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Dealing with ignored attributes in choice experiments on valuation of Sweden's environmental quality objectives

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Abstract

Using a choice experiment, this paper investigates how Swedish citizens value three environmental quality objectives. In addition, a follow-up question is used to investigate whether respondents ignored any attributes when responding. The resulting information is used in the model estimation by restricting the individual parameters for the ignored attributes to zero. When taking the *shares* of respondents who considered both the environmental and the cost attributes (52-69 percent of the respondents) into account, then the WTPs for each attribute change if the respondents who ignored the attributes have a zero WTP. At the same time, we find evidence that not all respondents who claimed to have ignored an attribute really did. However, the most commonly ignored non-monetary attributes always have the lowest rankings in terms of WTP across all three environmental objectives. Thus, our results show that instead of ignoring, respondents seem to put less weight on the attributes they claimed to have ignored.

Key words: Choice experiment, environmental quality objectives, follow-up question,

ignoring attributes, WTP.

JEL classification: D61, Q50, Q51.

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1. Introduction

Stated preference surveys on environmental goods usually put a lot of faith in the cognitive abilities of respondents. Many choice experiments (CE) involve a trade-off among several attributes, where each attribute in itself can be quite complex.[1] Moreover, stated preference surveys concern decisions regarding issues that the respondents are not used to making decisions about. There is therefore a risk that respondents use simplifying strategies when responding (e.g., DeShazo and Fermo, 2002; DeShazo and Fermo, 2004). One example of a simplifying strategy is to ignore one or several attributes. There are of course other reasons why respondents ignore attributes as well; e.g., they may decide to not consider the cost attribute to communicate that the issue is very important to them or to protest against the trade-off between money and the environment (Stevens et al., 1991).[2] In addition, the design itself can result in lexicographic orderings, for example when one attribute is so much more important than the others or when the cost attribute is not high enough to result in a trade-off for the respondent (Rosenberger et al., 2003; Rizzi and de Dios Ortúzar, 2003). However, the act of ignoring certain attributes may also simply reflect that the respondent is not willing to pay anything for a change in the attribute, at least not within the range given in the experiment. In this case, the choices made are a reflection of the true underlying preferences.

[1] In a CE, respondents make repeated choices between alternatives. The alternatives are described by a number of attributes, and the levels of the attributes are varied among the choice sets. For overviews of the choice experiment method, see for example Alpizar et al. (2003) and Louviere et al. (2000).

[2] Stevens et al. (1991) discuss the problem of valuing the environment in monetary terms. According to them, people who are ”genuinely altruistic” do not make trade-offs between money and wildlife. The fact that 44 percent of their respondents agreed with the statement that ”preservation of wildlife should not be determined by how much money can be spent” and 67 percent agreed that ”as much wildlife as possible should be preserved no matter the cost” indicates that some people do not consider costs when answering surveys. Moreover, respondents might make choices that support their self-image (McFadden et al., 2005). Thus, a respondent might ignore a cost attribute in order to support his/her self-image as an environmental friendly person.

Whatever the reason that people ignore attributes, it is important to consider this behavior when estimating a stated preference model. Moreover, this knowledge becomes crucial when conducting a welfare analysis using the willingness to pay (WTP) measures. Studies that do not take into account whether respondents have considered some attributes may give biased welfare estimates and therefore result in potentially wrong policy implications.

In this paper we investigate the effects of using a follow-up question after the choice situations in a CE. More precisely, we asked the respondents whether they ignored any of the attributes when responding in a valuation survey on three Swedish environmental quality objectives. We then compare the marginal WTPs of two different logit models. In the first model, we estimate the marginal WTP for the whole sample without making use of the follow-up question. In the second, we use the follow-up question and estimate the marginal WTP for the conditional sample of respondents who considered the attribute in question and who also considered the cost attribute; i.e., we restrict the individual parameters for the ignored attributes to zero.

A few previous studies used approaches similar to ours to model the issue of ignoring attributes, both in transportation applications (Hensher et al., 2005) and in environmental applications (DeShazo and Fermo, 2004; Campbell et al., 2006; Campbell et al., 2008). In all these papers, the conclusion is that restricting parameters using follow-up questions can have large effects on the parameter estimates and the implied WTP measures. For example, in Campbell et al. (2006 and 2008), WTP estimates decreased by more than 50 percent when lexicographic preferences were accounted for, and Hensher et al. (2005), find significantly lower WTP estimates for travel time savings in a model which assumes that certain attributes are ignored. Interestingly, DeShazo and Fermo (2004) find the opposite result: The average

marginal WTP increases when controlling for those who do not consider all the attributes in a choice set. Thus, according to the empirical evidence so far, the estimates will be biased in some direction. In this paper, we extend the previous analysis by discussing how to treat respondents who ignore attributes in a welfare analysis. On the other hand, it is possible that respondents stated that they ignored an attribute, while they really only put less weight on it or ignored it only in some of the choice sets. Therefore, we also test whether the coefficients of ignored attributes really are zero. We follow up the discussion with an empirical analysis where we look at two extreme cases: one where we assume that those who ignored nevertheless have a positive WTP and one where they have a zero WTP for the attribute in question. This way we obtain an upper and a lower limit on the WTP estimates. We also investigate the relative importance of the attributes of the environmental objectives and whether there is a correlation between the share of people who ignored a certain attribute and the ranking of that attribute based on the WTP estimates. The rest of the paper is organized as follows: Section 2 presents the CE, Section 3 the econometric model, and Section 4 the results. Section 5 concludes the paper.

