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in a Contingent Valuation Study:  
The Value of S. Erasmo in the  
Lagoon of Venice**

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# **Information and Willingness to Pay in a Contingent Valuation Study: The Value of S. Erasmo in the Lagoon of Venice**

## **Summary**

This paper reports on a contingent valuation study eliciting willingness to pay for a public program for the preservation of lagoon, beach and infrastructure in the island of S. Erasmo in the Lagoon of Venice. A referendum dichotomous choice approach with a follow-up question is used to obtain information about willingness to pay from a sample of residents of the Veneto Region in Italy.

We use split samples to investigate the effect of providing different levels of information to respondents before asking the payment questions. Our experimental treatment is a reminder of possible reasons for voting in favor or against the proposed program before the referendum question. We find that reminding respondents of the reasons for voting for or against the public works increases WTP among less highly educated respondents, and decreases WTP among more highly educated respondents.

**Keywords:** Contingent valuation, Effects of information

**JEL Classification:** Q0, Q3, Q26

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## **1. Introduction**

This paper reports on a contingent valuation study eliciting willingness to pay (WTP) for a public program to improve environmental quality, both directly and indirectly via construction of infrastructure, on and around the island of S. Erasmo in the Lagoon of Venice.<sup>1</sup> In 1987, Venice and the Lagoon were placed on the UNESCO Cultural Heritage List, a registry of sites with high priority for preservation for future generations for their natural beauty and cultural significance. Moreover, the Lagoon of Venice is regarded as a unique hydrological resource and ecosystem.

S. Erasmo is one of the largest islands in the Lagoon of Venice. Like virtually all other islands in the Lagoon, S. Erasmo suffers from coastal erosion problems, degraded environmental quality, and a lack of infrastructure and services. The survey was administered by telephone to a sample of residents of the Veneto Region, and information about willingness to pay (WTP) for the program was elicited using dichotomous-choice questions in a referendum format.

The purpose of this research is two-fold. First, we wish to obtain willingness to pay for the population of (broadly defined) beneficiaries of the program in order to estimate the monetary benefits of the public works program. In our CV survey,

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<sup>1</sup> The method of Contingent Valuation (CV) is a well-established technique used to assign a monetary value to non-market goods and services, such as environmental resources (Mitchell and Carson, 1989). CV is a survey-based technique, in that it asks individuals to report their willingness to pay for a specified improvement in environmental quality. Willingness to pay is defined as the amount of money that can be taken away from a person's income at the higher level of environmental quality to keep his utility constant. It is, therefore, the theoretically correct measure of the welfare change—and hence the benefits—associated with the change in environmental quality.

respondents were told about a hypothetical public program that would, if passed by a majority vote, restore beaches, implement erosion control, and improve infrastructure on the island. They were subsequently asked whether they would vote for or against the proposition on a ballot, if establishing the program would imply a cost of €X to their household. Statistical modeling of the responses to this and to follow-up questions allows us to compute mean and median WTP for the program, and hence its benefits. We seek to identify use and non use components of WTP.

Second, we explore a methodological issue related to the provision of different levels of information to respondents in a CV survey before asking referendum payment questions. We examine the impact of alternative presentations of the benefits and costs of the program using a split-sample experiment. Specifically, we randomly assigned the respondents living in specified areas to one of two subsamples: the first group of respondents received the standard questionnaire, while respondents in the second group were given a reminder of possible reasons for voting in favor or against the proposed program before the referendum question. The purpose of this treatment is to test if this summary influences the responses to the WTP questions.

Mean WTP for the S. Erasmo public works is €67 per household. Median WTP provides a robust lower bound equal to €20. We estimate the total benefits for the Veneto Region to range between €41 million and €107 million, which suggests that the benefits of the program exceed its cost. We find that reminding respondents of the advantages and disadvantages of the public works increases WTP among less highly educated respondents, and decreases WTP among more highly educated respondents. This is a

potentially important result for practitioners of the method of contingent valuation and for future applications of this approach to other islands and coastal environments.

The remainder of this paper is organized as follows. Section 2 provides background information. Section 3 describes the survey questionnaire. Section 4 defines the population of beneficiaries of the program being valued, describes the sampling procedure and the experimental design. Section 5 reports the results of the study and the estimates of willingness to pay. Section 6 presents the calculations of the benefits of the public works, and section 7 provides concluding remarks.

## **2. Background and Motivation**

In the early 1970s, the Italian legislature passed a statute designed to address flooding and erosion in the Venice Lagoon System (Law April 16, 1973, N. 171, *Interventi per la salvaguardia di Venezia*). The law covers high tides (“acque alte”), storms, erosion, and pollution, and states that protection of the Lagoon of Venice is a matter of “pre-eminent national interest.”

The statute does not explicitly require that consideration be given to costs and benefits in the selection of remedies and interventions,<sup>2</sup> and some observers have recently questioned the wisdom of expensive public works on scarcely populated islands of the Lagoon. For example, the cost of the public works on the island of S. Erasmo is €40

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<sup>2</sup> No benefit-cost analyses have been conducted for public works of limited scope, but some rudimentary benefit-cost work has been conducted for public works and engineering feats with broader, system-wide impacts. For example, efforts have been made to list the possible categories of benefits associated with the construction and operation of MOSES (MOdulo Sperimentale Elettromeccanico, originally the prototype mobile barrier against high tides used for experimental and study purposes between 1988 and 1992, and later the name of the entire project for mobile barriers at the lagoon inlets; see [www.salve.it](http://www.salve.it)), but we are not aware of actual benefit estimates, and the results of this study are unpublished.

million, but the resident population is only 800. This implies that it is important to estimate the benefits associated with some of these initiatives and public works.

What is reported here is one such effort. This research uses the method of contingent valuation to estimate the benefits of public works on and around the island of S. Erasmo in the lagoon of Venice, focusing on beneficiaries other than its residents. Like other islands in the lagoon, S. Erasmo (shown in Figure 1) experiences severe coastal erosion problems, lagoon and beach degradation, and a lack of adequate infrastructure and services. However, in contrast with other well-known islands in the lagoon of Venice, S. Erasmo has very few historical or architectural features, is not a popular destination for tourists visiting Venice and other islands (e.g., Torcello, Murano and Lido), and is well-known only to local Lagoon excursionists. Even people who do not visit S. Erasmo and use its resources, however, may well hold positive values for its conservation. This implies that a contingent valuation study eliciting willingness to pay for public works for improving environmental quality and reducing coastal erosion on and around S. Erasmo should survey both users and non-users of the island in order to identify use and non-use components of value.

We employ contingent valuation because other non-market valuation methods are unsuitable and/or fail to capture potentially important components of value. For example, since the housing stock in S. Erasmo is very small and transactions are extremely infrequent, hedonic pricing methods based on property values cannot be applied here. The travel cost method is appropriate for S. Erasmo, and we do conduct one such study (reported elsewhere), but only contingent valuation can capture non-use values, which we are particularly interested in.

Earlier applications of contingent valuation on coastal environments include McConnell (1977) (beach use and congestion public beaches in Rhode Island), Bell (1986) (recreational benefits of a beach nourishment program), and Lindsay et al. (1992) (beach protection programs in Maine and New Hampshire).

