The Role of Use and Non-use Values in Environmental Valuation: Do they matter in Scope Tests?

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Abstract

Scope insensitivity has been a common result in many contingent valuation studies applied to high non-use value resources. Previous studies have explained these results with different arguments, such as the theory of diminishing marginal existence values or even going as far as questioning the validity of contingent valuation method (CVM). In this paper, we conduct a meta-analysis on contingent valuation studies of biodiversity and ecosystems valuation, underlining the differential role played by use and non-use values. Our results show that WTP is positively related to the size of resources which provide mainly use values, and on the opposite, negatively related to the good size when non-use values are predominant. Moreover, we assess the differential effect of each type of good valued, finding that the size of some resources such as wetlands, rivers and valleys increases significantly the WTP estimates, while on the other hand, in wildlife valuation studies larger sizes lead to lower welfare estimates. Results are commented and discussed in order to shed some light on previous scope test failures surrounding non-use values**.**

Keywords. Contingent valuation, scope test, use value, non-use value, meta-analysis

1. Introduction

Sensitivity to scope has been repeatedly discussed in the contingent valuation (hereafter CV) literature for environmental goods. Since the NOAA Panel recommendations (Arrow et al., 1993), later studies have tested the scope sensitivity of their willingness to pay (hereafter WTP) estimates considering it as validation criteria of their valuation exercise (Heberlein et al., 2005). In this sense, several studies presented results showing scope insensitivity as a weakness of the CV method (Kahneman and Knetsch, 1992; Desvousges et al., 1993; Boyle et al., 1994; Chilton and Hutchinson, 2003), while others argued that well conducted CV results passed the scope test (Loomis et al., 1993; Loomis and White, 1996; Nunes and Schokkaert, 2003; Smith and Osborne, 1996). There are some other authors that defend the idea that scope test should not be a validity criteria and that both results may be expected depending upon the circumstances of valuation (Heberlein et al., 2005; Banerjee and Murphy, 2005). Attempting to reconcile previous findings, Rollins and Lyke (1998) developed the theory of diminishing marginal existence values, where insensitivity to scope is explained by the increment of the good proposed in the valuation exercise, concluding that WTP cannot be sensitive to increments above a certain upper level, unless sample size is adjusted correctly.

However, in wildlife valuation studies, scope failures cannot be entirely explained by diminishing marginal existence values, since there are exercises that have shown negative scope (Fredman, 1995; Chambers and Whitehead, 2003; Heberlein et al., 2005). Given these controversies, we have compiled recent CV exercises in order to study the relationship between scope test results and the degree of use and non-use values of each species.

The current paper is structured as follows: first, in section 2, main previous results about insensitivity to scope in the CV and meta-analytical literature are summarized and discussed. Then the design of the meta-analytical analysis of use and non-use values is described in section 3. The paper continues with the data analysis and results in section 4, concluding with some final remarks in section 5.

2. Literature review

Scope in the CV literature

One of the NOAA Panel recommendations on applying the CV method was testing for WTP sensitivity to scope (Arrow et al., 1993). Because of this recommendation, scope test studies have been common in a wide range of environmental goods, such as wildlife, ecosystems and health. In ecosystem valuation, for example, Loomis et al. (1993) conducted a CV study of forest protection in Australia, assessing scope sensitivity for the protected forest area. They used the same map for identifying the protected area on each treatment, allowing respondents to clearly distinguish between the 6,000 Ha park, the 70,000 Ha forest and the 122,000 Ha that represented all South-Eastern Australian forest land. Their results showed scope sensitivity between the two first levels (6,000 and 70,000 ha), while no difference was found for increases on the forest area from 70,000 to 122,000. They justified their results by indicating that the amount of protected area increases toward some maximum upper limit within the market area of interest to the respondent, consequently diminishing marginal WTP for protection of additional areas. Bateman et al. (2005) develop a scope test study for controlling acidification in upland lakes, obtaining a little difference on the WTP estimate between protecting 4 lakes or all 400 lakes. This implies again a declining marginal WTP. As Loomis et al. (1993), they explain that respondents might hold economically significant values for the preservation of some minimum threshold number of lake ecosystems but, beyond that minimum threshold, marginal WTP to protect additional numbers of lakes appeared to be nominal. In a recent health study, Bateman and Brouwer (2006) develop a CV survey on reducing skin cancer risks on the New Zealand population, differentiating among individual and household WTP and obtaining scope sensitivity.

