides a first view of the potential for constructing a benefit transfer function.

The studies on benefits associated with natural areas that a priori can be included in the meta-analysis for Spain are presented in **tables 1 and 2**.



Graphic 1 - Trend of visitors to National Parks in Spain (1989-1997).

Source: prepared by the authors using data from the Ministerio de Medio Ambiente (1997).

These tables summarize the main characteristics of these exercises. Firstly, analysis is made of the type of goods valued, according to the degree of protection they enjoy; their area in hectares; the estimated number of visitors per year and the area of influence of the park or origin of the average visitor. Secondly, characteristics of the hypothetical market (scenario) are presented, fundamentally format of the elicitation question has been taken into account, and whether the objective of the study was to obtain use values, conservation values or both.

Thirdly, note is made of the questionnaire's implementation characteristics, that is, target population (visitors or residents), sample size, type of survey (personal, telephone or mail) and dates when the surveys were carried out.

Finally, the results obtained by each study are presented (and confidence interval) and the percentage and treatment of protest responses, when information was available.

Fourteen studies have been reviewed in this way, considering both published works (in scientific journals and books) and unpublished ones (working papers, congress papers, etc.) and even preliminary results^(*), as is the case of the contingent valuation exercises car-

(*) 1 Euro = 166.386 ptas.

(*) Following Glass (1976) we have not excluded any study on the basis of its quality and we have included, therefore, preliminary results that are susceptible to being improved and revised in future.

Table 1 Valuation studies of natural areas in Spain.

Place - reference	Type of area	Scenario	Implementation	Results (1 euro = 166.386 ptas)
La Dehesa del Moncayo (Zaragoza) Rebollo and Pérez (1994)	Natural Park 1.388,9 ha. 140000 v / a, 1 day regional . Scope Wet area, . Nature sports	Entry fee Use:MX Conservation: A	Visitors (>18) n=427 Personal in situ March, April, May, 1994	WTP=610 (use)+ 940 (conservation) = 1550 p/v (total value) Excluded protests (10%)
Pla de Boavi els Pallars Sobirà (Lleida) Riera, Descalzi and Ruiz(1994)	Natural Park 9722 ha. (Valle de Espot) 40852 v / a, 1 day Regional Scope Wet area	Entry fee Use: MX	Visitors (>18) n=300 (4 subsamples) Personal in situ 1993	WTP=1082 p / v (875-1279) Excluded protests (83)
Senorio de Bertiz (Navarra) Pérez <i>et al.</i> (1995)	Natural Park 2000 ha., 110000 v/a 1 day Local scope Wet area Nature sports	Entry fee Use: MX	Visitors (>18) n=402 (373 válidas)Personal in situ Spring and Easter 1995.	WTP= 734 p / v (667-800) Excluded protest responses (7,2 %)
Monfragüe (Caceres) Campos <i>et al.</i> (1996)	Natural Park 18259 ha. (area of influence 136.632 ha.)11.000 v/a, 1 day Local scope Dry area	Entry fee Use: MX Conservation: A	Visitors (>18) n=420 nuso=349 (17 % protests) ncons=406 (3 % protests) ntotal=338 (20 % protests) Personal in situ. March - August 1994	WTP use=1328 p / v (1211-1445) Excluded protests (17 %) WTP Cons =1353 p / v (1165-1541) Excluded protests (3 %) WTP tot=2666 p / v (2423-2909) Excluded protests (20%)
Ordesa y Monte Perdido (Huesca) Pérez <i>et al.</i> (1996) Pérez and Barreiro (1997)	National Park 15.608 ha 700.000 v/a, Entry fee > 1 day National scope Wet area Nature sports	Entry fee Use: MX DC DD (simulated) A	Visitors (>18) n(DC) = 857 n(DD)= 845 n(MX) = 835 Personal in situ (a) From July to Oct, 1995 (b.)Spring, Summer 1996	WTP (A)=1133,8 p / v (1060,3-1207,1) WTP(DC)=1175,3 p / v WTP(DD)=1147,8 p / v WTP(MX)=897,4 p / v Excluded protests
Aigüestortes i Estany de Estany (Lleida) Riera <i>et al.</i> (1997)	National Park 14119 ha. 40.852 v / a, 1 day Regional scope Wet area	Entry fee Use: MX	Visitors(>18) n=525 Personal survey in situ Summer 1997	WTP = 1428 p/v
Monte Aloia Monte Aloia (Pontevedra) González (1997)	Natural Park 46 ha. 82136 v / a, 1 day National scope Wet area	Entry fee Use: MX	Visitors (> 18); n = 402 personal interviews in situ. 1995	WTP Aloia = 382 p/v Excluded protests
La Cumbre Cuenca de Tejada, Mumbres, Tamadaba and Inagua (Gran Canaria) León (1997)	Natural Park 28000 ha. 1388.000 v/a, 1 day International scope Dry area	Entry fee Use A DC DD MX	Visitors (>18) n=748 (valid) (605 positive and without protests) n(open-ended) = 222 (174 positive and without protests) n(dichotomous) = 526 (432 positive and without protests) personal survey in situ From August to September 1994	WTP (A) = 1376 p / v WTP(DC)= 4231 p / v WTP(DD)=1356 p / v WTP (MX)= 1849 p / v WTP (MX2) = 1365 p / v Excluded protests