Silberman et al. (1992) elicit willingness to pay for beach nourishment from Sea Bright to Ocean Township, New Jersey, by intercepting users on site and by survey non-users over the telephone. Kontogianni et al. (2001) reports on an effort to compare willingness to pay for wetland protection at Kalloni Bay on the island of Lesbos, Greece, with qualitative information obtained from focus groups of local stakeholders about their priorities for both conservation and development.<sup>3</sup> These studies share some common limitations, in that they are based on relatively small sample sizes and do not use the most recent innovations in the method of contingent valuation. At least some of them, however, recognize that non-use values are likely to be an important component of willingness to pay for beach erosion control programs.

Contingent valuation has also been employed to value improvements in surface water quality delivered by infrastructure, such as publicly-owned water treatment works (Choe et al., 1996). Construction of wastewater treatment infrastructure is one of the proposed works for S. Erasmo.

Our CV questionnaire was administered over the telephone to a random sample of residents of the Veneto Region stratified by distance from the Lagoon of Venice. This

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<sup>3</sup> Willingness to pay for erosion control has also been studied for riverine environments. Loomis et al. (2000) develop a CV survey questionnaire focusing on erosion control and other four ecosystem services to be restored along a 45-mile section of the Platte River. Households were asked a dichotomous-choice WTP question for an increase in ecosystem services through a higher water bill. Results from 100 in-person interviews indicate that households would pay an average of \$21 per month or \$252 per year for the additional ecosystem services.

sample includes both people who are currently visiting S. Erasmo or using it in any other way, and people who do not normally visit the island.

As previously explained, we randomly assign our respondents to one of two subsamples. One subsample is read a version of the questionnaire that is identical to the other group's version in all respects, except that respondents are given a reminder of possible reasons for voting in favor or against the public works program that would deliver the environmental improvement at and around S. Erasmo. We are not aware of other studies that have formally examined whether provision of such a summary influences WTP, and by how much. Informal evidence from focus groups suggests that reminders of possible reasons for voting in favor and against the proposed policy offer some reassurance that both types of votes are acceptable, which may make respondents who are against the proposed public program more comfortable in saying so (Carson, 2002, personal communication).

### **3. Structure of the Questionnaire**

Our survey questionnaire is comprised of five sections. The telephone interview starts with the usual greetings and some warm-up questions, followed by section 1 of the questionnaire, which inquires about the respondent's knowledge and use of the Lagoon of Venice and of the island of S. Erasmo. This section also presents a brief description of the island and its current environmental degradation and erosion problems. In section 2, respondents are queried about their recreational use of the Lagoon of Venice, and are asked questions about number of trips, destinations within the Lagoon, equipment, and



cost per trip. Section 3 inquires specifically about the number of visits to S. Erasmo in the last 12 months, if any, and asks respondents to estimate their travel cost to the island.

Section 4 presents the valuation scenario, which consists of a public program at the regional level delivering public works on and around the island. These include beach nourishment to offset erosion, drainage of inner canals, construction of a wastewater treatment facility, refurbishment of sewage lines and water ducts, and restoration of the ancient Torre Massimiliana (Maximilian's Tower).

Respondents were told that additional taxes would be needed to raise the revenue necessary to fund the program. The payment question is phrased as a referendum on the ballot. Should the referendum result in a majority of "yes" votes, the program would be implemented and funded with a one-time income tax; otherwise the proposal would be abandoned, and no additional tax would be imposed on the residents of the Region.<sup>4</sup> The tax amount is varied across households, and respondents are asked whether they would vote against or in favor of the program at that cost to their household. We include a follow up question: if a respondent has accepted to pay the initial tax amount, he is asked whether he would pay 50% more than the first bid; if not, the follow-up bid is 50% less than the initial bid. (The exact bid amounts are reported in Table 2 below.)

We also inquire about reasons for each of the possible response sequences ("Yes-Yes", "Yes-No", "No-Yes" and "No-No")<sup>5</sup> and elicit people's opinions about the program, seeking to capture their interest in and support for different interventions (e.g.

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<sup>4</sup> Because the Lagoon environmental improvement program is required by law and the public works on S. Erasmo are scheduled to begin soon, throughout the development of the questionnaire we worked very hard to ensure that respondents would accept the scenario and the valuation exercise. Based on our focus groups and pre-test, we believe that we were successful in minimizing the likelihood of protest answers and off-hand dismissal of the valuation scenario.

<sup>5</sup> The NOAA Panel on Contingent Valuation (1993) recommended investigating the motivations for the observed responses to the payment questions.

beach nourishment, infrastructure improvements), and their attitudes toward the environment. In this section we also try to find out if they will visit S. Erasmo after the interventions, and how many times they expect to do so.

The fifth and last section of the instrument asks questions about the usual individual characteristics (age, gender, education, income, etc.). These will be used in regression models to test the internal validity of willingness to pay.

#### **4. Sampling Frame and Experimental Design**

An important step in any CV study is to define the population of beneficiaries of the program being valued. In theory, a preservation program that concerns the Venice lagoon system may potentially produce benefits to all Italians (and perhaps all Europeans or even the entire world). However, S. Erasmo is a relatively little-known destination that does not attract tourists visiting Venice.

If we exclude the value of housing and land on the island, the total economic value of S. Erasmo should be comprised primarily of local recreational use (e.g. daily beach use during the Summer season) and non-use values.<sup>6</sup> These considerations suggest that use values are likely to be limited to the residents of Venice and neighboring areas, whereas the residents of other areas are likely to experience primarily non-use values (if any).<sup>7</sup>

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<sup>6</sup> Use values refer to the utility from direct consumption of the good. Non-use values are generally classified into existence, option, and bequest. In particular, existence is due to the utility an individual derives from the awareness that a good exists, even though the individual does not use it and will not do so in the future. Option value derives from the possibility to use the good in the future, as individuals cannot forecast their future preferences. Finally, bequest value is about the utility from preserving the good for future generations. See Freeman (1993).

<sup>7</sup> Two hundred pre-test interviews confirmed that S. Erasmo is virtually unknown to people living 50 km or farther from the Lagoon of Venice, but that these persons nevertheless hold positive values for the public program.

In addition, the size of the island and the scale of the public works suggest that the most appropriate program to improve the island's environment is a regional program, and not a national one. We felt that the scope of the public works would be too small for a national program, and too large for a municipal or provincial program.

Accordingly, the survey sample was randomly drawn from the population of residents of the Veneto Region, stratified by distance from the Lagoon of Venice.<sup>8</sup> Table 1 describes the stratification areas and their respective sample sizes.

Our study investigates a methodological issue using split samples. Respondents living in areas C, D, and E were randomly assigned to one of two subsamples.<sup>9</sup> Respondents in subsample 1 received a summary list (henceforth referred to as "caveat") of motivations for voting in favor and against the proposed program. The caveat read as follows:

"To explain the issues more clearly, I will describe to you the main reasons why other people have answered 'yes' or 'no.' Other respondents who answered 'yes' believe that:

1. The island is an environmental resource that deserves protection in itself, whether or not one has visited it or knows of it.
2. You may be interested in visiting the island of S. Erasmo in the future.
3. As an environmental resource, the island of S. Erasmo should be protected for future generations.
4. The environmental problems that affect the island are serious and the public works are necessary.