Valuing ecosystems, Rollins and Lyke (1998) estimated WTP for proposals to create new natural parks in Canada. Each park represented a unique ecosystem, and all were sufficiently remote than only existence values could be considered. They presented different treatments of the survey instrument with increases on the number of parks from one to 10, the later representing all the ecosystems that are present in Canada. Their study showed that people distinguished among the goods of different scope, but

due to diminishing marginal WTP for larger scope goods, differences between values were negligible. However, results coming from wildlife and biodiversity valuation cannot be entirely explained by diminishing marginal WTP. Boyle et al. (1994) tested whether CV estimates are sensitive to marginal changes on an environmental commodity. Their program was preventing migratory waterfowl deaths in waste oil, with increments of 2,000, 20,000 and 200,000 bird deaths prevented. Their research hypothesis followed standard economic theory and indicated that if an individual derives utility from the prevention of waterfowl deaths, then the estimated WTP values will be nonnegative and will increase as a higher number of bird deaths are prevented. The estimated contingent values showed scope sensitivity between saving 2,000 and 200,000 birds, but no difference on WTP estimates were found between saving 2,000 and 20,000 birds. The authors explained that these results may be caused by the public's inability to process small proportions of a good and the respondent's general lack of familiarity with the commodity being evaluated. Fredman (1995) conducted a CV study for woodpecker population in Sweden. He obtained negative marginal WTP for an increase in woodpecker population, which may be justified by people's wishes to distribute their income to the recovery of other different species once the one they are valuing is recovered, instead of increasing its population on a larger scope. The reason is that the existence value is linked to the fact that the species survives, and not linked to further increases on its population. Chambers and Whitehead (2003) found the same results for a valuation program of wolves in Minnesota, were respondents valued more a recovery program than a damage program. Heberlein et al. (2005) also found decreasing WTP for wolves when valuing a reintroduction, obtaining higher benefit estimates for 300 wolves than for 800. They explained the negative scope arguing that conflicts with people may play an important role, and that this negative scope is related to affective and cognitive scope, reflecting people's true preferences. In this same study, increments in biodiversity conservation resulted in negative scope, but on the contrary, increments in water quality were related to a higher WTP, showing scope sensitivity. Concluding, the theory of diminishing marginal existence values reconcile scope insensitivity of some previous exercises, such as Loomis et al. (1993) , Boyle et al. (1994) or Bateman et al. (2005), but fails to explain the negative scope result obtained by Heberlein et al. (2005) , Fredman (1995) or Chambers and Whitehead (2003). In the next section, we present a meta-analysis on CV studies as a tool to better

understand the relations between use and non-use values and the scope sensitivity or sensitivity to the size of the good.

Scope in stated preference meta-analyses

Meta-analyses are important analytical tools to better understand the findings of a specific literature. Besides being important in the CV literature, scope sensitivity has also been a key element in meta-analyses conducted on CV studies. Smith and Osborne (1996) developed a meta-analytical report on CV studies measuring WTP for improving or maintaining visibility in US natural parks. They employed a meta-regression to test whether WTP estimates were sensitive to the size of the good. Visibility is a clear high use value good since is related to human enjoyment. Their findings supported a statistically significant relationship between WTP estimates and the percentage of improvement in visibility. This result confirms their starting hypothesis of internal consistency of CV estimates in relation to the scope of the good. Meanwhile, Loomis and White (1996) find that the change in wildlife population as well as one-time payments, being a respondent instead of a visitor and valuing a mammal or a bird were statistically significant in predicting WTP for endangered species. In this case endangered species are considered as non-use value goods, although they included other studies related to use values such as hunting and fishing. Brouwer et al. (1999) have conducted a meta-analysis on the use and non-use values generated by wetland ecosystems across North America and Europe. They found that average WTP is higher for those ecosystem functions that are useful for people. First of all, people rate highest flood risks control, in a second position water supply, and finally biodiversity conservation. Johnston et al. (2003) find that larger quality improvements in surface waters are found to be related to higher non use WTP. More recently, Brander et al. (2007) obtain that the area of dive sites is significant determining coral reef values, where people are taking into account use values. On contrast, other meta-analysis did not obtain sensitivity to scope in their estimates. Enjolras et al. (2007) obtain insensitivity to the size of the good where the surface of lagoons has a negative effect on the payment per acre. In forest valuation, Lindhjem (2007) reviews stated preference literature in Scandinavia for the last 20 years finding that WTP is insensitive to the size of the forest valued. Jacobsen and Hanley (2007) obtain in another meta-analysis that species protection has a negative sign in WTP, leading to lower estimates.