Source: compiled by the authors.

Symbols: mx = mixed (dichotomous +open-ended). Dc = dichotomous. Dd = double dichotomous, a = open-ended. V / a = visits / annum. P/v = ptas/visit. P / a = ptas / annum.

ried out in 1997 in La Caldera de Taburiente (La Palma), Teide (Tenerife) and Aigüestortes i Estany de Sant Maurici (Lleida) (León *et al.*, 1998).

Following Carson *et al.* (1996), the inclusion of published and unpublished studies can help to minimize publication bias⁽¹⁰⁾. In general, the studies considered here have been applied independently and follow the

⁽¹⁰⁾ In some cases, the fact that the study is published implies that its results are positive or confirm certain initial hypotheses, in line with predominating thought. In applied economics, there are usually studies carried out in a private sphere (consultancy, etc.) which are not published or which can only provide the main results, lacking with regard to important methodological details (Matarazzo and Nijkamp, 1997).

⁽¹¹⁾ In 1993, the National Oceanic and Atmospheric Administration (NOAA) called a committee of experts - the NOAA Panel - headed by the Nobel prize winners Robert Solow, from MIT, and Kenneth Arrow, from Stanford University, to study the reliability of the CV method in the valuation of environmental damage and to draw up a series of recommendations that would be a guide when designing and implementing empirical studies based on this method. The Panel's conclusions were in favour of the method although they pointed out the importance of good design and listed a series of recommendations that have been generally accepted and applied.

NOAA panel guidelines (Arrow *et al.*, 1993)⁽¹¹⁾.

Map 1 places geographically on the Iberian Peninsula the natural areas considered in our review. Following the recommendations of Desvousges *et al.*, (1992), Boyle and Bergstrom (1992) and Kask and Shogen (1994), and once the objective of the study has been defined, we proceeded with the definition of a selection protocol to guarantee maximum homogeneity in the studies that would finally be included in the analysis.

Thus, the criteria guiding this selection have been firstly, the goods to be valued, recreational benefits associated with natural areas (use values); the method employed to obtain the value, contingent valuation, and the geographical scope, restricted to applications in Spain, which allows us to assume that the socio-economic characteristics of the population did not vary substantially.

Regarding the monetary value obtained from the applications considered, we have considered the mean as

Table 2 Valuation studies of natural areas in Spain.

Place - reference	Type of area	Scenario	Implementation	Results (1 euro = 166.386 ptas)
L'Albufera (Valencia) Del Saz and Suárez (1998)	Natural Park 21.000 ha. 100.000 v/a, 1 day Regional scope Wet area	Entry fee Use: A MX	Visitors (>18) N=501 (419 positive) Personal survey in situ July to november 1995	WTP (A)= 590,7 p / v IC 95 % (552-629) Wtp (MX) = 759 / v IC 95 % (743-774) Excluded protests (16,4 %)
Tablas de Daimiel (Ciudad Real) Júdez et al. (1998)	National Park 1928 ha. 86270 v/a, 1 day National scope Dry area Nature sports	Entry fee Use: DC A	Visitors (>18) N (DC)=433 (366 positive) N (A) = 102 (65 positive) Personal survey in situ Spring and Summer 1997	Wtp (dc) = 943,4 p / v IC 95 % (1038,6-848,2) WTP (a) = 462,7 p / v IC 95 % (334,9 - 518,5) Excluded protests
Posets-Maladeta (Huesca) Pérez et al. (1998)	Natural Park 33267 ha 200.000 v/a, >1 day Regional scope Wet area. Nature sports	Entry fee Use: MX	Visitors (>18) N = 695 (np =382) Personal survey in situ April - October 1996	WTP = 825 p / v IC 95 % (756 - 893) Excluded protest responses (288 or 41,4 %)
Teide (Tenerife) León et al. (1998)	Natural Park 13571 ha. 3.237.000 v/a, 1 day International scope Dry area	Entry fee Use: MX	Visitors (>18) N=834 Personal survey in situ Summer 1997	WTP = 1856 p/v
Caldera de Taburiente) (La Palma) León et al. (1998)	Natural Park 4690 ha. 210.141 v/a, 1 day International scope Dry area	Entry fee Use: MX	Visitors (>18) N=596 Personal survey in situ Summer 1997	WTP = 1627 p/v
Illas Cies (Pontevedra) González, Polomé and Prada (1999)	Natural Park 966,9 ha. (454 ha land) 150.000 v /a,1 day (4 months a year) National scope Wet area Nature sports	Entry fee Use: DD	Visitors (>18) N=595 (502 usable) Personal survey in situ Summer 1998	WTP = 1679 p/v