Other respondents who answered "no" believe that:

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<sup>8</sup> If we presume that Italians living in other regions are similar in their preference for the protection of S. Erasmo to residents of the Veneto region that live farther than 50 km from Venice, the latter's (non-use) values could be imputed to residents of other areas of the country to derive total national WTP for improving environmental quality in S. Erasmo. This practice is consistent with the fact that the legislation establishing funds for the preservation was passed at the national level. It should be kept in mind that if we were to conduct a CV survey asking people from all of Italy to report their WTP for a small, very narrowly focused public program for the preservation of one island of the Lagoon, this scenario might suffer from credibility problems.

<sup>9</sup> In the original plan we envisioned a treatment-control experiment for the entire sample. However, due to budget considerations, the experimental treatment was restricted to the groups that live farthest from the Lagoon, which we expected to be more responsive to the treatment.

1. There is no reason to finance the protection of an island that they do not know or visit.
2. There are other public works that deserve more attention and priority in financing.
3. They will never visit the island.
4. The public works are not adequate and will not remedy S. Erasmo environmental problems.”

The list, therefore, includes general reasons for “yes” and “no” responses (e.g., “The island suffers from serious problems and the described works are essential,” or, “The benefits from the works are not worth the funding”), as well as reasons specifically related to non-use values of the resource. Respondents in subsample 2 were not given this reminder.

As shown in Table 1, 2,100 families were initially contacted for the survey. They were sent a letter from the University of Padua, announcing that their household had been selected for participation in the survey. These families were subsequently contacted by telephone in March-June 2002. A total of 729 refused to participate, and 41 could not be found, resulting in 1,330 completed interviews. A total of 142 respondents in zones C, D and E described above (roughly 50% of the respondents in these areas) were given the caveat.

As always with dichotomous choice CV surveys, the bid amount was varied to the respondents. Initial and follow-up amounts are shown in Table 2. There were a total of 10 bid sets. Initial bid levels ranged from €10 to €100; follow-up bids were 50% more or less than the initial bid. Respondents were randomly assigned to the bid sets.

## **5. Results**

### *A. Descriptive Statistics of the Sample*

Our first order of business is to examine the characteristics of our respondents. Descriptive statistics for the respondents' characteristics are reported in Table 3. The average respondent is about 50 years old, and has completed two years of high school. The average household income is roughly €21,000 a year.<sup>10</sup>

Over two-thirds of our respondents are women (69.55%), and 41% are employed. About 23% are retired, and an additional 32% do not work outside of the home. This includes homemakers (25%), students (4%), or unemployed persons (2%). The remaining 4% did not report their occupation status. Finally, 4% of the respondents belong to an environmental organization.

Table 4 reports information about use of and familiarity with S. Erasmo. In the last year, roughly one-fourth of the respondents have visited the Venice lagoon by public or private boats (LAGOONUSER), and 8% has been to S. Erasmo (ERASMOUSER). About 14% of the respondents have been to S. Erasmo at least once in his/her life (ERASMOVISITOR). About two-thirds of the respondents already knew of S. Erasmo before taking the survey (KNOWS), while the remainder learned about the island only through the survey. When those who had never been to S. Erasmo were asked if they would visit the island after the completion of the public works, 42% of the respondents said that they would (POTENTIALUSER).

Figure 2 shows that use of the lagoon and knowledge of the existence of S. Erasmo decline with the distance of the respondent's residence from the lagoon. About 39% of the Venice residents we interviewed have visited the Lagoon of Venice in the last

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<sup>10</sup> About one-third of the respondents do not report his or her family income. The average household income of €21,000 is calculated for those respondents who did report their household income.

twelve months. The percentage of Lagoon users decreases to 16% for those that live in municipalities with a Lagoon waterfront (Zone A), or within 15 km from the Lagoon (Zone B), and to 13.5% for those living as far as 30 km from the Lagoon (Zone C). Only 6% of those respondents who live 30 to 50 km from the Lagoon (Zone D) frequent the Lagoon, and only 3% of those living farther than 50 km (Zone E) visit the Lagoon.

Prior knowledge of S. Erasmo follows a similar pattern, but the figures are much higher. Eighty-eight percent of the residents of Venice, and 60% of the residents in Zone A, know of S. Erasmo. The percentage of respondents who know of S. Erasmo slightly increases moving from Zone A to Zone B, and then dramatically decreases to 35.7% in Zone C and to about 23% in Zones D and E.

#### *B. Answers to the Payment Questions*

In a dichotomous-choice CV study, the probability of a “yes” response to the payment question should decline monotonically as the bid increases. We report the percentage of “yes” responses to the initial bid in table 5. In our survey, 58% of the respondents that received the lowest amount, €10, as the initial bid, stated that they were willing to pay it. The percentage of “yes” votes declines to 37% as the initial bid amount increases to €40, but rises to 50% for €50. It then declines again at €60, €70, and €80, but slightly increases again at €90. At €90, the percentage of “yes” responses is 34%, a figure that is not statistically different from the percentage of “yes” responses at €80. The proportion of “yes” responses declines to 23.5% at the highest bid amount, €100.

Table 6 combines the responses to the initial and the follow-up payment questions, showing that the majority of the respondents give two “no” or two “yes”

responses (53.5% and 23.3% of the sample, respectively). “No”-“yes” (NY) and “Yes”-“no” (YN) patterns are much less common. This is frequently seen in CV surveys about environmental quality.

An analysis of the motivations for the responses to the payment questions (reported in Appendix A) suggests that most of our respondents’ answers were consistent with economic behavior, and that very few of our subjects protest the public works or the valuation exercise.

In addition, the frequencies of “yes” and “no” responses vary, as one would expect, with current and potential visitor status. For example, the percentage of “no” responses to the initial payment question is 49% among recent visitors of S. Erasmo (n=310), 50% among potential future visitors (n=557), and 79% among those respondents who do not visit the island now nor plan to in the future (n=463). A similar pattern is observed for NN responses, which are provided by 42.90% of users, 42.80% of potential future users, and 73.59% of current and future non-users. These figures imply that WTP should be lowest among non-users of the resources being valued.

### *C. The Effect of the Experimental Treatment*

To assess the effect of the caveat experimental treatment on the WTP responses, we begin with examining the frequencies of “no” responses to the initial payment question and of NN responses across the treatment and control groups.<sup>11</sup> By doing this, we empirically test the informal evidence from focus groups that people are more

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<sup>11</sup> It is important that the comparison be done across control subjects (respondents who live in Zone C, D and E, but were not slated for the treatment), and treatment subjects. Were we to compare *all* subjects who did not receive the caveat treatment with those who did receive it, we would be making inappropriate inference, since respondents who live in the city of Venice and in zones A and B are more likely to visit S. Erasmo and hence are more likely to have greater willingness to pay for the program.

comfortable expressing their votes against a public program when they hear that other people feel in the same way (Carson, personal communication). If this is true, then the frequency of “no” to the initial payment question and/or NN responses should be higher in the group that receives the treatment.

About 61% of the 149 subjects in the control group answers “no” to the initial payment questions, whereas 67% of the 142 respondents in the treatment group answers “no” to the initial payment question. These figures support our expectations, but the difference across the two subsamples is not statistically significant<sup>12</sup>. When attention is restricted to the NN responses, we find that 52% of the control group reports such answers against 59% of the treatment group. A t test does not find the difference across the two groups to be statistically significant.<sup>13</sup>

Based on these statistics, therefore, one would conclude that the caveat may tend to reduce WTP, but the effect is small and statistically insignificant. To further explore the effect of the caveat, we turn to regression analysis (reported in the next sections).

