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Estimating the non-market benefits of an urban park: Does proximity matter?

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Abstract

There is increasing and widespread public support for public park provision in urban areas given that they provide an array of different recreational activities enhancing the citizen's quality of life. A contingent valuation survey of 900 randomly chosen inhabitants was undertaken in Valencia (Spain) to estimate the non-market benefits derived from the provision of a new urban park where there is currently an old train station. In conducting our study we distinguished between the districts of the city more and less affected by the project according to the proximity to the future park. Our main finding is that the mean willingness to pay (WTP) is considerably higher for people who live closer to the planned park as it is more accessible to them. The fact that this finding may be rather obvious does not in any case reduce its importance in light of the policy implications that could be derived from it. To give further credence to this result we used both parametric and non-parametric approaches, which yielded similar results. Finally, an equation was estimated in order to validate the results obtained from a theoretical point of view.

Keywords: Public parks; Proximity; Contingent valuation; Urban planning

Introduction

Urban parks and open spaces are locations that provide opportunities for a wide range of leisure, sport and recreational activities. While parks alone cannot solve our current urban problems such as air pollution, noise, health risks, amenity loss, etc., they are crucial for the economic health of our cities and to the citizens' quality of life for several reasons. Firstly, park and recreation programmes in urban areas can contribute to the promotion of public health and safety by encouraging physical and mental fitness and by providing an effective antidote to the stress of urban living (Nowak et al., 1998). The feelings and the emotions evoked in the parks are perceived by people as very important contributors to their well-being (Chiesura, 2004). Secondly, parks have an important amenity value for the urban population given that they can contribute to decreasing the visual impact of an environment dominated by asphalt and concrete. Thirdly, parks, especially those with a greater presence of trees, make an important contribution to public health by removing or ameliorating the presence of pollutants from the air. And, finally, the increased income and leisure-time have made parks a popular destination for a wide variety of recreational activities and sports (walking, biking, boating, etc.).

In light of the fact that municipalities are aware of the numerous benefits for the society that urban parks provide, it seems evident that it would be very valuable to estimate them. However, estimating the non-market benefits that stem from urban parks is not an easy task, given the market failure associated with public goods.[1] Consequently, questions concerning the economic value of public goods have been addressed by economists using different approaches. The contingent valuation method (CVM) (Mitchell and Carson, 1989) is the most widely used

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[1]Although a park cannot be considered a pure public good given that a problem of congestion can arise or even is not physically difficult to exclude people from it, we refer to it as a public good.

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empirical method for measuring the demand for non-market goods. This survey approach relies on asking respondents in a hypothetical market how much they are willing to pay for a specific public good. The attraction of contingent valuation is that it facilitates the construction of a market in which the researcher can observe an economic decision directly related to the good in question (Carson, 1991). The resulting information is more useful than a simple referendum poll since the CVM records both the direction and the strength of a respondent's preferences (Lockwood et al., 1996).

Early literature in this area relies mainly on the effects of urban parks and greenbelts in residential property values applying the hedonic pricing methodology (see, for example, Hobden et al., 2004; Bengochea, 2003; Geoghegan, 2002; Din et al., 2001; Bolitzer and Netusil, 2000; Luttik, 2000; Tyrväinen, 1997; Tyrväinen and Meittinen, 2000; Powe et al., 1995; Palmquist, 1992). However, the papers that have applied the CVM to this issue are few (see, for example, Jim and Chen, 2005; Damigos and Kaliampakos, 2003; Breffle et al., 1998; Tyrväinen and Väänänen,1998).

While Willis (2003) applies the CVM to the implementation of an entry charge in a park in Naples (Italy), this paper aims to obtain an estimation of the non-market benefits derived from the construction of a new urban park in the city of Valencia (Spain). This is an ex ante valuation because the decision of providing this park has not yet been made. The information gathered from this study will unequivocally contribute to better understanding the real consequences for the population of Valencia of the provision of this public good and, therefore, to make a better informed decision later. However, like any economic methodology, contingent valuation has its limitations and it alone can never provide the definitive answer to any major policy question (Carson, 1998).

In addition, this study goes beyond the simple estimation of the WTP and its determinants because in doing such an analysis it splits the total sample surveyed into two subsamples according to the proximity to the planned park. In particular, it distinguishes between the districts of the city more affected by the planned park—given their proximity to it—and those others less affected by it. Through this distinction we seek to discover whether the proximity to the future park could affect the value of the WTP estimates. The fact that this relationship between WTP and distance may be rather obvious does not in any case reduce its importance, in light of the policy implications that could be derived from it.