Source: compiled by the authors.
Symbols: Mx = mixed (dichotomous +open-ended), Dc = dichotomous, Dd = double dichotomous, S = bidding game, A = open-ended, V / a = visits / annum, P/v = ptas/visit, P /a = ptas / annum.

the relevant measure because it is most coherent with the Potential Pareto Principle of cost-benefit analysis (Johansson et al., 1995)⁽¹²⁾. Another feature that is com-

mon to most of the applications included here, except for González (1997) and Júdez *et al.* (1998), is the use of a mixed format for the elicitation question, that is a

dichotomous choice followed by an open-ended question, which is not the most widely used format in the international context but reduces the number of non answers to the open-ended question and simplifies the task for the interviewed, as it delimits his or her WTP before asking



Map 1 - Situation of the natural areas covered in the reviewed CV studies.
Source: Compiled by the authors.

⁽¹²⁾ Different arguments about the most appropriate measurement of welfare are to be found in the works of Hanemann (1984, 1989) and Johansson *et al.* (1989). According to Hanemann, the median is coherent with the welfare of the majority, implicit in the formulation of a dichotomous question and is more robust in the face of atypical observations and the functional form of the WTP distribution function. Whereas Johansson sustains that although the mean is more sensitive to extreme observations and to the choice of a parametric distribution, it is consistent with the Potential Pareto Principle commonly used in cost-benefit analysis. In short, it seems to be that the choice between one or the other is based on distributive criteria.

⁽¹³⁾ This format runs the risk that the response is influenced by the price offered in the dichotomous question (starting point bias).

for the actual value⁽¹³⁾. Finally, all the studies included exclude protest responses from the analysis⁽¹⁴⁾. Finally, we have obtained 14 observations that have made up the data to be analyzed.

From the studies considered it can be derived that the mean willingness to pay, through an entry fee, for recreation services of Spanish natural areas is 1354 ptas. (median 1264) in 1998 ptas., the equivalent to 8.14 euros (median 7.6). The minimum WTP corresponds to Monte Aloia (Pontevedra), the smallest area considered and with a moderate number of visitors (González, 1997), and the maximum WTP is associated with La Cumbre (Gran Canaria), one of the largest areas and one of the most visited places (León, 1997b). In tables 1, 2 and 3 we can also observe that the areas being considered are fairly heterogeneous regarding size, ranging between 700 ha at Monte Aloia and 33,267 at Posets Maladeta (Pérez *et al.*, 1998), giving a mean of 14,446 ha, and also with regard to visitor numbers, with a maximum of 3 million at La Cumbre and a minimum of 11,000 in the study by Campos *et al.* (1996) at Monfragüe (mean 583,168 visits). With respect to sample size, the mean is 475 interviews (median 432), with the minimum being 102 questionnaires with open-ended format at Tablas de Daimiel (Júdez *et al.*, 1998) and the maximum 857 for the dichotomous choice at Ordesa (Pérez and Barreiro, 1997).