Due to the controversy of scope sensitivity in the meta-analytical literature and taking into account the debate among reasons for failing a scope test in the CV literature, we hypothesize that scope sensitivity is related to the use and non use values of the goods in question. Scope insensitivity, far from being a reason for invalidating CV exercises, may be expected for some environmental goods, specifically for goods with very high non-use values.

3. Meta-analysis design

The present study presents a meta-analytical review of the CV literature valuing biodiversity and ecosystem goods for the last two decades. From an extensive review of the literature, we selected those studies providing information about the size of the good in measurable and comparable units. This imposed constraint significantly reduced the sample. A final sample of 100 observations from 34 studies was employed for the purposes of this research, where the largest number of observations from a single study is 10. The total number of studies is compiled and summarized in table 1, where information is provided about the authors, year of publication, type of good valued, survey design and survey implementation characteristics.

The dependent variable in our models is the estimated WTP reported by each original study. WTP estimates have been converted to $2007 with the Consumer Price Index obtained from the IMF (IFM, 2007). This is a common procedure in meta-analyses (Smith and Osborne, 1996; Jacobsen and Hanley, 2007). WTP is expected to be affected by several factors. In the analysis that follows we include geographical, good related and methodological variables in order to model WTP variation.

Explanatory variables are thus grouped in three different classifications: study characteristics, good characteristics and geographical characteristics. Study characteristics are necessary in order to explain differences in WTP related to methodological procedures. Following Loomis and White (1996), we obtain information about the question format variables; including the following: open ended (*OE*), single bounded dichotomous choice (*SBDC*), double bounded dichotomous choice *(DBDC)* and payment card *(PC),* with the omitted variable *other payment*

indicating mixed payment vehicles. Another included variable is the survey mode, indicating whether the survey was conducted via telephone or face-to-face questionnaires (*direct interview*) or otherwise via mail or computer. The time-frame of the payment is also reflected by the indicator *annual*, reflecting that the WTP estimate was asked as being an annual payment instead of a sum lump. The *response rate* was also included in the model as being a signal of the study's reliability and response quality, expecting that higher response rates may provide less biased estimates. Finally, we also include the variables *volunteer* and *household*, (being *visitor* the omitted variable), as a way to identify the type of respondents, where the variable *volunteer* identifies subjects such as students that volunteer their cooperation for a given study; while the variable *household* denotes that the study focused on a representative sample of households. All these variables are relevant for the CV literature, and in some cases, are still under debate.

The characterization of the good is also very important for our purposes. Since the aim of the following meta-analysis is to test the effect of use and non-use value goods in the propensity of passing scope tests, we have identified mainly two types of studies according to the values provided. This identification has been achieved by revising each original study and its corresponding objectives. As a consequence, if recreation or direct use was obtained from the environmental good being valued, the study is classified as providing use values. On the opposite, if passive use values were the main analytical objective of the primary study, then it was classified into the non-use category. With this information and with knowledge of the size of the good proposed, we create two explanatory variables: *size*use* and *size*nonuse*, reflecting the interaction between size of the high use and high non-use goods, respectively.

As additional geographical indicators, the variables *Europe* and *North America* indicate the area where the studies where undertaken, with the rest of the world as the omitted variable. This classification was well suited due to the large amount of estimates coming from the US and UK. Finally, the variable *locals* indicates that respondents are geographically close to the environmental good being value. Means and definitions for each variable are presented in Table 2.

4. Data analysis and estimated results

With the described dataset, we conduct a meta-regression to further explore the links between use and non use values and scope sensitivity. As we observe in the previous literature review, earlier meta-analytical as well as stated preference studies have dealt with mixed results concerning scope sensitivity. Our research hypothesis is that we expect scope sensitivity to be determined by the amount of use and non-use values of each environmental good. To test this hypothesis, the sizes of all good being valued are included as explanatory variables in the model. A Tobit model is the best statistical option to model our data, providing similar results to those coming from Ordinary Least Squares (OLS) approach, but with more efficient estimates.