The article first describes the policy issue under valuation. It then presents the survey process, the empirical models chosen and the main results obtained. Finally, conclusions and suggestions for future research follow.

Case of study: "El Parque Central"

The city of Valencia (Spain), as has already happened in other major cities in Europe, has planned to remodel its old train station located in the heart of the city. This project will imply the construction of a new underground railway system that will cross the city from the south to the north so a new underground inter-modal train station will be built. This new facility will meet current and future transit needs for a population of nearly two million people. As a direct consequence of this project, an area of almost 280,000 square metres will be released in the city centre. This area will be dedicated to the construction of an urban park, called "El Parque Central", that will satisfy the recreation needs of a population weary of noise, air pollution and other negative externalities. The proposed park will increase, in the central districts, the current number of square metres of green area from 2.49 to 3.63 square metres per individual (see Table 1). Although it implies a 45 per cent increase, it still falls well short of the general target, established by the World Health Organisation, of a minimum of 9 square metres of green space per city dweller.

The new park will be presided by a 30,000 square metre central lake where people will be able to do boating, canoeing and other water-related activities thus enhancing the opportunities for recreation. Water resources are often a key feature of urban parks and a primary visitor attraction. Indeed, it is widely recognized that human beings find water an innately attractive medium, both aesthetically and as a location for a variety of recreational activities (Wood and Handley, 1999).

Furthermore, some old warehouses, used previously for the servicing of trains, will now be transformed into facilities for cultural and artistic exhibitions with the intention of attracting in particular an unsatisfied youth that currently has few opportunities for recreation, especially in the city's central districts. The park will also host outdoor-musical events and theatre festivals as is the case in other major parks around Europe.

Table 1
Green area per city dweller (2003)

	Population	Green area (m^2)	Green area/population (m^2)
Valencia city	782,846	2,478,269	3.16
Central districts	246,107	613,386	2.49
Central districts with the proposed park	246,107	893,386	3.63

Source: Ajuntament de Valencia (2003), Anuari Estadistic de la Ciutat de Valencia. Ajuntament de Valencia.

Finally, the park will imply an important increase in the current supply of outdoor-sport facilities such as bike paths, running tracks, tennis courts, football and basketball playgrounds, etc. For example, the development of bike paths that serve both pedestrians and cyclists encourages the use of parks and green areas making them more popular and more attractive to visitors. At the same time, the new sport facilities will save people having to go elsewhere to play their favourite sports as they do currently.

The survey

After the pre-test stages,[2] the final survey was fielded in March 2001. The structure and wording of the questionnaire used were based on the NOAA panel recommendations for CVM studies (Arrow et al., 1993). A sample of 900 inhabitants of Valencia were interviewed by professional interviewers at the households of the respondents following random routes due to its advantages with respect to other delivery modes (telephone or mail interviews). Mitchell and Carson (1995) argue strongly in favour of personal interviews because the control of the interview situation is argued to be a significant advantage over the less controllable mail survey; however, face-to-face interviews are very expensive and in some cases can be a funding restraint.[3] The sampling scheme was designed to obtain a representative sample of city households considering the 19 districts in which the city is divided. The verbal description of the public good under valuation was accompanied by visual aids, computer-created images that simulated the layout and design of the new park and its recreational facilities, thus facilitating a fuller understanding of the valuation scenario (see Picture 1). As Mitchell (2002) points out, visual aids play a vital role in holding respondents' attention during the presentation of a relatively long scenario.

The provision of a public good by means of voluntary contributions is particularly troublesome because for actual contributions there is a strong incentive to free ride (Carson, 1997). Therefore, the payment vehicle chosen was a mandatory[4] and individual special tax[5] whose collection would be exclusively devoted to carrying out the works during the scheduled execution period of five years (2002–2007). in this respect, it is necessary to stress that it is important to remind respondents of the date on which the public good will be completely operative since this reinforces the credibility of the hypothetical market and, at the same time, allows the respondents to judge whether the time span is relevant to them or not (Ajzen et al., 1996).

Picture 1. General view of the future park and the urban layout of Valencia: computer-simulated image.