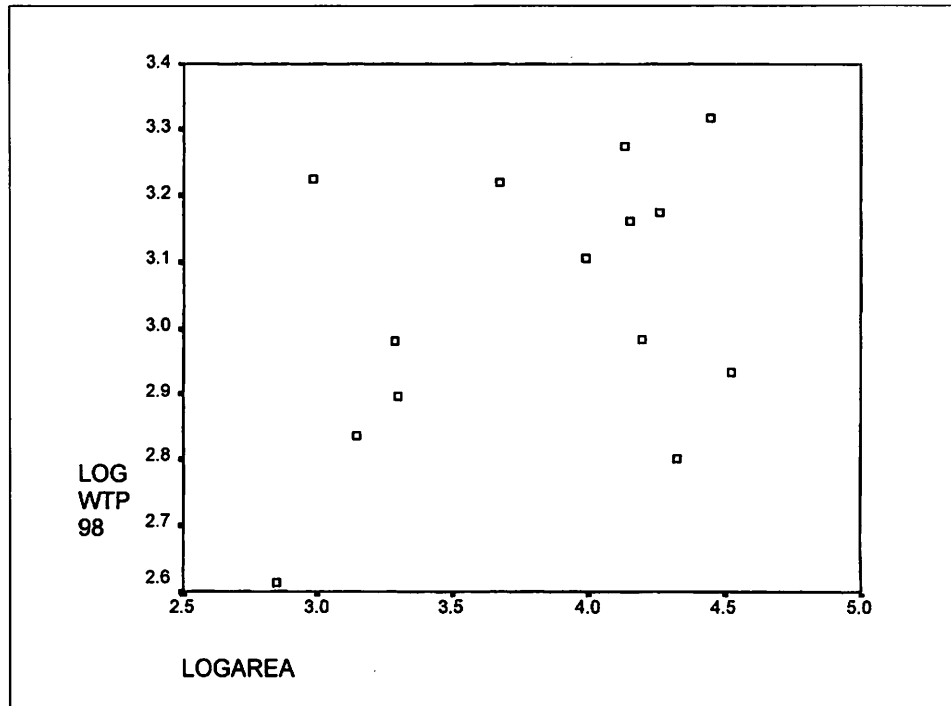
Graphics 2 and **3** depict this positive relationship between the visitors' mean willingness to pay and both the area of the park and the annual number of visitors, respectively.

The Spanish experiences reviewed in this article can be compared with those existing for other Mediterranean countries, such as Italy.

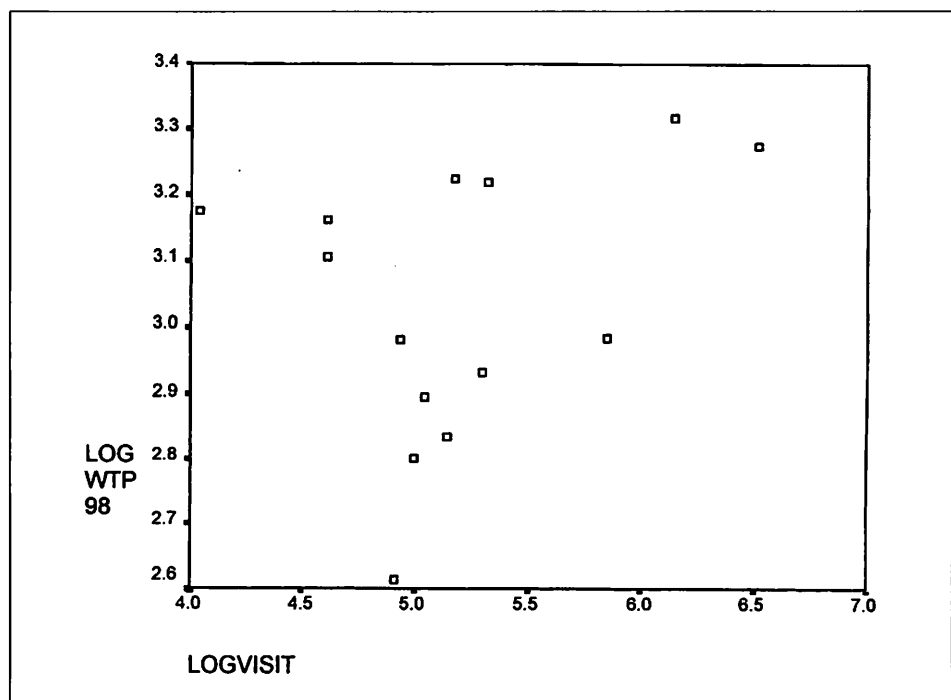
(¹³) If protest responses were included, zero values would be assigned to visitors that probably have a positive value to the services provided by the natural area but do not accept the scenario presented or the fact of paying for goods related to nature. The exclusion of these observations is also a NOAA Panel recommendation (Arrow *et al.*, 1993).

(¹⁴) Among these, 20 use contingent valuation and travel cost methods jointly.

