Redeveloping Dockland Areas for Recreation Purposes: A Contingent Valuation Study

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ABSTRACT

In this paper, the Contingent Valuation Method (CVM) is applied in order to measure the value of the environmental improvements derived from the redeveloping of some port-related areas for recreation purposes in the City of Castellón (Spain). To date, no previous study has attempted to apply this method to this policy issue.

As the data show a high rate of zero responses we have applied the Spike model, one of the most recent models in CVM literature, since traditional models (Logit and Probit) are not suitable due to the characteristics of our data yielding negative willingness to pay values. The results show that the willingness to pay is significantly correlated to income, age (negatively), the expected use of the new recreation facilities and the subjective value given to the project as a whole.

KEYWORDS: Contingent Valuation Method; environmental and urban improvements; Spike model; aggregation.

JEL: Q20.

I. Introduction

Traditionally, urban watersides have been in the most run-down, and very often crime-ridden, parts of the cities, the areas from which the industry has departed and in which no-one wishes to live (Syms, 1993). However, nowadays the image of these areas has been transformed because is getting an usual phenomenon that port cities proceed to restore their waterfront moving away the commercial activities, and all the negative effects derived from them (traffic of heavy goods, noise, visual intrusion and amenity loss etc.), from the closest areas to the urban boundaries transferring to the city authorities some port areas for recreation and leisure uses for the citizens. These processes encompasses a set of urban and environmental improvements (positive externalities) for the cities and their inhabitants whose value is necessary to know. However, this is a difficult task because such improvements share, to some extent, the non excludable a non rival nature of the public goods. The lack of a market does not imply the absence of value because allegedly these environmental improvements have a high social value because they may contribute to improve the welfare of the individuals.

This article applies the contingent valuation method (CVM), widely used to measure the value of environmental and public goods (Mitchell and Carson, 1989), in order to obtain the value of the positive externalities derived from the restoration of the waterfront of the city of Castellon (Spain) as a basis for strategic planning of urban recreation and thus extending the scope of traditional cost-benefit analysis that does not have in account these externalities. To date, no previous study has attempted to apply this method, specifically, to this policy issue. This restoring process implies the recovering of some old dockland areas for recreation and leisure purposes thus increasing a practically non existing offer of these services in the urban areas surrounding the port of Castellón.

The CVM elicits preferences for public goods by asking people their willingness to pay (WTP) for them. This method presents consumers with hypothetical opportunities to buy public goods, thus circumventing the absence of real market for them. 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 with the good of interest (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). However, like any economic methodology, contingent valuation has its limitations and it can never alone provide the definitive answer to any major policy question (Carson, 1998).

As the data collected from the survey showed a high rate of zero responses, in order to get the mean WTP we have applied the Spike model (Kriström, 1997) which, in this particular case, is superior to others models considered that yielded negative WTP values.

The article first describes the policy issue under valuation. It next describes the survey process, the empirical model chosen, the results obtained and the aggregation of the individual values. Finally, conclusions and policy implications follow.

II. The Muelle de Costa[1]: an open door to the sea

The Port of Castellon as have previously happened in other port cities, both in Spain as in the rest of the world (see for example, Hoyle et al., 1988, Craig-Smith & Fagence, 1995 and Medda & Nijkamp, 1998), is currently undertaking a restoring process called the "Muelle de Costa, an open door to the sea", that implies the vacating of the old commercial docks which will be transferred to the city authorities for recreation activities. Urban watersides have frequently been regarded as 'no-go' areas as a consequence of crime and other criminal activities. However, public investment in port areas, allied with the private sector investment, is transforming the traditionally negative image of these areas perceived by the citizens. Indeed, is widely recognised the fact that humans beings find water an innately attractive medium, both aesthetically and as the location for a variety of recreational activities (Wood and Handley, 1999). Therefore, investment efforts in these areas improving the environmental quality can act as a catalyst for tourism and recreation activities and thus enhancing the image and economic success of the city of Castellon as a whole.

[1] Muelle de Costa can be translated as Coastal Dock.

In particular, the dockland areas released are going to be dedicated to the construction of (1) a 40.000 m^2 green area, (2) two museums, one dedicated to the sea world and the other dedicated to store an old train[2] that years ago used to connect the city with the port and which has an important sentimental value for the inhabitants of Castellon and its port area, (3) an outdoor facility for music concerts with a capacity for 400 people, (4) an exhibition facility, (5) a shopping mall and a multi-theatre complex and (6) to the enlargement of its current marina allowing the landing of bigger sailboats or even tourist cruisers for pleasure trips. Finally, the old lighthouse, currently out of use, will be moved from his current position to a new one in the middle of a small lake as an ornamental element of the urban furniture. Therefore, the port area will be converted in a open area due to the fact that there will be free access for visitors and the current fence that separates the port areas from the urban framework will disappear.