The elicitation method chosen was the discrete choice model, first introduced in CV analysis by Bishop and Heberlein (1979) and ratified by the NOAA Blue Ribbon Panel (Arrow et al., 1993), given its popularity. However, with the purpose of ascertaining whether the respondents were or not in the market of this public good, they were asked a previous question, thus allowing us to apply the Spike model (Kriström, 1997). This model seems more appropriate than other approaches when the number of zero responses received is considerably high, as is our case.

Five different bids were used: 1000, 5000, 10,000, 15,000 and 25,000 Pesetas[6] based on the results obtained in the pre-test and in the pilot study where an open-ended question was used. As Clinch and Murphy (2001) point out, a larger number of bids levels would have allowed for greater accuracy in the estimation of the bid curve but each subsample would have been smaller leading to greater sampling error.[7] Of the 900 people interviewed, 64% gave zero responses. Although this percentage seems high, Johnson and Whitehead (2000) state that for many policy issues WTP questions generate a considerable number of zero responses.

[2]In this respect, Schumann (1996) points out that surveys which fail to take into account the importance of early questionnaire development prove to be of little use.

[3]Ironically, learning about WTP is fairly cheap, but documenting it with personal interviews, probability samples, and high response rates is very expensive (Randall, 1997).

[4]The majority of earlier studies conducted in Spain have used voluntary payment mechanisms under the belief that they reduce the probability of rejection (see, for example Saz and García, 2003).

[5]In Spain the local Administration may levy a special tax—called "contribución especial" in Spanish—on those citizens that will benefit from some public works.

[6]The bids were in Pesetas because the survey was carried out before the Euro came into force in Spain. The exchange rate between the Peseta and the Euro is 166.386.

[7]As has been cleverly pointed out by a referee, 17.3% of the respondents accepted the highest bid level suggesting that the highest bid was not high enough to capture the range of WTP among the population. In this respect, we consider it necessary to say that this bid level was chosen because the pilot study, where an open-ended question was used, saw that only 2 individuals out of 100 gave a value higher than 25,000 Pesetas. However, for future research projects, we will clearly consider the possibility of introducing further bid levels if the observed responses fit the original bid distribution poorly, as in Macmillan et al. (2001) where questionnaires were mailed out in several tranches.

At the same time the respondents were asked about their WTP for the planned park they were reminded of alternative and relevant expenditure possibilities in the city of Valencia that could compete for their limited household budget.[8]

Another important issue is that there are some projects where there are likely to be potential losers as well as gainers. Thus, if CVM studies concentrate only on estimating WTP for environmental improvements ruling out willingness to accept compensation (WTA), there is a serious risk of generating biased estimates of project benefits (Macmillan et al., 2001; Clinch and Murphy, 2001). Therefore, in our particular case the respondents who responded 'no' to the bid offered were asked to indicate which of the following four categories most closely resembled their view:[9]

1. I support the project and the use of a special tax but it is not worth "X" Pesetas to me.
2. I support the project and the use of a special tax but I cannot afford "X" Pesetas.
3. I support the project, but not if it requires a special tax of any amount.
4. I oppose the project regardless of whether it costs me anything.

We understand that respondents who were against the project (and therefore required compensation) are those who circled option 4. Only 13 respondents chose this option, meaning that 1.4% of the entire sample can be characterized as losers. Moreover, we have investigated the coherence of these responses by comparing them to those given in response to another question where they were asked to score the whole project on a scale of 0–10. A score above five meant they valued the project positively, while the opposite was the case when the score given was below five. Only seven of the 13 individuals who circled option 4 failed the project, so their response was coherent. This implies that the percentage of potential losers could be insignificant (lower than 1%) in this particular case. This result is consistent with our previous expectations, as Valencia residents have been eagerly awaiting this project for the last 25 years.

The survey concludes with demographic and economic questions about the respondents and their households: their sex, their birth year, their income before taxes, their education, how many people they normally live with, how long they have lived in their current place of residence and whether they were considering the possibility of moving to another place attracted by the project "Parque Central". This last question was introduced in the questionnaire in an attempt to discover whether the project was generating some kind of expected benefits which would provoke a change in the dwelling place of the respondents. However, latterly the data showed that currently few people considered the possibility of moving to a neighbourhood closer to this area.