Thus, Merlo and Della Puppa (1993) present a complete review for Italian valuation studies associated with forest and agricultural areas. The authors recompile 40 applications carried out from 1970 to 1993, of which 24 used the contingent valuation method⁽¹⁵⁾. Therefore, this first approximation seems to suggest that the use of the CV method in Italy began much earlier and it is far more intense than in Spain. The fact that is likely to



Graphic 2 - Relationship between willingness to pay and area of the Park.



Graphic 3 - Relationship between willingness to pay and annual visitors of the Park.

have marked this difference is the administrative interest existing in Italy to apply this type of technique. Although the first studies were carried out by individual researchers for doctoral works and academic projects, local and regional authorities involved in planning and developing land use soon showed interest in the usefulness of these techniques for supporting on real decisions. Thus, we can find applications in land management (allocation between potential uses), determining access fees to natural areas and their effect on visitor numbers, cost-benefit analysis for public works, forestry management (annual balance taking into account the level of recreational services provided to the community), judicial processes for environmental damage compensation to society, determination of compensation levels to farmers within the C.A.P. (Common Agricultural Policy), etc. The valuation scenario also presents a greater variety in the Italian case. There are studies with closed-ended, open-ended, payment card and iterative bidding elicitation format and, in general, most of the exercises obtain the recreational value by interviewing visitors during and after their visit to the place.

If we compare the results obtained in the studies carried out in Italy and reviewed by Merlo and Della Puppa (1993) with those reviewed in this article, we observe that the average willingness to pay in the form of an entry fee in Italy is 489 ptas visit/day (2.9 euros), or 630 equivalent ptas in 1998 (3.8 euros). This result is clearly far below that obtained in our review for Spain, 1354 ptas (8.1 euros)⁽¹⁶⁾. The divergence may be explained by the characteristics of the natural areas analyzed in each country. Thus, from the review by Merlo and Della Puppa (1993) it can be gathered that the distance between urban areas and recreational sites is smaller; that the Italian population considers the recreational benefits associated with natural areas to be a right and therefore show, generally, low or no willingness to pay; finally, all the Italian studies show a high number of protests against the use of taxes as a means of payment.

In order to step from the usual work of theoretical synthesis to comparative analysis with a statistical basis, we need some kind of additional technical tool. Below we will carry out this joint and compared analysis by applying quantitative analysis techniques designed with this objective.

META-ANALYTICAL MODEL. ESTIMATION

The first step to carry out a meta-analysis of the 14 studies selected is defining the variables that may be conditioning the differences in the results obtained by these studies. Thus, we sort the variables that are going to make up our analysis into the following subgroups.

Characteristics of the goods to be valued. In our case we have considered the size of the natural area considered (measured in ha), the type of goods (Na-

tional Park or Natural Park), the demand for recreational services represented by the number of annual visits, the origin of the visitors (from the same region, from neighbouring regions, from the same country, from other countries), the average duration of their stay and the activities that it is possible to do in the park.

Scenario characteristics. We include the elicitation question format (mixed, dichotomous, double dichotomous or open-ended).

Implementation characteristics. We consider the sample size, the year when the surveys were carried out⁽¹⁷⁾ and whether or not the study has been published as an article or book chapter.

In the case of the explanatory variables, we must restrict the regression analysis to those variables for which data were available in all the studies under consideration, which means there may be a bias related to omitted variables⁽¹⁸⁾. However, this bias will not cause problems in the estimation if these omitted variables are not correlated with those included. We have preferred to restrict our analysis to a small number of variables, avoiding perhaps more complete and detailed information but based on hypotheses of doubtful validity. Due to the small number of studies analyzed, results should only be considered as indicative.

The usual practice is to present each variable initially considered, regardless of whether it is later eliminated from the model due to its scarce significance. Thus the reader is informed of whether a particular variable is not in the model because it is not significant or because it was not considered from the beginning. In our case, the explanatory variables included in the regression analysis are described in **table 3**. Other variables, probably related to specific characteristics of the area or the recreational experience, or to the visitors' attitudes and perceptions could be also relevant, but have not been

⁽¹⁶⁾ However, it is comparable with the mean value, of roughly 1 euro, obtained in studies carried out for the United Kingdom (Bateman *et al.*, 1999).

⁽¹⁷⁾ Better than the year of publication as in some cases there is a considerable time interval between undertaking the surveys and publishing the report.

⁽¹⁸⁾ For example, socio-economic characteristics of the population, attitudes towards the environment, activities that are carried out in the area, availability of substitutes etc.