#### *D. Statistical Models of the WTP Responses*

To obtain estimates of mean and median WTP for the proposed policy, we assume that WTP is distributed as a Weibull with scale  $\sigma$  and shape parameter  $\theta$ . Respondents do not report their exact WTP amounts, but their responses to the initial and follow-up payment questions can be combined to form intervals around the respondent’s willingness to pay, and to estimate  $\sigma$  and  $\theta$  using the method of maximum likelihood.

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<sup>12</sup> The t statistic is -1.07, which fails to reject the null of no difference at the conventional significance levels.

<sup>13</sup> The t statistic is -1.21, and we thus fail to reject the null of no difference at the conventional significance levels.



Given our assumptions, the log likelihood function of the sample is:

$$(1) \quad \log L = \sum_{i=1}^n \log[\exp(-(WTP_i^L / \sigma)^\theta) - \exp(-(WTP_i^U / \sigma)^\theta)] ,$$

where  $WTP^L$  and  $WTP^U$  denote the lower and upper bounds of the interval around the respondent's WTP amount, and  $i$  denotes the individual respondent.<sup>14, 15</sup> Mean WTP is equal to  $\sigma \cdot \Gamma(1/\theta + 1)$ , whereas median WTP is  $\sigma[-\ln(0.5)]^{1/\theta}$ .

Estimation results are reported in Table 7. Column (A), based on all observations, shows that mean WTP is €66.61 (s.e. 5.42), whereas median WTP is a much lower amount, €20.39 (s.e. 1.52). Mean WTP is, therefore, roughly three times as large as median WTP.<sup>16</sup> The estimates of willingness to pay are robust with respect to the choice of the distribution of WTP and to the exclusion from the sample of respondents who may have exhibited protest responses (see Appendix B).<sup>17</sup>

Since WTP follows the Weibull distribution with scale  $\sigma$  and shape  $\theta$ , log WTP can be expressed as:

$$(3) \quad \log WTP = \ln \sigma + \varepsilon = \lambda + \varepsilon,$$

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<sup>14</sup> We work with the Weibull distribution because Weibull variates are defined on the positive semi-axis and have a flexible shape parameter. We compared the fit of the Weibull log likelihood with normal, log normal, and exponential log likelihoods, and found that the Weibull outperformed the log normal and exponential, and was comparable to the normal.

<sup>15</sup> The estimates based on likelihood function (1) are often referred to as “double-bounded” in the contingent valuation literature (Hanemann, Loomis and Kanninen, 1991). Implicit in (1) is the assumption that respondents refer to the same underlying WTP amount when answering both payment questions. Recently, some researchers (Cameron and Quiggin, 1994; Alberini, 1995; Alberini, Kanninen and Carson, 1997) have relaxed this assumption, and have allowed for two separate, but possibly correlated, draws to drive the responses to the initial and follow-up payment questions. This has resulted in bivariate models of willingness to pay. We tried to fit bivariate models, but our estimation routine had convergence problems.

<sup>16</sup> This is one of the properties of positively skewed distributions, as the Weibull is when the shape parameter,  $\theta$ , is between zero and approximately 3.6.

<sup>17</sup> The standard errors around the estimates were computed with a simulation-based approach (See Alberini and Cooper, 2000). Mean WTP is greater than median WTP when the distribution is positively skewed, as is the case here. Because the estimate of mean WTP is entirely driven by the upper tail of the distribution, median WTP is used as a robust lower bound for mean WTP.

where  $\varepsilon$  follows the type I extreme value error distribution with scale  $\theta$ . To test internal validity, we allow  $\sigma$ , and hence  $\lambda$ , to vary across respondents. Specifically, we posit that  $\lambda_i = \mathbf{x}_i\beta$ , where  $\mathbf{x}$  is a  $1 \times k$  vector of individual characteristics and/or a treatment dummy, and  $\beta$  is a  $k \times 1$  vector of unknown parameters.

In the simplest specification,  $\mathbf{x}$  includes only dummies denoting whether the respondent is a user of the resources of S. Erasmo (i.e., a visitor), allowing us to decompose WTP into use and non-use values. Broader specifications include income, and other socio-demographics, plus an experimental treatment dummy. We discuss results for use and non-use values in section 5.E, internal validity tests in section 5.F, and the effect on the treatment in section 5.G below.

#### *E. Components of WTP.*

Economic theory holds that the total economic value of an environmental resource is comprised of its use and non-use value:

$$(4) \quad \text{Total Economic Value} = \text{Use value} + \text{Non-use value.}$$

Non-use values are generally classified into three main categories. The first category is the existence value, namely the value placed on the very existence of the resource by individuals that do not use it and do not plan to do so in the future. The second category is the bequest value, i.e., the value placed on the resource by individuals who are not users and wish to preserve the resource for future generations to use and enjoy. The third category represents the option value, which arises when an individual is prepared to pay for the commodity in case in the future he wishes to use it.

The questionnaire asks a number of questions about current and future use (visits) to S. Erasmo. Specifically, we know whether the respondent visited S. Erasmo (ERASMOUSER=1) or the Lagoon of Venice (LAGOONUSER=1) in the last 12 months, and whether he is not a current user but believes he will use the resource in the future, after the public works have taken place (POTENTIALUSER=1).

Accordingly, we partition our sample into (a) current visitors,<sup>18</sup> (b) respondents who do not currently visit but plan to after the public works,<sup>19</sup> and (c) non-users, and fit separate Weibull likelihood functions to these groups.

Table 7 shows mean and median WTP figures for these three types of individuals. Mean WTP is €92 for current users, €71 for potential users, and €36 for non-users. We interpret the €36 to be the non-use value of the resource.<sup>20</sup> Wald tests show that users and potential users hold mean WTP and median figures that are not statistically different from one another (Wald statistic=1.55 and 0.30), but *are* statistically different from the WTP of non-users (Wald statistic=11.03).<sup>21</sup>

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<sup>18</sup> Since only about 8% of our respondents has visited S. Erasmo in the last 12 months, we included both those persons that had visited the island in the previous year and those persons who had taken trips to the Lagoon, without necessarily visiting S. Erasmo, in this group.

<sup>19</sup> Identifying users under the improved environmental conditions is the correct way to disentangle use and non-use values.

<sup>20</sup> Economists and scholars have long debated about taking into account non-use values in cost-benefit analyses. At this time, most economists agree that non-use values should be included in the calculation of benefits (Carson *et al.* 1993, Arrow *et al.* 1996). Regarding a taxonomy of non-use values, recent literature considers existence and bequest values as pure non-use values, while option and vicarious use (or indirect use) values can be classified as both use and non-use values, depending on the specific application. In this study, evidence from focus groups and the characteristics of the good to be valued suggest that the option value is mainly due to use value in the future.

<sup>21</sup> The Wald statistics for comparison of users and non-users are 10.26 for mean WTP and 46.09 for median WTP. The Wald statistics for comparison of potential users and non-users are 11.03 for mean WTP 101.51 for median WTP. Under the null hypothesis of no difference in mean WTP across each pair, the Wald statistic is distributed as a chi square with one degree of freedom. The critical limit at the 5% significance level is 3.84.