This restoring process has an estimated period of execution of three years, from the end of 1999 onwards, in three different phases, one each year. In addition, it will entail an important increase in the current supply of such kind of recreational facilities not only for the port district of the city, also for the rest of the city and its metropolitan area. In fact, is foreseen that an important amount of visitors will come from this last area where are located several coastal tourist towns that accommodate a lot of visitors in summer time.

III.- Survey

In June 1999 was carried out the final administration of the survey. Previously, several focus groups and a pilot study were conducted[3]. The interviews were performed by professional interviewers at the households of the respondents following random routes due to its advantages respect to others delivery modes (telephone or mail interviews). Mitchell and Carson (1995) argues 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

[2] This old train is called the “cockroach”.
[3] 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.

some cases can be a funding restraint[4]. The verbal description of the public good under valuation was accompanied by visual aids, images created by computer that simulated the new recreational facilities, thus facilitating understanding of the valuation scenario.

The population surveyed was limited to the adult population, over 18 years old, of the three areas considered: Castellon city, the port district and the Metropolitan Area (see table I). The weight assigned to each area in the final sample was calculated considering both the population of each area as well as the degree of influence or proximity to the new recreational facilities that are going to be provided, thus the port district, the area closest to the port and more affected by the public works, was assigned a higher weight that the one that would derive of considering only its population.

Table I
Number of interviews and population of each area

Area	Population	Number of interviews carried out
Castellon city	121,753 (53.5%)	350 (50%)
Port district	13,976 (6.2%)	210 (30%)
Metropolitan area	91,781 (40.3%)	140 (20%)
Total	227,510 (100.0%)	700 (100%)

The decision of not restricting interviews solely to the geographical limits of the City of Castellon, and its port district, but also to include the towns known as the Metropolitan Area was made because the inhabitants of the latter area are also potential beneficiaries of the urban works to be implemented in the City of Castellon and therefore their exclusion would probably have caused the social benefits of such public works to be underestimated (Pate and Loomis 1997).

The sample's demographic characteristics resemble those of the Castellon province's entire population (gender, education, age, current employment situation, etc.). The first part of the survey asked respondents about the previous knowledge of the public goods to be provided and the expected rate of use of them once provided as well as another question related with them trying to increase the familiarity of the respondents with the good being valued. The survey results provide evidence of a

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

substantial lack of previous knowledge of the public good. Fifty-two percent of all respondents reported they did not have hear about the project.

The payment vehicle chosen was a voluntary and individual contribution[5] to a special trust fund responsible for carrying out the works during the scheduled execution period of three years (1999 - 2001). 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). The elicitation method chosen was a dichotomous choice question: *"Would you be willing to pay pesetas X per year*?", however a previous question was asked to the respondents with the purpose of knowing if they were or not in the market thus allowing to apply the Spike model: *"Having in mind your personal budget and the fact that exist another public goods for which you can be asked some money, would you be willing to pay some money during the next three years of execution of the public works?"* . Six different bids were used: 1,000, 3,000, 5,000, 7,500, 10,000 and 15,000 pesetas[6] based on the results obtained in the pilot study where an open-ended question was used. Of the 700 people interviewed, 206 gave protest responses[7], basically because they believed they already paid too much taxes (69 % of the respondents that protested) . Although this 29.5 % is a fairly high rate for voluntary contributions, it seems feasible for Spain where people are not used to participating in political decisions which are related with the provision of public goods (Saz and Garcia, 2001).

The survey conclude about asking demographic and economic questions about the respondents and their households –their sex, their birth year, their income before taxes, how much education they have completed, how many people they normally live with, how long they have lived in their current residence place and if they were

[5] We used a voluntary payment vehicle rather than a mandatory tax because this vehicle seems to be the most neutral in Spain as shown in previous studies (Riera 1993 and 1995, and Pérez y Pérez et al., 1996). A mandatory tax would have increased the rejection to being interviewed because in Spain people think that fiscal pressure has grown very quickly in recent years and that there is no correspondence between the amounts they pay and what they receive from the Administration. Consequently, they are not willing to pay more than they pay at present. In any case, as Champ et al. (1997) point out, donations can be interpreted as lower bounds on Hicksian values.