Table 3 Explanatory variables.

Variable	Interpretation
Wet	Dummy =1 if the park or natural area is located in a wet area.
Stay	Dummy =1 if the average stay in the park is more than one day
Activities	Dummy =1 if the park offers opportunities for sports (climbing, rafting, canoeing etc.).
Logarea	Logarithm of the park area expressed in hectares.
Logvisit	Logarithm of the annual number of visits to the park.
Date	Year in which the surveys were undertaken.
Published	Dummy =1 if the study has been published as a journal or chapter article in a book.
Origin	Dummy =1 if the visitor comes from the same region.
Format	Dummy =1 if the format is mixed.

included because the articles, chapters, papers etc. that have been reviewed do not provide enough information to allow them to be considered. In general, the main problem for the application of meta-analysis is transversality (Van den Bergh *et al.*, 1997), related to the intrinsic heterogeneous nature of the studies. That is, the studies have been applied by different researchers, in different contexts and with different designs. This bias is aggravated by the fact that the data presented in the studies, theses, congress papers or working documents is normally insufficient and lacks the necessary details about implementation, for example, potential indicators of accuracy such as standard errors or standard deviation, or other characteristics such as the functional form used for the analysis of the dichotomous answer (Smith and Karou, 1990; Carson *et al.*, 1996).

In our exercise, the coefficients of the variables that influence willingness to pay were estimated with different levels of accuracy and functional forms. This implies that there is a risk that the model suffers from heteroscedasticity if we apply OLS (Ordinary Least Squares) in the estimation⁽¹⁹⁾. In order to compensate for this problem, the possibility of estimating by means of GLS (Generalized Least Squares) is suggested. This method consists of weighting the data by the inverse of the variable that is supposed to be causing the problem. In the case of meta-analysis, the most likely cause is the different level of accuracy in the results (Carson *et al.*, 1996; Van der Bergh *et al.*, 1997). Possible weighted variables could be the standard error of the estimation or the standard deviation (accuracy indicators). In our case, there is no information published about these variables in most of the studies reviewed, nor about the confidence interval or the median. This problem was solved following the approach suggested by Chappie and Lave (1982) and Santos (1999), that is, to carry out the weighting according to the sample size⁽²⁰⁾. As we shall see below, this approximation does not substantially modify the estimation results, the goodness of fit nor the significance of the estimates. This result is similar to that obtained by Santos (1999), for a meta-analysis

of CV studies applied to natural areas. We estimate different regression equations taking into account the explanatory variables that represent characteristics of the goods being valued, scenario definition and implementation of the exercise. The best regression equation, as is habitual in meta-analysis literature, takes a semi-log form of the type⁽²¹⁾:

$$\log(WTP) = \alpha + \beta X + \varepsilon$$

Where α and β are vectors of parameters to be estimated, ε is the error term with the usual properties and X is the matrix of independent or explanatory variables. The logarithmic transformation of the dependent variable offered better results than the original willingness to pay, both in terms of goodness of fit and significance of the estimates and was, therefore, preferred. The former equation could be considered, with the reservations mentioned, the benefit transfer function to be estimated. In order to select the model which best fits our data, we have followed the usual procedure of trying different models, introducing more or fewer variables according to whether they appear significant or not following the t-Student criterion and according to their contribution to the improvement of the explanatory power of the model, measured through the coefficient of determination.

The specification which best explains the variation of data is that shown in **table 4**, which gives OLS and GLS results.

In that table we can see that the variables included are very significant (degree of significance over 99%) and their coefficients show reasonable magnitudes and

Table 4 Result of the estimation.

Variable	Ols	Glsl(1)
	Coefficient	Coefficient
Constant (7,339)***	2,037 (7,404)***	2,055
Wet (-3,520)***	-0,203 (-3,490)***	-0,202
Origin (-4,141)***	-0,292 (-4,101)***	-0,291
Logarea (4,457)***	0,310 (4,392)***	0,305
Stay (-4,390)***	-0,402 (-4,357)***	0,402
Activities (3,769)***	0,339 (3,735)***	0,336
Dependent variable	LogWTP98 = logarithm of mean willingness to pay (ptas / visit) converted into 1998 ptas.	
N° observations	14	14
R ²	0,859	0,859
R ² adjusted	0,770	0,771
F	9,708	9,738
(1) GLS with weighting = inverse of logarithm of the sample size. *** p<0,01 ** p<0,05 * p<0,10 t-statistic values in brackets (t = estimated coefficient standard deviation).		