Netting out the non-use values, we obtain €(92-36)=€56 as the use value for those subjects that are current users, and €(71-36)=€35 to be the potential use values for those subjects who say that they will use the resource once its quality has been improved.

#### *F. Internal Validity*

To test the internal validity of the WTP responses, we let  $\lambda_i$  in equation (3) be equal to  $\mathbf{x}_i\beta$ . The vector  $\mathbf{x}$  includes, as before, dummy variables that capture current and potential use patterns, and the indicator KNOWS, which takes on a value of one if the respondent had heard of S. Erasmo before the survey. It also includes dummies for the area of residence of the respondent, a dummy for whether the respondent contributes to environmental organizations, income per member of the household, age, a gender dummy (MALE), and missing value indicators for the latter three variables.<sup>22</sup> Because some respondents may hold a positive value for the resource, but feel that they cannot commit their household' finances, we created an indicator, NONWORKER, for individuals who are not gainfully employed, such as homemakers, students, and the unemployed. Finally, we check the effect of the experimental treatment by including a dummy (CAVEAT) denoting whether the caveat was administered to the respondent:

$$\lambda_i = \mathbf{x}_i\beta + CAVEAT_i \cdot \delta.$$

In Table 8 we present several specifications of the WTP regression based on various subsets of these regressors. In columns (I)-(III) we include various combinations

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<sup>22</sup> We created a dummy variable, PCAPINCMISS that takes on a value of 1 when the respondent did not answer the income question. Missing values in the income variable were then replaced with zeros, and both the income variable and PCAPINCMISS were included in the right-hand side of the WTP equation. The coefficient on PCAPINCMISS, therefore, captures any systematic differences in WTP between those respondents who did and did not report income. The coefficient on PCAPINC, the income variable, tells us how WTP varies with income, conditional on information on income being available. A similar procedure was followed for MALE and AGE.

of *current* use dummies, where we attempt to distinguish for recent users of the Lagoon who did not visit S. Erasmo and recent visitors to S. Erasmo, and the *future* use dummy. The coefficients on the dummies for current use of the Lagoon and potential future use of S. Erasmo are positively and significantly associated with WTP. Recent visitors to S. Erasmo, however, do not have significantly higher WTP. This is probably due to the fact that there are too few respondents in our sample who report having taken trips to the island in the past year.

Column (IV) shows that knowledge of the island prior to the survey is associated with higher WTP amounts, but the caveat with advantages and disadvantages of the public program has virtually no effect on WTP. In column (V), we add dummies for the area of residence of the respondent, finding that they do not improve the fit of the model, and that they do not alter the coefficients of the use dummies. A likelihood ratio test of the null that the coefficients of the geographical variables are all equal to zero fails to reject the null hypothesis at the conventional significance levels.<sup>23</sup>

By contrast, column (VI) shows that membership in an environmental organization *is* significantly associated with WTP. All else the same, both mean and median WTP figures are 66 percent higher for a member of an environmental organization. However, column (VIII) shows that this effect is no longer significant when additional individual characteristics, such as income, age, gender, education, and gainful employment status (and the dummies indicating missing values for these variables) are included in the right-hand side of the (log) WTP equation.

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<sup>23</sup> The likelihood ratio statistic is  $LR = -2 * (-1516.69 + 1514.89) = 3.6$ , and thus does not exceed the 5% critical limit for the chi square with 5 degrees of freedom (which is equal to 11.07).

Column (VII) of Table 8 shows that income per household member is positively and significantly associated with willingness to pay. The coefficient on the dummy denoting a missing income value is insignificant, implying that, all else the same, the willingness to pay of those respondents who did not report their income is not different from that of those who did.

To assess the magnitude of the coefficient on income, consider a 30-year-old female resident of the city of Venice who does not belong to environmental organization, has completed high school, is neither a current nor a future user of the Lagoon of Venice, and knows S. Erasmo. Mean and median WTP for an individual with these characteristics are €65 and €25 respectively, at the average income per family member (€6000). If income increases by €1000, mean and median WTP would increase to €67 and €26, and if it were to double to €12000, they would rise to €87 and €29, respectively. For this respondent, the income elasticity of WTP is 0.192.

The coefficient on education is positive and significant, implying that a more highly educated person is willing to pay more for the preservation of S. Erasmo. Failure to report schooling information is not systematically associated with WTP. In the above example at the average income level, adding 4 years of education (college degree) raises mean WTP from €65 to €86 (roughly €2.50 per additional year of schooling), and median WTP from €25 to €34 (a little less than €2 per additional year of schooling).

Age is negatively and significantly associated with WTP: the coefficient on this variable implies that adding 10 years to the age of the respondent in the above example reduces mean WTP from €65 to €53 and median WTP from €25 to €21. Once again, those respondents who did not report their ages are not significantly different from those

who did.<sup>24</sup> Finally, once we control for income, education, and age, we find that the employment status and gender of the respondent do not further explain his or her willingness to pay.

### *G. Further Exploring the Effect of the Caveat*

As shown in specification (IV)-(VII) of table 8, which include the CAVEAT dummy, reminding respondents of the advantages and disadvantages of the intervention has no statistically discernible effect on their willingness to pay for the public program. This is true in all of these specifications, and remains true even when we estimate a parsimonious specification in which the only regressor included in the model is the CAVEAT dummy.

We also reasoned that the caveat may have a different effect on the respondent's WTP, depending on whether he or she has heard of or knows of S. Erasmo before the telephone interview. To check for this effect, we created an interaction term between KNOWS and CAVEAT, and entered it in the model along with KNOWS and CAVEAT, plus all other regressors. The coefficients on the interaction term and on CAVEAT, however, were both insignificant (not reported in table 8).

The most instructive specification, shown in column (VIII), includes an interaction between CAVEAT and the respondent's education level. In this specification the coefficients on CAVEAT and the interaction term (CAVEAT×EDUCATION) are both significant at the 10% level. While the former is positive, the latter is negative, implying that the reminder to the respondent tends to increase willingness to pay among

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<sup>24</sup> We also tried including a quadratic term in age in the right-hand side of the WTP equation, but found no evidence of a quadratic relationship.

less highly educated subjects. The average respondent is willing to pay 21% more if he is read the reminder of the advantages and disadvantages of the interventions than he would otherwise. However, if we consider a respondent that holds a college degree (corresponding to 18 years of schooling), his willingness to pay is about 21% *lower* if he receives the reminder. A possible interpretation of this result might be that the caveat highlights benefits of the policy that less highly educated respondents were not aware of, or even create importance bias—the response effect whereby people feel that the resource is valuable just because it is mentioned in the survey instrument (Mitchell and Carson, 1989, pp. 244-245).<sup>25</sup>

## 6. The Benefits of the Program

Since WTP varies systematically with the individual characteristics of the respondent, ideally one would form regression-based predictions for WTP for all households of the Veneto Region, which would be then aggregated to obtain the total benefits of the program. Unfortunately, the data from the 2001 Census are not publicly available yet, preventing us from using population household characteristics to implement this approach.