[6] The exchange rate in June 99 was 160 pesetas to 1 US$.

[7] To detect this type of response, two types of questions were included in the questionnaire in an attempt to determine firstly, why people refused to take part in the hypothetical market and secondly, why they gave a zero or negative value, that is, why they were not willing to pay (Portney 1994).

considering the possibility of moving to another place attracted by the project "Muelle de Costa, an open door to the sea". This last question was introduced in the questionnaire trying to know if the project was generating some kind of expected benefits thus triggering off a change in the dwelling place of the respondents. However, lately the data showed that currently few people considered this possibility of moving to a closer place to the port area.

IV. Empirical model

Using standard CVM methodology, the survey results can be used to determined whether people are willing to pay for new recreation facilities. However, in our particular case we have to deal with an added problem, the fact that more than 65 % of respondents gave a zero WTP value. For many policy issues, WTP questions generate many zero responses (Johnson and Whitehead, 2000), therefore if we apply a logit or probit model in order to obtain the mean WTP we probably will have negative WTP estimates. While this problem has been debated several times in the literature[8] no consensus of the appropriate means of dealing with it has emerged. For example, Haab and McConnell (1997) compare two solutions to negative WTP estimates. The first solution, restricts the distribution of the estimate of WTP to be positive and the second solution is to employ a distribution-free approach.

The solution adopted in this paper is double too because first, following Kriström (1997), we apply the so called spike model that assumes that a sizable subsample of the respondents have no economic value for the public good in question. And, the second solution is to employ the distribution-free approach proposed by Kriström (1990a) that is more reliable than a poorly specified distribution function.

Spike model

Following Kriström's first paper quoted, consider a household confronted with a question to accept or reject a project for a given sum of money A. The project can be represented as the change $z^0 \leadsto z^1$ of environmental quality. The WTP for this change is defined as:

[8] See Johansson et al. (1989).

$$V(Y - WTP, z^1) = V(Y, z^0) \qquad (1)$$

where V(y,z) is an individual's indirect utility function and y is his income. Suppose now that there is a continuum of individuals with possibly different valuation of the project, then the probability that an individual's WTP does not exceed an amount A is given by:

$$prob(WTP \leq A) = F_{WTP}(A) \qquad (2)$$

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

$$E(WTP) = \int_0^{\infty} [1 - F_{WTP}(A)]dA - \int_{-\infty}^{0} F_{WTP}(A)dA \qquad (3)$$

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 is assumed that the distribution function of WTP has the following form:

$$\begin{array}{lll} F_{WTP} = 0 & if & A = 0 \\ p & if & A = 0 \\ G_{WTP}(A) & if & A = 0 \end{array} \qquad (4)$$

where p belongs to (0,1) and G_{WTP}(A) is a continuous and increasing function such that $G_{WTP}(0) = p$ and $\lim \leq G_{WTP}(A) = 1$. 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 she or he 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:

$$l = \sum_{1}^{N} E_i D_i \ln\left[1 - F_{WTP}(A)\right] + E_i(1 - D_i)\ln\left[F_{WTP}(A) - F_{WTP}(0)\right] + (1 - E_i)\ln\left[F_{WTP}(0)\right] \quad (5)$$

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). So we have three possible situations. Firstly, bid A is rejected because the individual considers it is too high but agrees to pay something. Secondly, bid A or any other amount is rejected, and finally bid A may be accepted because the person's true WTP is higher than the proposed bid. Once the maximum likelihood function has been estimated, the mean WTP in this simple Spike model is given by the following formula if α is positive[9]:

$$\frac{1}{\alpha}\ln\left[1 + \exp(\alpha)\right] \quad (5)$$

In our particular case the percentage of WTP = 0 responses received was 68%. When the level of zeroes is so high, the spike model is more suitable as it assigns a positive probability to zero responses, unlike the other models analysed. Table II shows the value of the coefficients for the spike model and the other two models applied - probit and logit - which were included for comparison purposes. The mean WTP obtained –se table III- from the spike model was 7,475 pesetas in comparison with the negative values obtained from the logit and probit models (-10,067 and –11,186 pesetas respectively). On the other hand the median was zero since more than half of those interviewed said they were not willing to pay anything. The huge difference recorded between the mean and median in the spike model clearly indicates that the WTP distribution of the provision of public goods in the city of Castellon is asymmetrical.