According to the obtained results displayed in Table 3, the quantity of use values proposed by the CV studies (*size*use*) is positive and statistically significant explaining WTP, while the quantity of non-use values (*size**nonuse) is negative and significant explaining WTP. This means that when valuing high non-use goods, the size of the good is negatively related with WTP, what leads to scope insensitivity or even to negative scope. These results are in line with previous findings in the CV literature, such as Heberlein et al. (2005) or Chambers and Whitehead (2003). However, Nunes and Schokkaert (2003) find that WTP estimations for a natural park are sensitive to scope once correcting for the "warm glow effect". This may be one explanation that helps us understanding our meta-analysis results. Note that the baseline studies were not corrected for such effect, and non-use values are highly susceptible to "warm glow".

Our model provides some other interesting results. Attending to the geographical variables, we can observe that studies conducted in Europe result in higher WTP estimates in relation to other areas. In addition, the proximity with the environmental good (variable *locals*) yields the expected result, being positively correlated with the WTP amount. This can be explained given that environmental goods are often seen as valuable goods, closely related to the local welfare. Methodological variables carry also interesting effects in order to deep into the variability among studies and the preferable CV techniques. Annual payments are found to be positively related to WTP estimates, this may be explained by risk-aversion or other factors such as the discount factor employed by many individuals when making the payment choices. It seems reasonable

to think that individuals would be more likely to pay for a program if the payment is done gradually over several years than paying a large amount at once. The type of respondent does not have any significant effect on WTP estimates, while the question format is influencing WTP values. Single bounded and double bounded WTP questions are found to give higher WTP estimates, while open ended and payment card are not significant explaining WTP. This result is in line with expectations, and it has been commonly found in the literature (Bateman and Jones, 2003). Furthermore, the variable denoting the response rate is highly significant and negative. As explained by Loomis and White (1996), this result is due to the fact that high response rates reflect disinterested respondent's observations, and consequently produce a reduction in hypothetical bias.

The survey mode yields also some interesting results. Direct interviews, those conducted by telephone or face-to-face, produce higher WTP estimates than indirect interviews (mail or e-mail). Although personal surveys have been indicated as the most reliable survey mode (Arrow et al., 1993), previous literature on interviewer effects demonstrates how this method is not free from social desirability bias (Leggett et al., 2003; Fisher, 1993; Loureiro and Lotade, 2005). People sometimes respond to direct surveys as having more socially desirable responses than what they really have, and thus revealing higher WTP estimates. The existence of 'social desirability' bias in CV surveys was highlighted by Leggett et al. (2003), comparing WTP reported by face-to-face and self administered CV surveys. Face-to-face surveys were seen to overestimate WTP approximately about 23% (Leggett et al., 2003). Social desirability biases are obtained when respondents' answers are based on their perceptions of what is socially acceptable (Fisher, 1993). Based on this premise, our findings can be pointing to the existence of social desirability bias in direct mode interviews.

Extended Models

From the meta-analysis conducted in the previous section we are able to distinguish the effect of use and non use values in WTP sensitivity to the size of the good. Nevertheless, in this section we aim to extend our model in order to look at the individual effect of each good type being valued and the type of program presented. Based on the computation of the size of the good for use and non-use values, we apply

the same procedure to calculate the size associated to each particular good. Previous meta-analyses have shown how WTP to avoid a decline is larger than WTP to acquire an improvement over the current conditions (Smith and Osborne, 1996). To test this effect, we include two more variables reflecting when the proposed change in size is a gain in use values or non-use values, or otherwise the program is focused on avoiding losses. A gain reflects those programs aiming to improve the good quantitatively of qualitatively. All these new variables are summarized in Table 3.

With the same dataset and the same specification we show the Tobit results for the expanded models are presented Table 5. It is interesting to highlight the different effect in WTP for each type of good. When valuing parks, the size of the program is not leading to scope insensitivity. At a first glance this result is surprising, since parks are often highly valued by providing recreation opportunities and direct use, but when we look at the values these parks hold we can see they all are existence values. They are remote parks and areas focused in wildlife. Brookshire et al. (1983) defend the idea that existence value is a public good, since consumption activities associated with existence values are non-rival and nonexclusive. The public nature of existence values yields to the scope insensitivity and the possibility of the 'free riding' effect, where people refuse to pay when they expect other individuals to do so. Moreover, as forest size is our omitted variable and is related to use values in a larger extent, the result found for park size can be expected. On contrast, wetlands, rivers and valleys carry all positive and significant effects explaining WTP. This might be related to the recreation opportunities and ecological functions these kind of goods offer. On the contrary, wildlife size is negatively related to WTP, indicating that the higher the population valued, the lower the WTP. These results show us again the effect of the nature of the good on scope behavior, where the values behind each type of good may be playing an important role.