⁽¹⁹⁾ In the standard regression model, OLS, it is assumed that the errors in the observations are distributed with identical variances. If in reality they come from estimations with different variances, the OLS estimates will be unbiased, but inefficient, and the standard errors calculated in the conventional way are inappropriate.

⁽²⁰⁾ They suppose that the sample variance is proportional to the inverse of the square root of the sample size. In the reviewed studies the sample size ranges between roughly 300 valid observations by Riera *et al.* (1994) and Pérez *et al.* (1995) and more than 800 by León *et al.* (1998).

⁽²¹⁾ Notes about modifications and assumptions in the selection of explanatory variables: the original willingness to pay has been converted to its 1998 equivalent with figures for the retail price index provided by the INE (Statistical Spanish Institute) for the years 1990-98. In certain studies the result is presented with protests excluded and included. In these cases, and in order to maintain a certain homogeneity among the data, we have decided to estimate consumer surplus without protest responses. For the Ordesa and Monte Perdido National Park there are several studies. We have taken the most recent for our analysis (Pérez and Barreiro, 1997), which carries out a complete analysis of all the surveys undertaken in the park to that date.

signs according to prior expectations. Thus, the coefficient of the variable WET shows a negative sign, which indicates that sites located in wet areas are less valued by their visitors. The likely reason is that areas with plenty of water (usually of regions in the North) have, in general, a greater number of available substitutes that can provide identical or similar recreational services. The sign of the variable ORIGIN coefficient also implies that those visitors who travel greater distances to reach their destination are willing to pay more for their enjoyment⁽²²⁾.

Also in agreement with a priori theoretical expectations and with what is shown in graphic 2, is the positive and very significant relationship between the area of the park and the willingness to pay of individuals for its recreational services. This is evidence that the set of studies analyzed is free from the so-called "embedding effect" given that the value assigned to the goods increases clearly with their size. The negative sign of the coefficient for the variable STAY reflects decreasing marginal benefits with respect to time spent in the area and is coherent with results of other studies (Pérez and Barreiro, 1997). Finally, the potentiality of the natural area visited, as far as the activities that can be done is concerned, shows a positive and very significant relationship with willingness to pay. Also remarkable is that the independent term is very significant, which implies that other variables exist that have not been included in the estimation and that would better fit the model (omitted variables). These variables are likely to be related to other characteristics of the goods being valued, of the visitors (attitudes towards nature, experience etc.), data which do not figure in any of the reviewed reports, papers and publications but which should be considered in future enlargements of this work or similar meta-analyses⁽²³⁾. The selected model explains 77% of the variation in WTP results ($R^2=0.77$) and the F-test allows us to reject the null hypothesis of no influence of the explanatory variables on the dependent variable, in this case the mean willingness to pay⁽²⁴⁾.

The R^2 of this meta-analytical model is a measure of the absence of statistical noise in the variation of mean willingness to pay between studies (Santos, 1999). Furthermore, the goodness of fit of our model is greater than that obtained in other meta-analyses⁽²⁵⁾. One important point for the possibility of constructing a benefit transfer function is that all the variables that appear significant in this model are related to the characteristics of the goods being valued and not to methodological options, hypothetical market (questionnaire) or implementation characteristics. Neither the question format, nor the sample size, nor the date of carrying out the questionnaires seem to explain the differences obtained in the results. This result is positive with respect both to the possibility of transferring benefits between sites and contexts and to the usefulness of meta-analysis as a

method for constructing transfer functions with a solid basis: the existing experiences of valuation for specific environmental goods. Following Santos (1999), this result also shows the reliability of the model put forward. With reservations associated with the small number of studies considered, the transfer function, introducing the estimated coefficients, would have the following expression,

$$\log DP = 2,037 - 0,203HUM - 0,292PROC + 0,310LOG(AREA) - 0,42ESTANC + 0,339ACTIV$$

Following Smith and Kaoru (1990) and Santos (1999), we can use this transfer function, obtained by means of a meta-analytical model, to predict the mean willingness to pay for each study considered. Thus, we analyse the results we would obtain through the application of this transfer function instead of carrying out an original exercise of valuation for each of the 14 studies selected, substituting the values of the independent variables in the area subjected to valuation in the transfer function. Moreover, we compare these predicted results with real values. As **table 5** shows, the error

⁽²²⁾ The travel cost method is based on this assumption: the costs incurred by the individual to travel to the recreational area work as a proxy for market price and, together with the number of visitors or visits, make it possible to construct a demand function from which the consumer surplus can be derived.