We therefore implement an alternative calculation that distinguishes for use and non-use values. We proceed as follows. First, we note that current and future visitors to

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<sup>25</sup> Table 8 assumes that the effects of CAVEAT, if any, are limited to the right-hand side of log WTP, while the error term  $\varepsilon$  in equation (3) is homoskedastic, its scale,  $\theta$ , being constant and unaffected by CAVEAT. To check for a more complex effect of CAVEAT, we re-estimate the log WTP equation allowing for CAVEAT to enter in both  $\lambda_i$  and the scale parameter of  $\varepsilon$ :  $\theta = \exp(\alpha_0 + \alpha_1 \cdot \text{CAVEAT})$ . Parsimonious specifications of this model were well behaved, but failed to detect any significant effect of CAVEAT on the scale of  $\varepsilon$ .  $\alpha_1$  was negative, implying that providing subjects with a reminder of the reasons for voting in favor or against the program tends to reduce the variance of log WTP, but this effect is very small ( $\alpha_1 = -0.05$ ) and statistically insignificant. With broader specifications, the maximum likelihood routine often failed to converge. We also tried log-normal specification for  $\varepsilon$  in lieu of the type I extreme value, but not even in this case did CAVEAT have a significant coefficient.



S. Erasmo hold WTP values that are statistically indiscernible from one another, which implies that they can be pooled, and that models of the WTP responses can be fit for the pooled group. Using this approach, and the usual assumption that the latent WTP is distributed following the Weibull distribution, we obtain an estimate of mean WTP of €77.37 (standard error 6.29), and median WTP of 34.22 (s.e. 2.34) for current/future visitors. A Weibull model of the WTP responses by those respondents who do not currently visit S. Erasmo nor plan to in the future produces mean and median WTP figures of 36.21 (s.e. 7.89) and 4.80 (s.e. 1.24), respectively.

We then assume that the population percentages of visitors/potential users and non-users in each zone are the same as those observed in the sample, and compute the total number of households with actual or potential visitors, and without users, for each zone.<sup>26</sup> We sum the households of each type over the zones to compute the expected total of households with and without users in the Veneto Region, which we denote as  $N^U$  and  $N^{NU}$ , respectively. The total benefits are  $(N^U \times 77.37 + N^{NU} \times 36.21)$ , when mean WTP is used, and  $(N^U \times 34.22 + N^{NU} \times 4.80)$  when median WTP is used.

Our calculations show that  $N^U = 1,107,696.80$  and  $N^{NU} = 591,538.20$ , resulting in total benefits of €107,122,100 (s.e. 11,634,649) when mean WTP is used, and €40,744,768 (s.e. 992,518) when median WTP is used. These estimates suggest that the benefits greatly exceed the cost of the public works when mean WTP is used, and barely exceed them when median WTP—a robust, conservative estimate of WTP—is used.

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<sup>26</sup> To illustrate, if 20% of the households in zone A in our sample were users or potential users, and  $N_j$  is the number of households residing in this zone as per the most recent Census, the total number of households with users or potential users in zone A is computed to be  $N_j^U = N_j \times (0.20)$ . The total number of households in zone A without users would be  $N_j^{NU} = N_j \times (0.80)$ .

## 7. Discussion and Conclusions

This paper reports the results of a contingent valuation survey that elicits willingness to pay for a public program for erosion control and infrastructure improvement on the island of S. Erasmo in the Lagoon of Venice. Residents of the Veneto Region were surveyed over the telephone using dichotomous choice payment questions. Our survey includes an experimental treatment, in that a subset of the respondents are given a reminder of possible reasons for voting in favor and against the public program.

Our statistical analyses show that people *are* willing to pay for S. Erasmo. Mean WTP is about €66 per household, whereas median WTP—a robust lower bound for mean WTP—is roughly €20. Our WTP responses show internal consistency, in that WTP increases with knowledge of the island, current use of the lagoon, and expected use of S. Erasmo after the works have been completed. Willingness to pay depends in predictable ways on income, educational attainment of the respondents, and age.

Finally, we examine the effect of administering a reminder of the advantages and disadvantages of the proposed policy before the WTP questions. There are no statistical differences in the frequencies of “no” responses to the payment questions across the groups that were and were not given the reminder. When we turn to regression analysis, we find the coefficient on CAVEAT—the dummy for the reminder treatment—is statistically insignificant in most specifications of the model. When we include in the model of WTP an interaction between respondent education and CAVEAT, we find that administering the reminder raises WTP for less highly educated respondents, and decreases it for more highly educated respondents.

Given the internal validity of our results, we conclude that contingent valuation is a reasonable and promising approach to estimating WTP for publicly policies for erosion control and environmental quality improvement in island/coastal areas, and might be usefully employed in similar contexts at other locales. For example, recent global climate change protocols have emphasized coastal and island erosion as a potentially serious consequence of climate change (see, for example, the discussion in Yohe and Schlesinger, 2002), which begs for estimating the benefits of offsetting policies at these locales.

Finally, we compute the total benefits of the public works by distinguishing between current and potential visitors, and non-users. Total benefits from the program range between €41 million (using median WTP) and €107 million (using mean WTP). Both exceed the costs of the program. We regard the former figure as a robust lower bound for the benefits accruing to the residents of the Veneto Region.

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Figure 1. The Island of S. Erasmo in the Lagoon of Venice



Figure 2

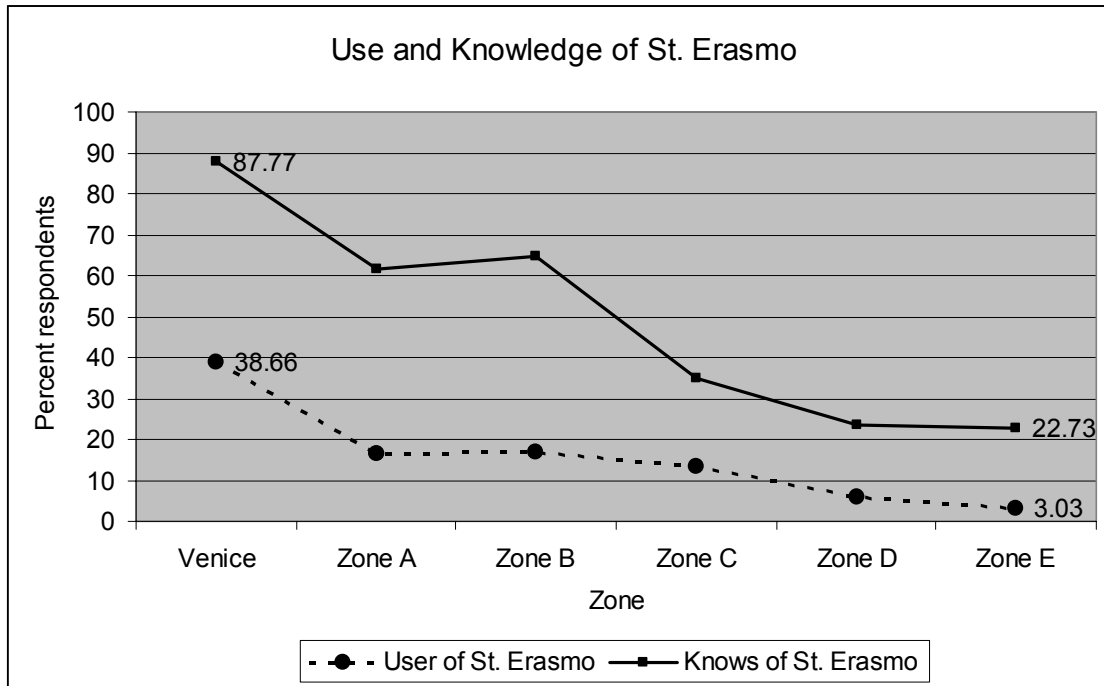


Table 1: Sampling frame

<b>Zone</b>	<b>Approximate distance from the Venice Lagoon (km)</b>	<b>Planned number of interviews</b>	<b>Actual interviews</b>
Venice (Venice Historical Centre and Lagoon Islands)	0	700	507
A (e.g. Mira, Chioggia, Mestre)	from 0 to 5	500	342
B (e.g. Dolo, Fossalta di P., Mogliano V.to)	from 5 to 15	300	189
C (e.g. Noale, Vigonza, Taglio di Po)	from 15 to 30	250	141
D (e.g. Asolo, Tombolo, Vittorio V.to)	from 30 to 50	200	85
E (e.g. Soave, Valdagno, Feltre)	> 50	150	66