[9] 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 II
Estimated models

	Spike	Logit	Probit
?	-0,77558827	-0,66970748	-0,04259934
	(9.505)	(-4.375)	(-4.683)
?	0,05066531	-0,06655236	-0,03807465
	(7.034)	(-3.290)	(-3.308)
N	695	695	695
Log likelihood	-528.7258	-384.3066	-384.4098

Note: T-values are shown in brackets.

Another way of dealing with the problem of negative WTP estimates is to estimate a conventional logit (or probit model) and then truncate the integral to some arbitrary point in $\mathbb{R}^+$ (Hanemann and Kriström, 1995). Therefore, we truncated the integral at 15,000 pesetas, thus following (Duffield and Patterson, 1991) we force the estimate of WTP to fall between zero and the maximum bid offered to respondents. The mean WTP obtained is 10,367 pesetas and 10,411 pesetas in the logit and probit models respectively, figures that are about a forty per cent higher than the mean WTP obtained with the Spike model.

Table III
Estimated mean WTP

Model	Mean
Spike	7,475
Logit	-10,067
Logit with truncation at 15,000 pesetas	10,367
Probit	-11,186
Probit with truncation at 15,000 pesetas	10,411

A non-parametric approach

In this section a non-parametric approach is applied to obtain the mean WTP according to Kriström (1990a). This approach is related to utility theory using a first order argument since the probabilities will depend only on the value of the bid. It is based on the algorithm of Ayer et al. (1955) and enables the mean WTP (and median) to be found. It also offers certain advantages over other parametric approaches as this estimator is easier to calculate and more reliable than a poorly specified distribution function. This algorithm states that if the proportion of yes-answers to increasing bids is monotonically non-increasing, then the sequence provides a maximum likelihood estimator of probability for acceptance.

Table IV shows the proportion of positive responses for each of the six proposed bids and the Ayer et al. estimates of the probability of acceptance. Although, we have information on the probability of acceptance at six different points, it is impossible to calculate the mean and median 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, although there are other alternatives as have recently shown by Boman et al. (1999). Secondly, we must also assume, rather arbitrarily, that ? = 1 when A = 0 and that ? = 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 it is zero since it is understood to be too high and therefore no one will accept the price offered. For A* we considered three different values or truncation points, 25,000, 40,000 and 50,000 pesetas[10]. Once the empirical survival function of WTP has been obtained by linear interpolation, the mean can be calculated as the area bounded by this function and it ranges from 14,179 pesetas to a maximum value of 21,016 pesetas. The mean estimates via the non-parametric approach are considerably higher than the means obtained via the parametric models (logit and probit). This occurs because we have constrained the distribution to have positive support (Kriström, 1990b); by assuming that that ? = 1 when A = 0 we do not allow for negative WTP. The value of the median can be read off at ? = 0.5 from the figure, and it equals 15,859 pesetas for the lowest truncation point considered. However, now we have to deal with a problem. As the proportion of yes responses have been calculated only considering the respondents that are in the market (they gave a yes answer to the first valuation question and a positive or negative response to the second valuation questions used), that means that we are considering only 218 individual from the total sample of 700 respondents, i.e. the 31.1 per cent of the people surveyed. Therefore, if we assign this weight to the estimated means and medians then the figures are considerably lower (see table V).

Table IV
Proportion of "yes" responses and estimates of the probability for acceptance

[10] This figures are the highest value declared by the respondents, in the open-ended question used in the pilot study, in the three areas considered (Port district, Castellon city and Metropolitan area) so they are not arbitrary values.

Bid (pesetas)	Proportion of "yes" responses	Ayer's estimates
1,000	40/41	0.976
3,000	35/37	0.946
5,000	35/42	0.833
7,500	17/24	0.708
10,000	22/32	0.687
15,000	23/42	0.547

Table V
Estimated mean and median WTP using Ayer's algorithm

Truncation point	mean	weighted mean	median	weighted median
50,000	21,016	6,535	18,007	5,600
40,000	18,281	5,685	17,148	5,333
25,000	14,179	4,409	15,859	4,932

VI.- WTP determinants

The analysis presented uses complete case analysis dropping any observation with item non-response on any variable in the questionnaire. Therefore, the sample size for estimating a logit model with demographic and attitude variables is 562. A full statistical model including all the variables considered was previously estimated. However, with the purpose of conserving space, only the model with independent variables significant at the 0.05 level or better were retained in the regression. The construction of a equation that predicts WTP for the good with reasonable explanatory power and coefficients with the expected signs provides evidence of the proposition that the survey has measured the intended construct (Carson, 2000).