Extended model 2 includes the *gain* variables. With respect to the gain variable, there is evidence of a negative effect in WTP for gaining compared to avoiding further losses when valuing non-use goods. This result goes in line with Smith and Osborne´s (1996) finding for visibility improvements, and underlies the link between the 'endowment' effect and non-use values. Goods that characterized by high non-use values are thus more valued when avoiding losses than when proposing gains. For use goods no

evidence has been found since the coefficient associated with *gain*use* is not statistically significant at conventional critical levels. The extended model 3 includes all discussed variables.

5. Conclusions

In this paper, we have hypothesized the effect of use and non-use values on scope tests. Given the mixed results in the scope test literature, we have conducted a meta-analysis with ecosystem and biodiversity CV studies. From this meta-analysis, we are able to assess a significant link between use values and WTP sensitivity, and a negative relationship between high non-use goods and WTP estimates. One explanation for this result might be a generalization of the warm glow giving effect found by Nunes and Schokkaert (2003).

Next, in order to detect WTP sensitivity to the size of each type of good, we have conducted an extended model including a more detailed characterization of the good valued. For some goods, the quantity offered is related to higher WTP estimates (wetlands, rivers and valley), while for others the relation is inverse (wildlife) or statistically insignificant (parks, coast). These findings lead us to conclude that WTP sensitivity to the amount of the good or scope test is conditioned by the good type, and specifically, by the amount of use and non-use values ascribed to the particular good. Scope insensitivity is thus an expected result for high non-use goods while negative scope can also be found. A second extended model looked into the effect of avoiding losses and gaining in the resource when valuing use and non-us goods. Results point to the existence of an endowment effect behavior for high non-use goods, where WTP is negatively related to a gain in size of the good.

Furthermore, results from the meta-analysis have implications for future CV analysis with respect the effect of the response rate in WTP estimations, and the preferable implementation procedure. Higher response rates were related to lower WTP estimates while face-to-face interviews affected WTP in a positive and statistically significant way.

Summarizing, meta-analyses are interesting approaches to globalize results from a particular research area. The analysis conducted here provides evidence of how use and non-use values are affecting WTP sensitivity to the size of the good provided. Furthermore, social desirability bias, warm glow and endowment behavior were discussed with relation to the results found. Further analyses are needed in order to increase the knowledge about the optimum CV procedures.

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Annex I

Tables and graphics

Table 1

Studies compiled for the meta-analysis

Author	year	Country	Obs.	good	survey characteristics
Bulte et al.	2005	Netherlands	1	wildlife	internet household DC taxes
Heberlein et al.	2005	Wisconsing (US)	4	wildlife	mail-telephone household OE donation, property taxes, state income taxes, fees and permits
White et al.	1997	North Yorkshire (UK)	3	wildlife	telephone household DC taxes
Kotchen and Reiling	2000	Maine (US)	2	wildlife	mail household DC taxes
Chambers and Whitehead	2003	Minnesota (US)	4	wildlife	mail household DC taxes
Bowker and Stoll	1998	Texas (US)	4	WILDLIFE	mail household visitors DC donation
Hageman	1985	California (US)	2	WILDLIFE	mail household PC taxes
Loomis and Larson	1994	California (US)	4	WILDLIFE	Mail household visitors OE donation
Bulte and Van Kooten	1999	US	3	wildlife	household
Tanguay et al.	1993	Canada	2	wildlife	household
Stevens et al.	1997	Massachusetts (US)	4	wildlife	face-to-face volunteers DC
Rubin et al.	1991	Washington (US)	3	wildlife	mail household OE
Loomis et al.	1993	Australia	6	forest	mail household OE DC donation
Rollins and Lyke	1998	Canada	4	park	mail household DC taxes
Powe and Bateman	2004	Broadland (UK)	5	wetland	face-to-face household DC taxes
Svedsäter	2000	UK and Sweden	2	FOREST	mail face-to-face volunteers OE donation
Loomis et al.	1994	Oregon (US)	1	FOREST	mail household DC taxes

Loomis et al.	2000	Colorado (US)	1	RIVER	mail household DC bill

Table 1 (cont.)