[8]In particular, the respondents were reminded of an alternative project that consisted in the redevelopment of old port-related areas into recreational areas known as "The balcony overlooking the sea". This project has been boosted by the election of Valencia as the site of the 32nd edition of the America's Cup sailing competition.

[9]This question was inspirited in the dissonance-minimizing format proposed by Blame et al. (1999).

Theoretical model

The discrete choice model has become the most used approach for determining whether people are willing to pay for a non-market good. Since the CV responses are binary variables, we need a statistical model appropriate for a discrete dependent variable, such as that detailed in Hanemann and Kanninen (1996). In fact, when a household is confronted with a question to accept or reject a project that implies an environmental improvement from Q_0 to Q_1, we need to ask people about their WTP to obtain the proposed change. However, the "yes" or "no" responses obtained only provide qualitative information about WTP. So to obtain a measure of WTP we need a statistical model that relates the responses of the respondents to the monetary amount asked for.

So, consider the following indirect utility function for a representative individual:

$$V = U(Y, S, Q), \tag{1}$$

where Y is his or her income, S a vector of the socio-economic characteristics of the individual (age, education, etc.) and Q the current state of the environment. Consider now a local policy that improves the environment such as that mentioned above. In this case, the welfare measure involved is given by the following equation:

$$V(Y - WTP, S, Q_1) = V(Y, S, Q_0), \tag{2}$$

where WTP is the amount a respondent would be willing to pay to secure a welfare gain as a result of improving the environment, that is, the change from Q_0 to Q_1. This amount corresponds to the Hicksian compensation variation for the proposed change.

Now, following the seminal article by Hanemann (1984), if we assume that the utility function has some components which are unobservable to the researcher and are treated as stochastic, then the individual's utility function can be written as

$$V(Y, S, Q) = U(Y, S, Q) + \varepsilon, \tag{3}$$

where ε is a random disturbance term with an expected value of zero. When offered an amount of money A for a change in Q ($Q_0 \rightarrow Q_1$), the individual will accept the offer if:

$$U(Y - A, S, Q_1) + \varepsilon_1 \geqslant U(Y, S, Q_0) + \varepsilon_0, \tag{4}$$

where ε_0 and ε_1 are identically and independently distributed (i.i.d.) random variables with zero means. For the researcher, the individual's response is a random variable

that will have some cumulative distribution (c.d.f.) $G_{WTP}(A)$. Therefore, the probability that an individual will accept the suggested cost A is given by the equation below (Kriström, 1990a):

$$\text{Prob}\{\text{“yes” to } A\} = \text{Prob}(A \leqslant \text{WTP}) = 1 - G_{WTP}(A). \quad (5)$$

When $G_{WTP}(A)$ is the standard normal c.d.f., one has a probit model and when it is the standard logistic the model obtained is the logit one.

Despite the popularity of the discrete choice approach, calculating welfare measures from the estimated coefficients can be troublesome when the number of zero responses obtained is considerably high because we will probably obtain negative WTP estimates. While this vexing problem has been debated several times in the literature[10] no consensus on the appropriate means of dealing with it has emerged. The Spike model, proposed by Kriström (1997),[11] has arisen as an alternative means of modelling dichotomous choice contingent valuation responses and is argued to be a solution to the problem of negative willingness to pay (Haab and McConnell, 1997).

Therefore, following Kriström's paper quoted above, suppose now that there is a continuum of individuals with possibly different valuations of the project; then, the probability that an individual's WTP does not exceed amount A is given by

$$\text{Prob}(\text{WTP} \leqslant A) = F_{WTP}(A), \quad (6)$$

where $F_{WTP}(A)$ is a right, continuous, non-decreasing function. Consequently, the expected WTP is

$$E(\text{WTP}) = \int_0^\infty 1 - F_{WTP}(A)\,dA - \int_{-\infty}^0 F_{WTP}(A)\,dA. \quad (7)$$

In order to estimate $F_{WTP}(A)$, when a binary valuation question is used, the proposed bid A must be varied across the sample, using a different A for each subsample. In this model it is assumed that the distribution function of WTP has the following form:

$$F_{WTP} = \begin{cases} 0 & \text{if } A < 0, \\ p & \text{if } A = 0, \\ G_{WTP}(A) & \text{if } A > 0, \end{cases} \quad (8)$$

where p belongs to $(0, 1)$ and $G_{WTP}(A)$ is a continuous and increasing function such that $G_{WTP}(0) = p$ and $\lim_{A\to\infty} G_{WTP}(A) = 1$. Thus, there is a jump-discontinuity, a spike, at zero.