The final statistical model estimated is presented in table VI, where the dependent variable records if a person was or was not willing to pay the amount asked during the interview. As it is known, the number 1 records a yes response and the zero value records a no response. The interpretation of the regression results suggests that the negative sign of the BID variable denotes that the higher the pesetas amount that the respondent was asked to pay, the lower the probability that the respondent would vote for the project. The INCOME variable presents a positive coefficient indicating that the

higher the respondent's income, the higher the probability that the respondent would vote for the public good. This variable is significant at the 0.01 level.

The AGE variable shows a negative sign which means that the probability of a yes response decreases with the age of the individual interviewed as a consequence of lower expectation of future use of the new recreational facilities or maybe as a result of a different education of older people.

Table VI
Logit regression model of probability of a yes response

Variable	Coefficient	T-statistic
COSTANT	-4.835546***	-5.398
BID	-0.000089***	-3.727
INCOME	0.020911***	3.552
AGE	-0.025602***	-3.769
VALUE	0.047643***	4.953
USE	1.236739***	5.098
Log-likelihood = -268.3649		
Pseudo R^2 = 0.344		
N = 562		

*** Significant at the 0.01 level.
The Pseudo R^2 computed is that proposed by Veall and Zimmermann (1992).

The variable VALUE was defined as the subjective value given by the respondent to the project as a whole, considering its different parts as they were described in the questionnaire, in a scale from zero to ten. Therefore the positive sign of its coefficient indicate that those individuals that gave higher values were more likely to agree to pay for the public good. Finally, the variable USE considers the expected use of the new recreational facilities by the individuals. It is equal to one if the respondent answered "very much" or "much" and zero otherwise. Thirty six per cent of the sample declared they will use "very much" or "much" the new facilities, so this respondents were more likely to pay for the new public good that the rest of the respondents that declared "some", "few" or "none".

VII.- Aggregation

Aggregation is a controversial issue in economics. In order to use the findings of a contingent valuation study to obtain an estimate of aggregate individual WTP amounts for a specific quantity of a public good it is necessary to make several assumptions which are potentially troublesome. In our case, this particular aggregating process must cover at least four important aspects. Firstly, we must choose from the different models analysed, the one which best suits our data since, as already shown, the results of each vary considerably. The conclusion we reached is that the Spike model seems to be the most suitable because of the asymmetry of the WTP distribution and because of the high number of zero responses. Secondly, we must choose between the mean and the median to get the annual aggregate flow of benefits. Mean is the traditional measure used in benefit-cost analysis, while median WTP, which corresponds to the flat amount that would receive majority approval, is a standard public choice criterion (Carson, 2000). In our particular case, having decided to apply the Spike model, the aggregation criteria must obviously be based on the mean since the median obtained was zero pesetas as more than sixty per cent of those interviewed declared their WTP to be zero. Thirdly, it is necessary to choose a weighting scheme for individuals. Since WTP involves an income constraint, the standard weighting scheme is to assume that the current distribution of income is acceptable from a social welfare standpoint (Mitchell and Carson, 1989). Finally, the population affected by the public policy was that of the Port district, City of Castellon and its Metropolitan Area since we understand that the people living in the Metropolitan Area are also potential beneficiaries of the urban works to be carried out in the waterfront. Consequently, if the mean is multiplied by three[11] and then by the over-18 population (206,115) we obtain that the social benefits from the environmental and urban improvements amount to 4,622 million pesetas if the mean WTP considered is 7,475 pesetas.

VIII.- Concluding remarks and policy implications

In summary, this research has provided for the different public authorities involved useful information on the level of social benefits, and people's support, associated with the provision of recreational and leisure facilities in port areas. To date, no previous

[11] This is multiplied by three since the valuation question stated that the payment would be made each year during the three years scheduled for the execution of the work.

study has attempted to apply, specifically, the contingent valuation method to this policy issue. A survey experiment, which tries to quantify public preferences for recreation facilities in port areas, constitutes an important contribution to the common understanding of where resources should be allocated, and hence provides a reliable starting point for the strategic planning of urban regeneration in port cities.

Regarding to the data obtained from the survey, as more than 60 per cent of respondents gave a zero response, we have to deal with the problem of getting negative WTP values so we have to apply the Spike model and a non-parametric approach that, when a sizeable part of the sample give a zero response, seem more suitable than traditional models (logit and probit). Both approaches produce consistent estimates of the mean WTP although the former is preferred for aggregation. The results show, with reasonable explanatory power, that WTP is significantly correlated to income, age (negatively), the expected use of the new recreation facilities and the subjective value given to the project as a whole.

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