Studies compiled for the meta-analysis

Author	year	Country	Obs.	good	survey characteristics
Samples and Hollyer	1989	Hawai (US)	2	WILDLIFE	mail household DC Donation
Montgomery et al.	1994	US	1	WILDLIFE	Household
Boyle et al.	1994	Atlanta and Georgia (US)	3	WILDLIFE	face-to-face household OE Prices
McCartney	2006	Australia	2	LANDSCAPE	face-to-face DBDC Bill
Mill et al.	2007	Ireland	6	forest restoration	face-to-face visitors DC Taxes
Pate and Loomis	1997	California (US)	10	WETLAND management VALLLEY avoid loss	telephone-mail household DC Taxes
Hammitt et al.	2001	Taiwan	4	wetland management restoration	face-to-face household OE DC Taxes
Sattout et al.	2007	Lebanon	4	forest management	face-to-face household OE Bill
Colombo et al.	2006	Spain	1	VALLEY avoid loss	face-to-face household OE Taxes
Köhlin	2001	India	1	FOREST restoration	face-to-face household DC-OE
Holmes et al.	2004	North Carolina(US)	4	river restoration	computer household DC Taxes
Kwak et al.	2003	South Korea	1	forest management	face-to-face household DC Taxes
Goodman et al.	1998	UK	3	coast avoid damage	face-to-face household OE Taxes
Kosz	1996	Austria	1	wetland management	face-to-face household OE Taxes
Nunes and Van der Bergh	2004	Netherlands	1	coast avoid damage	face-to-face visitors DBDC Taxes
Stevens et al.	2000	Massachusetts (US)	1	forest management	mail household DC Price

Table 2

Variables included in the meta-analysis

Variable	Description	N	Mean	Min	Max
WTP	WTP reported in the study converted to $2007	100	96.79	12.17	394.14
size*use	Cross product of size of the good and use value goods	100	644.80	0	21300
size*nonuse	Cross product of size of the good and non-use value goods	100	67,775.73	0	2,000,000
North America	North American studies=1; rest=0	97	0.5773	0	1
Europe	European studies=1; rest=0	97	0.2371	0	1
rest world	Studies from Asia, Africa and Oceania=1; rest=0	97	0.1856	0	1
Annual	Annual payment=1; rest=0	97	0.6495	0	1
household	respondents are households=1, rest=0	100	0.8000	0	1
Visitor	respondents are visitors to the place=1, rest=0	100	0.1100	0	1
volunteer	respondents are students and/or volunteers=1, rest=0	100	0.0600	0	1
DC	WTP question is dichotomous choice=1, rest=0	100	0.6699	0	1
PC	WTP question with payment card=1, rest=0	100	0.0200	0	1
OE	WTP question is open ended=1, rest=0	100	0.3000	0	1
other payment	WTP question is mixed or other=1, rest=0	89	0.0100	0	1
response rate	Response rate	76	0.6326	0.13	1
Locals	Proximity to the good: local respondents=1; rest=0	76	0.4737	0	1
Direct	phone and face-to-face interviews=1, mail and others=0	100	0.5600	0	1
size*park	proposed size for the parks (hectares)	100	1.33	0	39
size*wetland	proposed size for the wetlands (hectares)	100	2,219.97	0	36,422
size*landscape	proposed size for landscapes (hectares)	100	3.22	0	161
size*coast	proposed size for the coast (km)	100	117.61	0	9,321.75
size*wildlife	proposed wildlife population	100	39,700.38	0	1,384,375
size*river	proposed river length (km)	100	0.43	0	14
size*valley	proposed size for the valleys (hectares)	100	1821.43	0	36422
size*forest	proposed size for the forests (hectares)	100	24,556.17	0	2,000,000
gain*use	gain in size for use value goods=1; rest=0	98	0.1837	0	1
gain*nonuse	gain in size for non-use value goods=1; rest=0	98	0.4082	0	1