The Spike model can be estimated with a variety of approaches but the most popular are the parametric maximum likelihood methods. Basically, this model uses two valuation questions. First the respondent is asked whether he or she wishes to contribute economically to a specific public good or not. This is to determine whether a person is in the market of the public good or not. The second suggests a specific price A. If the answer to the first question is 'NO', the second one is not necessary. The maximum likelihood function for the sample is given by the following equation:

$$l = \sum_1^N E_i D_i \ln[1 - F_{WTP}(A)] + E_i(1 - D_i) \times \ln[F_{WTP}(A) - F_{WTP}(0)] + (1 - E_i)\ln[F_{WTP}(0)], \quad (9)$$

where E_i is an indicator variable that takes value one if the individual is in the market (zero otherwise) and D_i takes value one if the respondent accepts to pay A (zero otherwise). Three possible situations are therefore obtained. Firstly, bid A is rejected because the individual considers it to be too high but agrees to pay something, so this individual said "yes" to the first question and "no" to the second one. Secondly, bid A or any other amount is rejected so both responses are "no". Finally, bid A may be accepted because the person's true WTP is higher than the proposed bid so in this case both responses are "yes". Once the maximum likelihood function has been estimated, the mean WTP in this simple Spike model is given by the following formula if β is positive:[12]

$$\frac{1}{\beta}\ln[1 + \exp(\alpha)]. \quad (10)$$

Empirical results: estimation of WTP distinguishing by proximity

Parametric estimation

On undertaking this research we have considered the degree of affectation by the proposed project for the different individuals interviewed. We therefore expected those individuals living closer to the proposed park could exhibit higher WTP values than the rest of the individuals given their higher and easier accessibility to it. In particuar, on the one hand we considered those individuals who live in the five districts of the city that sourround the current location of the proposed park and, on the other, we considered the rest of districts less affected by the future park. The coefficients of the models estimated are shown in Table 2. The mean WTP values obtained from the logit and probit models are negative when considereding "the entire sample" and the "less affected" cases as a consequence of the high number of zero responses obtained, so, in this particular case, it seems more appropriate to apply the Spike model that gives a positive probability to these

[10] See Bohara et al. (2001) for a recent revision of the literature surrounding the issue of negative willingness to pay.

[11] Although there are still few applications of the Spike model in comparison to other approaches, its popularity is increasing: see, for example, Santagata and Signorello, 2000; Clinch and Murphy, 2001; Yoo and Kwak, 2002; García and Riera, 2003; del Saz Salazar and García Menéndez, 2003; Powe and Bateman, 2004.

[12] These derivations are valid if we assume that the WTP follows a logistic distribution. A formula for the general case can be found in Kriström (1997).

Table 2
Estimated models and mean WTP considering the proximity to the proposed park

	The entire sample			Districts less affected by the project			Districts more affected by the project		
	Logit	Probit	Spike	Logit	Probit	Spike	Logit	Probit	Spike
α	−0.0080558	−0.0129462	−0.0139970	−0.3669179	−0.2472745	−0.3929572	0.2363232	0.0144488	0.0283511
	(−0.68)	(−0.179)	(−2.060)	(−1.925)	(−2.148)	(−3.603)	(1.556)	(1.536)	(0.324)
β	−0.0621243	−0.0373202	0.0523844	−0.05969124	−0.0338961	−0.0060179	−0.0653642	−0.0401626	0.0048797
	(−6.652)	(−6.718)	(11.463)	(−3.753)	(−3.807)	(7.744)	(−5.472)	(−5.619)	(8.561)
Mean WTP (Pesetas)	−129	−346	11,942	−6146	−7593	8571	3615	3597	14,497
Standard deviation of mean WTP	1909	1984	1069	4575	5032	1188	1845	1872	1701
Log likelihood	−537.2037	−537.2721	−789.9477	−200.1026	−200.3264	−310.9915	−330.5097	−330.4101	−472.4953
N	874	874	874	354	354	354	520	520	520

Note: t-values are shown in parenthesis.