⁽²³⁾ We also observe that the estimations provided by the OLS and GLS are not significantly different, with a slightly greater adjusted determination coefficient in the case of GLS. We will consider, therefore, the OLS results.

⁽²⁴⁾ $F_{0,01}(6,8)=6.37$. At 1%, the F value is not statistically significant, which allows us to reject the null hypothesis that all the coefficients of the model, β , are zero simultaneously (Green, 1993).

⁽²⁵⁾ Thus, Smith and Kaoru (1990) and Walsh *et al.* (1992) obtain values between 0.35-0.45 and Bateman *et al.* (1995) obtains an R^2 of approximately 0.60. The goodness of fit for these studies are clearly greater than those obtained in OLS estimations of individual studies given that the dependent variable is made up of sample means, free from interpersonal variations (Santos, 1999).

Table 5 Comparison between real value and transfer prediction (in ptas./day visit). 1 Euro = 166.386 ptas.

Place	Wtppred	Wtpreal	Error*	Error %**
Moncayo	715	687	29	4.15
Pla de Boavi	601	1275	674	52.88
Bertiz	802	789	12	1.57
Monfragüe	1163	1495	332	22.19
Ordesa	1175	965	210	21.72
Baixo Miño	522	411	111	27.02
La Cumbre	2609	2081	528	25.36
L'Albufera	761	634	126	19.89
Daimiel	986	961	25	2.64
Taburiente	1495	1657	162	9.76
Teide	2076	1890	186	9.86
Aigüestortes	674	1454	780	53.67
Illas Cies	1259	1679	420	25.04
Posets	348	857	509	59.41
Mean			293.14	23.94

* error = valor real - predicción
 ** error % = (valor real - predicción) / valor real
 Ambos, error y error % en valor absoluto.

would be around 8%. If we accept predictions with an error below 50% (Cummings *et al.*, 1986; Mitchell and Carson, 1989), about 85% of the predictions from the transfer function would be acceptable.

What is more, approximately 65% of the predictions would be made with an error below 25%. This result is comparable with that obtained by Loomis (1992), using the same prediction method. Furthermore, as can be seen in table 5, the average error would be around 24%, which allows us to state the good predictive capability of our meta-analytical model.

CONCLUSIONS

In the current article we have carried out a review of contingent valuation studies related to recreation in natural areas in Spain.

A first result is that the willingness to pay obtained by these studies appears to converge around a mean value of 1350 ptas per visit, with only two values significantly different.

If we consider, for example, the figure of 8.5 million visits to the Spanish national parks in 1995, the annual aggregate value for the recreational benefit obtained from these areas would come to 11509 million ptas (69.17 million euros), far above the annual 4091 million ptas (24.6 million euros) invested in the 10 national parks during 1997. A first conclusion is, therefore, that the Spanish population obtains a considerable net social benefit from the existence and conservation of these areas.

The meta-analysis carried out proves that the variables that determine the differences in results are mainly related to characteristics of the goods being valued (geographical area, size) and of the visitors (origin, length of visit and activities).

Not significant are the variables related to the valuation scenario, nor those related to the questionnaire's implementation characteristics. This result is encouraging regarding the potentiality of benefit transfer for it indicates that the valuation is influenced to a greater extent by objective characteristics of the recreational experience than by methodological options of the exercise and it is, therefore, in the former that adjustments should be focused.

What is more, when we compare the results obtained by each of the studies with those that would be obtained through the transfer function constructed on a meta-analysis basis, we observe that the mean percentage error is below 24%.

This error seems acceptable if we compare it with the usual costs, both in money and time, that would be involved in carrying out a new study each time we needed estimations for recreational benefits associated with a natural area.

However, the construction of a benefit transfer function should be based on a set of studies that is large

enough and similar with regard to the valuation scenario presented. In our case, although the studies analyzed show a high level of homogeneity, the number of observations is still small and the results could improve substantially as a greater number of applications is added.

Furthermore, among the limitations of this study is the absence of potentially explanatory variables that have not been included because of lack of data but which could imply a substantial increase in the explanatory capacity of the model.

These variables could be related to other characteristics of the goods being valued such as their interest with regard to wildlife, landscape, services, accessibility, availability of substitutes, characteristics of visitors and even socio-psychological or cultural factors (attitudes towards payments for environmental protection, familiarity or information on the areas being valued and perception of the importance of introducing conservation measures or public protection policies for the spaces).

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