Table 3

Meta-analysis results

WTP	Tobit model	
size*use	0.0044 (0.0027)	1.66*
size*nonuse	-0.0001 (0.0001)	-2.67**
North America	53.5332 (44.8479)	1.19
Europe	79.8180 (47.0860)	1.70*
Annual	52.7904 (25.8277)	2.04*
household	-44.3744 (42.6251)	-1.04
volunteer	-77.6316 (47.2457)	-1.64*
DC	184.7142 (84.9807)	2.17*
PC	22.8611 (98.6612)	0.23
OE	68.4882 (81.2752)	0.84
response rate	-185.8860 (67.3728)	-2.76**
Locals	71.1139 (23.8420)	2.98***
Direct	93.9306 (28.7463)	3.27***
constant	-64.7281 (108.8665)	-0.59
N	68	
Log likelihood	-389.39	
LR chi^2	52.69	
Prob > chi^2	0.0000	
Pseudo R^2	0.06	

(+ Standard errors are in parenthesis. (***) it indicates statistical significance at α=0.001; (**) it indicates statistical significance at α=0.01; and (*) indicates that the variable is statistically significant at α=0.1.

Table 4
Expanded meta-analysis results

WTP	expanded 1		expanded 2		expanded 3	
North America	-7.0427 (48.4773)	-0.15	91. 7530 (48. 4005)	1. 90*	2. 4214 (44. 0728)	0. 05
Europe	109.0474 (48.8675)	2.23**	81. 6315 (50. 0891)	1. 63*	116. 8119 (44. 6485)	2. 62*
Annual	-44.8055 (30.0392)	-1.49	49. 5625 (25. 6303)	1. 93*	-16. 9340 (27. 0564)	-0. 63
gain*use			-33. 6946 (37. 1901)	-0. 91	-91. 6240 (33. 8188)	-2. 71**
gain*nonuse			-68. 9748 (23. 4849)	-2. 94**	-94. 4062 (24. 6916)	-3. 82***
size*park	-1.0856 (1.2998)	-0.84			1. 3314 (1. 2827)	1. 04
size*wetland	0.0056 (0.0015)	3.79***			0. 0073 (0. 0013)	5. 44***
size*coast	-0.0064 (0.0091)	-0.71			-0. 0199 (0. 0084)	-2. 38*
size*wildlife	-0.0001 (0.0001)	-4.16***			-0. 0001 (0. 0001)	-2. 69**
size*river	22.6610 (7.0948)	3.19***			27. 7022 (6. 8885)	4. 02***
size*valley	0.0055 (0.0015)	3.56***			0. 0049 (0. 0014)	3. 48***
household	-47.5662 (45.0962)	-1.05	-16. 3615 (47. 9442)	-0. 34	-28. 0656 (42. 8113)	-0. 66
volunteer	-53.4230 (43.0234)	-1.24	-64. 3435 (49. 7578)	-1. 29	9. 8797 (42. 5611)	0. 23
DC	67.2959 (76.2558)	0.88	145. 6284 (85. 6245)	1. 70*	2. 8483 (68. 0639)	0. 04
PC	46.8918 (85.1318)	0.55	-22. 8468 (100. 5685)	-0. 23	-35. 2194 (76. 0990)	-0. 46
OE	31.1535 (69.5838)	0.45	54. 2116 (82. 7372)	0. 66	5. 6660 (61. 9469)	0. 09
response rate	2.5771 (67.4338)	0.04	-84. 2206 (66. 0808)	-1. 27	124. 6346 (64. 1160)	1. 94*
Locals	65.6134 (24.79623)	2.65**	66. 4948 (23. 9050)	2. 78**	73. 6453 (21. 6385)	3. 40***
Direct	-9.1493 (38.7595)	-0.24	86. 2794 (28. 8991)	2. 99**	-32. 0308 (35. 0582)	-0. 91
constant	39.4937 (106.9896)	0.36	-100. 0877 (119.2794)	-0. 84	30. 2430 (01. 3178)	0. 30
N	68		67		67	
Log likelihood	-375.17		-383.97		-363.35	
LR chi^2	81.33		49.16		90.39	
Prob > chi^2	0.0000		0.0000		0.0000	
Pseudo R^2	0.09		0.06		0.11	

(+ Standard errors are in parenthesis. (***) indicates statistical significance at α=0.001; (**) indicates statistical significance at α=0.01; and (*) indicates that the variable is statistically significant at α=0.1.