responses. However, the main finding of our analysis is that the mean WTP for the individuals that we have defined as those affected to a greater extent by the project is considerably higher (59%) than the figure registered by the less affected individuals. More specifically, the mean WTP for this group is 14,497 Pesetas, while for the less affected individuals this amount is 8571 Pesetas and for the entire sample it is 11,942 Pesetas. So, it would seem that there is a positive relationship between the WTP stated and the proximity to the site of the projected park, which will be demonstrated in the following section. This result reinforces previous findings on the effect of distance on WTP.[13]

Non-parametric estimation

Non-parametric estimation techniques for the discrete choice valuation format are receiving increasing interest given the concern associated with incorrect specifications of functional forms and distributions in parametric approaches (Cooper, 2002). In addition, we can feel more confident using parametric results if we validate them by means of non-parametric techniques. With this intention, a non-parametric approach is applied to obtain the mean WTP according to Kriström (1990b). This approach is related to utility theory using a first-order argument, since the probabilities of acceptance will depend only on the value of the bid. It is based on the algorithm of Ayer et al. (1955), which states that if the proportion of "yes" answers to increasing bids is monotonically non-increasing, then the sequence provides a maximum likelihood estimator of the probability of acceptance.

Table 3 shows the proportion of positive responses for each of the five proposed bids and the Ayer et al. estimates of the probability of acceptance.[14] Although we have information on the probability of acceptance at five different points, it is impossible to calculate the mean WTP unless two simplifying premises are assumed. Firstly, we must assume that the linear interpolation is a suitable approximation of behaviour between the six known points. Secondly, we must also assume, rather arbitrarily, that $\pi = 1$ when $A = 0$ and that $\pi = 0$ when $A = A^*$, that is, if the bid is zero, then the probability of accepting the payment is unity and if the price is A^* then the probability is zero since the price offered is understood to be too high and therefore will not be accepted. For A^* we considered one value or truncation point: 50,000 Pesetas, which is the highest value

[13] Breffle et al. (1998) showed the decreasing effect of distance on WTP for preserving undeveloped urban land and Pate and Loomis (1997) for public goods with large non-use values.

[14] While one expects the proportions to be strictly decreasing in A in a large sample survey, this might not be true in small-scale experiments, as is the case for the "less affected" and "higher affected" individuals. Therefore, if $\pi_i \leqslant \pi_{i+1}$, these proportions are replaced by $(Y_i + Y_{i+1})/(n_i + n_{i+1})$, where Y_i is the number of yes answers in group i. The procedure is repeated until the sequence is monotonic in A. For more details see Kriström (1990b).

Table 3
Proportion of "yes" responses and estimates of the probability of acceptance

Bid (Ptas.)	The entire sample		Less affected districts		More affected districts	
	Proportion of "yes" responses	Ayer's estimates	Proportion of "yes" responses	Ayer's estimates	Proportion of "yes" responses	Ayer's estimates
1000	90/177	0.508	35/74	0.472	55/103	0.533
5000	67/174	0.385	21/71	0.295	46/103	0.466
10,000	64/175	0.365	17/68	0.250	47/107	0.439
15,000	46/174	0.264	10/71	0.163	36/103	0.349
25,000	31/174	0.178	13/70	0.116	18/104	0.173

Table 4
Estimated WTP using Ayer's algorithm (Pesetas)

	Mean WTP	Standard deviation of mean WTP
The entire sample	10,422	394
Less affected districts	7830	571
More affected districts	11,238	529

Note: The standard deviation has been calculated following Boman et al. (1999).

declared by the respondents in the open-ended question used in the pilot study. Once the empirical survival function of WTP has been obtained by linear interpolation, the mean WTP can be calculated as the area bounded by this function and it ranges from 7830 Pesetas for the less affected individuals to a maximum value of 11,238 Pesetas for the more affected ones (see Table 4).[15] As we can see, these results would confirm our previous idea that there could be a positive relationship between the WTP values and the closeness to the site of the proposed park.

WTP determinants

The construction of an equation that predicts WTP for the good with a reasonable explanatory power and coefficients with the expected signs provides evidence of the proposition that the survey has measured the intended construct (Carson, 2000). Different model specifications were tested and various dummy variables were formed. The preferred model estimated with its variables and coefficients is shown in Table 5. The analysis presented uses complete case analysis dropping any observation with item non-response on any variable in the questionnaire. The dependent variable records whether or not a person was willing to pay the amount asked during the interview. BID is precisely the presented amount that has five possible values as mentioned previously. GLOBAL is the score (1–10) given by the respondents to the whole project considering its different parts. USE is respondents' expected use of the new recreational facilities on a scale from one (not at all) to 10 (very often). INCOME is the respondent's household annual income before taxes. EDUCATION is the education completed by the respondent in five categories (from the most basic level to University level). MORE is a dummy variable equal to one if the respondent lived in one of the five districts more affected by the projected park as a consequence of its proximity, and zero otherwise.