Table 2: Bid Design in the S. Erasmo Survey. All bids in EUR (€).

<b>1<sup>st</sup> bid (EUR)</b>	10	20	30	40	50	60	70	80	90	100
<b>Follow-up bid if YES</b>	15	30	45	60	75	90	105	120	135	150
<b>Follow-up bid if NO</b>	5	10	15	20	25	30	35	40	45	50
<b>Number of respondents</b>	137	128	139	130	134	140	134	124	128	136



Table 3. Descriptive statistics of the respondents (n=1330).

Variable	Mean or percentage of the sample	Standard deviation
Income	Mean Median	€15,196
	€21,132 €21,000	
Income per member of the household (PCAPINC)	Mean Median	€6,988
	€5,990 €4,500	
Did not answer the income question dummy (PCAPINCMISS)	31%	
Years of schooling (EDUCATION)	10.19	4.22
AGE	49.70	16.01
Household size	2.84	1.14
MALE dummy	0.3045	
Employed dummy (EMPLOYMENT)	0.4067	
RETIRED dummy	0.2323	
NONWORKER dummy (unemployed/student/homemaker)	0.3157	
Did not report employment status	0.0413	
Environmentalism dummy (ENVATT)	0.0406	

Table 4. Use and knowledge of S. Erasmo

Variable	Percent
Has visited the lagoon in the last 12 months (LAGOONUSER)	23.31
Has been to S. Erasmo in the last 12 months (ERASMOUSER)	7.59
Has been to S. Erasmo at least once in his or her life (ERASMOVISITOR)	14.51
Will visit S. Erasmo after the public program will be carried out (POTENTIALUSER)	41.88
Knows S. Erasmo (KNOWS)	64.74

Table 5. Percentage of “yes” responses to the initial bid.

Initial Bid	N	Percentage “yes”
10	137	0.58
20	128	0.48
30	139	0.47
40	130	0.37
50	134	0.51
60	140	0.38
70	134	0.36
80	124	0.31
90	128	0.34
100	136	0.23
Total	1330	

Table 6. Answers to the double-bounded dichotomous choice CV questions

WTP answers	Percent
No-No	53.54
No-Yes	5.95
Yes-No	17.17
Yes-Yes	23.34

Table 7. Mean and median WTP for the entire sample and specific subsamples.  
 All Figures in €. Total sample size 1326.  
 (Based on separate samples and likelihood functions.)

	<b>(A)</b> <b>All</b>	<b>(B)</b> <b>Lagoon users</b>	<b>(C)</b> <b>Potential users</b>	<b>(D)</b> <b>Non-users</b>
Mean WTP (standard error)	66.61 (5.42)	91.89 (15.57)	70.64 (6.92)	36.21 (7.72)
Median WTP (standard error)	20.39 (1.52)	36.09 (4.45)	33.28 (2.56)	4.80 (1.20)

Table 8. Double bounded estimates for the Weibull distribution.  
(T-statistics in parentheses)

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII	Model VIII
<b>Obs</b>	1325	1326	1325	1325	1325	1325	1325	1325
<b>Loglik</b>	-1569.69	-1530.12	-1528.03	-1516.69	-1514.89	-1513.22	-1458.32	-1456.91
<b>Intercept</b>	3.5236 (52.08)	2.8544 (28.03)	2.8572 (28.14)	2.4930 (18.57)	2.2252 (6.99)	2.2199 (6.97)	2.6941 (5.84)	2.6656 (5.80)
<b>Lagoonuser</b>	0.5339 (3.29)	1.3163 (8.37)	1.2018 (6.89)	1.0752 (6.20)	1.0796 (6.21)	1.0604 (6.11)	0.6191 (3.64)	0.6109 (3.60)
<b>Erasmouser</b>	0.3784 (1.40)		0.3693 (1.41)	0.2764 (1.06)	0.2925 (1.12)	0.2827 (1.08)	0.2033 (0.81)	0.1901 (0.76)
<b>Potentialuser</b>		1.1614 (8.68)	1.1587 (8.68)	1.1867 (8.90)	1.1788 (8.77)	1.1719 (8.36)	0.7620 (5.80)	0.7504 (5.73)
<b>Knows</b>				0.5809 (4.69)	0.6119 (4.59)	0.6106 (4.57)	0.4615 (3.56)	0.4471 (3.46)
<b>Caveat</b>				0.0534 (0.28)	0.3001 (1.01)	0.3076 (1.03)	0.2349 (0.81)	0.7896 (1.80)
<b>Venezia</b>					0.2163 (0.66)	0.2070 (0.63)	0.1691 (0.52)	0.1867 (0.59)
<b>Fascia A</b>					0.3349 (1.03)	0.3398 (1.05)	0.3350 (1.05)	0.3562 (0.50)
<b>Fascia B</b>					0.1342 (0.41)	0.1167 (0.34)	0.072 (0.20)	0.0883 (0.26)
<b>Fascia C</b>					0.0157 (0.08)	-0.0095 (0.08)	-0.0071 (-0.08)	0.0218 (0.08)
<b>Fascia D</b>					0.4916 (1.33)	0.4801 (1.29)	0.2973 (0.81)	0.3122 (0.85)
<b>Envatt</b>						0.5154 (1.73)	0.2441 (0.86)	0.2399 (0.84)
<b>Pcapinc</b>							0.32E-4 (2.59)	0.32E-4 (2.59)
<b>Pcapinmiss</b>							0.0930 (0.59)	0.0928 (0.60)
<b>Education</b>							0.0690 (4.26)	0.0749 (4.49)
<b>Educmiss</b>							-0.3398 (-1.03)	-0.3580 (-1.11)
<b>Age</b>							-0.0197 (4.84)	-0.0200 (-4.91)
<b>Agemiss</b>							-0.4271 (-0.69)	-0.5178 (-0.85)
<b>Nonworker</b>							0.0964 (0.76)	0.0886 (0.68)
<b>Nonworkmiss</b>							0.0302 (0.06)	-0.0161 (-0.03)
<b>Male</b>							0.0325 (0.24)	0.0352 (0.27)
<b>Malemiss</b>							-0.0865 (-1.14)	0.0323 (0.05)
<b>Caveat* Education</b>								-0.0597 (-1.70)

## Appendix A: Motivation for the Answers to the Payment Questions

After the payment questions, our survey instrument listed possible reasons for each observed sequence of responses, asking respondents to check all applicable reasons. This is consistent with one of the recommendations of the NOAA Panel on Contingent Valuation (1993). Table 7 shows the frequencies for such reasons. Among those who provided Yes-Yes responses, about 19% motivate their answer saying that they support the intervention program for S. Erasmo and the proposed tax. About 34% would support any environmental intervention for the protection of the lagoon of Venice. Many (46%) agree with every environmental program and are willing to pay for it. Only two persons gave Yes-Yes responses because they did not believe that they would actually have to pay for the tax.