Table 5
WTP determinants: Logit regression model of probability of a "yes" response

Variable	Coefficient	*t*-statistic
CONSTANT	−4.64443388	−6.826
BID	−0.00006901	−6.647
GLOBAL	0.32260599	4.790
USE	0.30768281	3.775
INCOME	0.06713691	1.731
EDUCATION	0.14442951	2.125
MORE	0.31753215	1.869
Log likelihood = −463.7398		
Pseudo $R^2 = 0.226$		
% Correct predictions = 68.8		
$N = 821$		

The pseudo-R^2 computed is that proposed by Veall and Zimmermann (1992).

This model was chosen because the signs of the main variables (BID, INCOME and EDUCATION) were consistent with expectations of demand theory and the goodness of fit, in terms of percentage of correct predictions and pseudo R^2, was acceptable. All the variables in the model are significant at the 0.10 level or better. The interpretation of the regression results suggest that the likelihood of a "yes" response to the dichotomous WTP question decreases with increasing bid values given the negative sign of the variable BID.[16] The positive sign of GLOBAL means that those individuals who gave higher values to the whole project were more likely to agree to pay for the planned public good. USE is also positive, meaning that there is a positive relationship between the expected

[15] All the calculations were made dropping the protest responses.

[16] Another test for verifying whether the results conform to the predictions of the economic theory is when the percentage of respondents willing to pay a particular price falls as the price they are asked to pay increases (Carson et al., 2001). In our particular case, this percentage decreases with the price offered as shown in Table 4.

use of the new recreation facilities and the probability of acceptance of the amount offered. Both INCOME and EDUCATION present a positive coefficient, meaning that the higher the respondent's household income and education, the higher the probability of a "yes" response. Finally, MORE is also positive reinforcing the idea addressed previously in Section 5 that there is a positive relationship between the mean WTP stated by the respondents and the proximity to the planned park.

Aggregation

Although aggregation is a contorversial issue in economics, sample estimates of WTP are now extrapolated to derive an aggregate estimate of the total benefits that this project will generate for the citizens of Valencia. On adding up all the individual WTP values we considered, on the one hand, weights that account for differences in terms of population among the two subsamples considered ("less and more affected" by the project) and, on the other hand, we were aware that discrepancies arise when applying different approaches. So, with the intention of being conservative to avoid overestimating the social benefits of the project, the estimates of the mean WTP considered in the aggregation process were the one obtained by the non-parametric approach. Taking into account the weight of each group in the sample (see Table 6) we have calculated a weighted mean WTP of 8920 Pesetas which is used in the aggregation process. So multiplication of this figure by five[17] and by the 260,948 city households[18] generates expected social benefits of 9,804,934,514 Pesetas assuming a discount rate of 6% and 10,509,489,474 Pesetas if the discount rate is 3.5%.[19]

Table 6
Population of Valencia by districts (2003)

	Total (19 districts)	Less affected area (14 districts)	More affected area (5 districts)
Population	782,846	536,739	246,107
Weight	100.00	0.68	0.32
Number of households[a]	260,948	178,913	82,035

Source: INE (Spanish National Institute of Statistics).
[a]According to INE data, the average size of a household in Spain in 2003 was 3 people.

Discussion

A comparison of Tables 2 and 4 reveals that the results of contingent valuation studies are quite sensitive to the econometric specification assumed (see, for example Hanemann and Kanninen, 1966; Clinch and Murphy, 2001). In our case, the mean WTP estimates obtained are between 43% and 59% higher when a Spike model is applied as opposed to a non-parametric approach. The Spike model seems to be most appropriate when the number of zero responses obtained is considerably high, while the non-parametric approach offers certain advantages over other parametric approaches given that is more reliable than a poorly specified distribution function.