Most of the No-No people (33.93%) motivate their answer with the budget constraint, saying that they could not afford the tax increase. Another 19% states that they already pay too much money in taxes, while 3.5% say that the proposed program is not worth the tax. About 21% say that it should not be their responsibility to pay for the protection of S. Erasmo, and 8.3% state that they do not receive any direct benefit from the S. Erasmo program or are not interested in the future of the island. About 15% of the No-No respondents motivate their answer with other reasons: for example, some respondents think that the money collected through the tax would not be used properly, or would prefer to pay for other, more important problems. Others do not believe the proposed scenario.

Regarding the Yes-No respondents, roughly 48% say that the second bid is too high compared to their income, while 43% say that the follow-up bid is too high compared to the benefits. Both of these reasons imply that the responses were consistent with economic theory. Of the remaining 10% of the Yes-No subjects, most state that they already pay too much money in taxes, think that there is already enough public monies funding for the Venice Lagoon System, or do not trust the authorities in charge of managing the tax revenue.

Almost half of the people who reject the first bid, but accept the second one, say that the initial bid is too high compared to the benefits. Of the others, 44.3% state that the bid is too high compared to their income, and 10% report other motivations, such as that the government should take care of S. Erasmo, that they believe the tax will become permanent rather than being a one-time occurrence, and that the tax should be proportional to income.

Table A1. Motivations for the answers to the payment questions.

	Percent
<b>Yes-Yes motivations</b> (Valid responses n=312)	
I support S. Erasmo program and it is worth the proposed tax	19.23
I agree with every program for Venice Lagoon preservation	33.97
I agree with every program for environmental preservation	45.83
I do not believe that there will be a new tax after the referendum	0.64
Other motivations for Yes-Yes	0.32
<b>No-no motivations</b> (Valid responses n=728)	
I support the S. Erasmo program but it is not worth the proposed tax	3.43
I do not receive any direct benefit from the S. Erasmo program and I do not care about the island	8.28
I cannot afford the proposed tax	33.93
I already pay too much money in taxes	18.82
It is not my responsibility to pay for the S. Erasmo program	21.02
Other motivations for No-No	14.56
<b>Yes-No motivations</b> (Valid responses n=235)	
The second bid is too high compared to the benefits	43.42
The second bid is too high compared to my income	48.08
Other motivations for Yes-No	9.78
<b>No-Yes motivations</b> (Valid responses n=84)	
The first bid is too high compared to the benefits	48.80
The first bid is too high compared to my income	41.66
Other motivations for No-Yes	9.52

## Appendix B. Robustness of the estimates of WTP.

In this appendix, we report the results of our robustness checks on the estimates of WTP. First, we checked how mean and median WTP changed when WTP was assumed to follow a lognormal distribution, instead of a Weibull. Median WTP based on the lognormal is €19.01 (s.e. 1.34), and mean WTP is €134.69 (s.e. 22.09). While the former welfare statistics is close to the corresponding figure for the Weibull distribution, the latter is much larger than that based on the Weibull distribution. This result is frequently observed in applied contingent valuation work.

Next, we examined how the estimates of willingness to pay change when the upper bound of the interval around WTP is forced to be equal to income for those respondents who answered yes-yes to the initial and follow-up payment question. Doing so with the Weibull distribution left mean and median WTP virtually unchanged (€66.60 and 20.39, respectively, versus €66.61 and 20.39 of table X), and similar results were noted when the upper bound was replaced with the arbitrary figure of €1000 (€62.44 and 20.90).

We also experimented with changing the distribution of WTP from a Weibull to a normal. As expected, doing so produced an estimate of median WTP that was very close to that from the Weibull model (€19.01, with a standard error of 1.34), but a much greater mean WTP (€134.69, with a standard error of 22.09).

Finally, in many CV studies, respondents provide “protest” responses to the payment questions. Protest respondents may decline to pay, or announce that their willingness to pay is zero, even if they hold positive values for the resource, because they disagree with certain aspects of the scenario or the provision mechanism. Depending on how numerous these responses are, they may lower the estimates of willingness to pay. Protest “nos” are usually identified by examining the responses to debriefing questions and other comments offered spontaneously by the respondents during the interview. Here, we consider two definition of protest votes. In the first definition, we consider protest respondents those persons who provided the following comments about their no-no responses: “public works are often poorly executed” (4 respondents), “I dislike politicians and institutions” (6), “this valuation method is unacceptable” (3), “the tax should be proportional to household income” (3), “the tax will become permanent” (3), and all of the above reasons (2). For good measure, we also excluded from the sample respondents who said that they were not authorized to commit money on behalf of their household (3), and that would like more information (6). This results in a total of 29 observations. The second definition adds respondents who stated that they voted no-no because they feel that the money would be wasted, bringing the number of protesters to 55.

When the first definition of protest votes is used, the estimates of mean and median WTP using the cleaned sample are 66.62 and 21.60 EUR, respectively, with standard errors of 5.38 and 1.53. When the second definition of protest votes is used, the cleaned sample produces estimates of mean and median WTP equal to €66.55 and 22.68, respectively,

with standard errors of 5.33 and 1.63. This shows that excluding possible protest observations from the sample has negligible effect on the estimates of WTP.

We also examined possible outliers. The CV literature defines them as people whose willingness to pay is disproportionately high or low relative to their income. We were concerned about people with very high willingness to pay for their income, and as recommended by Carson (1997), identified subjects whose willingness to pay is greater than 1%, 5% and 10% of their annual household income. In our study, considering only the initial bid question, 87 persons are willing to pay a tax amount higher than 1% of their household income, while nobody accepts a bid higher than 5% or 10% of their household income. When the follow-up question is also taken into account, there are 120 respondents willing to pay a bid higher than 1% of their household income, and one of these is even willing to pay a bid higher than 5% of his household income. Excluding the 87 respondents that at the initial bid are willing to pay a bid higher than 1% of their household income, mean WTP lowers to €57.68 (s.e. 5.18) and median WTP to €16.20 (s.e. 1.39). Excluding the 120 respondents that whether in the initial or in the follow up bid are willing to pay a tax amount higher than 1% of their household income, mean WTP lowers to €49.23 (s.e. 4.01) and median to WTP €15.29 (s.e. 1.29).



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- (lxv) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications” organised by Fondazione Eni Enrico Mattei and sponsored by the EU, Milan, September 25-27, 2003
- (lxvi) This paper has been presented at the 4th BioEcon Workshop on “Economic Analysis of Policies for Biodiversity Conservation” organised on behalf of the BIOECON Network by Fondazione Eni Enrico Mattei, Venice International University (VIU) and University College London (UCL), Venice, August 28-29, 2003

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