Apart from estimating the social benefits derived from the provision of a new urban park, we also aimed to demonstrate the expected relationship between WTP estimates and distance. While this result may be rather obvious, it does not nevertheless make it less important. We believe that the importance of this issue derives from at least two observations. Firstly, in terms of policymaking it is important to know how much people are willing to pay to be closer to the park, given that this information is necessary for applying a fair local property tax policy. And secondly, we think this result reinforces the credibility and theoretical validity of the study conducted given that on analysing the determinants of the WTP, distance emerged as a positive and significant variable. Therefore, in this particular case, this variable, and others such as the income or the bid offered, are underpinning the reliability of this valuation method. At this point it is necessary to ask oneself what would have happened if the result had been the opposite, i.e. a negative coefficient for the distance? The response is obvious: something would be wrong with this contingent valuation study.

One important issue that is frequently ignored in contingent valuation studies is that some projects affecting the quality of the environment may result in winners and losers. In such cases, contingent valuation practitioners should be prepared to elicit WTA compensation from project losers in order to avoid significantly overestimating project benefits. The importance of ensuring the reliability of these estimations is evident. For example, an underestimation of the costs borne by project losers could result in it passing a cost–benefit analysis. However, we do not think this is our case, as our study shows that the 'Parque

[17]This is multiplied by five, as the valuation question stated that the payment would be made each year during the five years scheduled for the execution of the work.

[18]As noted by Jakobsson and Dragun (2001), a key question is whether values should be aggregated over individuals or over households. Although the valuation question sometimes asks for individual WTP, some people consider household income as their budget constraint; therefore, to be conservative, as recommended by Arrow et al. (1993), the estimates should be aggregated over the number of households.

[19]Given the long-term nature of many environmental benefits (and costs), the outcome of a cost–benefit analysis of projects with an environmental impact can often be highly sensitive to the choice of the discount rate (Hanley, 1995). The received view is that a lower discount rate for the longer term should be used. The main rationale for declining long-term discount rates stems from uncertainty about the future (Weitzman, 1998, 2001). Therefore, we have used two different discount rates. The first one, 6%, is the discount rate used by the Spanish 'Ministerio de Fomento' which reflects the opportunity cost of capital. And, the second one, 3.5%, accounts for the long-term nature of many environmental benefits that may extend beyond the life of other project effects.

Central' project hardly has any losers, in light of the fact that only 0.7% of the respondents were against the project. Thus, we believe that our estimates are reasonably good.

Bid design can influence welfare estimates in single-bounded questions (Boyle et al., 1997; Brown et al., 1996). Therefore, we are aware that some concern remains due to the fact that 17% of the respondents accepted the highest bid of 25,000 Pesetas. Increasing both the sample size as the spread of the bid vector (particularly the upper levels) would have improved the precision of the mean WTP estimates. However, a very substantial increase in sampling procedure would have required a larger budget that was not available at the time.

Conclusions and policy implications

The provision of public parks provides use values to the city's inhabitants in the form of an array of different recreational opportunities. Given the increasing demand for these green areas and growing environmental awareness, the estimation of the nonmarket benefits that stem from the provision of this kind of public goods arises as a key element in the field of urban land-planning and decision-making. Although the Contingent Valuation approach has its limitations like any economic methodology, it is a flexible policy tool that allows an ex ante valuation of these benefits to be made, as is the case, which can be very useful for both public authorities and private groups of citizens concerned about the quality of the urban environment.

Our results show that the proximity to the site of the planned park matters. In particular, the WTP estimates obtained are considerably higher for the residents of the districts of the city more affected by the project given their greater proximity to the future park area. The robustness of these results has been validated by applying both parametric and non-parametric techniques. Once the park has been provided, the value of adjacent property is expected to improve by increasing local amenity. So the policy implications that could derive from these results are that the local property-tax system should take into account that the fact households located closer to the park are potentially higher beneficiaries than the rest of the households.

In the same way, our results gain more credibility because they are able to pass a minimal test of theoretical validity underpinning the reliability of the contingent valuation method. In particular, the estimation of a logit model with demographic variables has proven that the probability of a "yes" response is significantly correlated with the bid offered (negatively), the household's income, cultural level, use expectations and proximity to the planned park among other variables considered.

Finally, despite the encouraging nature of the results obtained, more work remains to be done in the future. In particular, once this public good has been provided, it would provide clarity for comparison purposes to capture these environmental benefits analysing the price of the houses surrounding this area by applying the hedonic pricing technique.

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