2. The environmental quality objectives and the choice experiments

In Sweden, a number of so-called environmental quality objectives have been formulated, of which 16 have been adopted by the Swedish Parliament. The main purpose of these objectives is to provide a framework for obtaining a sustainable environment. Another purpose is to define the quality of the environment, natural resources, and cultural resources in Sweden, and to be able to measure the change in environmental quality over time. The objectives are designed to, among other things, promote human health, safeguard biodiversity and the natural environment, and preserve the cultural environment and the cultural heritage (SEPA, 2006). We conducted three CE studies that investigate how people living in Sweden evaluate

three different environmental objectives: a Balanced Marine Environment, Flourishing Lakes and Streams, and Clean Air.[3] The overall goal of the Balanced Marine Environment objective is: "The North Sea and the Baltic Sea must have a sustainable productive capacity, and biological diversity must be preserved. Coasts and archipelagos must be characterized by a high degree of biological diversity and a wealth of recreational, natural and cultural assets. Industry, recreation and other utilization of the seas, coasts and archipelagos must be compatible with the promotion of sustainable development. Particularly valuable areas must be protected against encroachment and other disturbance" (SEPA, 2006). The overall goal of the Flourishing Lakes and Streams objective is: "Lakes and water courses must be ecologically sustainable and their variety of habitats must be preserved. Natural productive capacity, biological diversity, cultural heritage assets and the ecological and water-conserving functioning of the landscape must be preserved, at the same time as recreational assets are safeguarded" (SEPA, 2006). The overall goal of the Clean Air objective is: "The air must be clean enough not to represent a risk to human health or to animals, plants or cultural assets" (SEPA, 2006).

The survey was developed in collaboration with a group of Swedish EPA administrators. The questionnaire sent to the respondents consisted of three parts. The first part asked questions about the respondents' engagement in environmental issues, and the second part contained a scenario that clearly stated the opt-out levels of each attribute and described both the problems that exist today, and the preventive measures that could be used to improve the situation. Moreover, the second part also included the CE about one of the environmental quality objectives. Each respondent answered a CE on one of the environmental quality objectives. The random sample of 3,000 individuals was hence split into three groups of equal

[3] The data is part of a larger study on six environmental objectives (Kataria and Lampi, 2008).

size. The third part of the questionnaire consisted of questions regarding the respondent's socio-economic status.

All 16 environmental objectives have been described with different interim targets in an attempt to make them more tangible and to be of help in the progress toward reaching the objectives. We decided to use these interim targets when defining the attributes in the CE in order to concretize the objectives and make them easier to understand for the respondents. Although the environmental quality objectives are all very different there also are some similarities: most of the objectives have interim targets for improving the situation of animals/plants, humans, and cultural assets. In the case of a Balanced Marine Environment, we used four different attributes, while the other two objectives have both three attributes. Table 1 presents the attributes and levels of the CE in the survey. The cost attribute was expressed as a tax to be collected over the next five years.

>> Insert Table 1 here

The CE included six choice sets, each with three different alternatives. The first alternative was always an opt-out alternative describing the current environmental quality. (The opt-out levels are shown separately in Table 1). Hence, the changes we evaluate are improvements compared to the current situation. See Appendix B for an example of a choice set. Note again that each respondent answered only one CE. In order to reduce the risk of hypothetical bias we included a short cheap-talk script in each survey version. Although the results are somewhat mixed, cheap-talk scripts have been successfully used to reduce hypothetical bias in choice experiments (Carlsson et al., 2005; List et al., 2006).

The choice sets were created using a cyclical design, a so-called fold-over (Bunch et al, 1996; Carlsson and Martinsson, 2003). First, an orthogonal main effects design was generated, consisting of 12 attribute level combinations.[4] Each combination in the main-effects design is one alternative in one of the 12 choice sets. The levels of the attributes of the second alternative in a choice set are obtained by adding two levels to each attribute level of the first alternative, and when the highest level is reached, one starts over from the lowest level.[5] To these two alternatives, an opt-out alternative was added. The 12 sets were then randomly blocked into two survey versions. All respondents were asked to choose one of the three alternatives. This design procedure was used for each of the three experiments.

The follow-up question used to investigate whether the respondent had considered the attributes when making their choices in the questionnaire read: "Was (were) there any attribute(s) that you did not consider when you made your choices? (Several alternatives are possible)". They could then mark the attributes they did not consider. Those who considered all attributes could mark a "No" alternative. This question followed directly after the last choice set in all questionnaires.[6]

[4] Orthogonal main effects design means that we do not have correlations between the attribute levels. Moreover, each attribute level is included equally often (level balance).

[5] So if an attribute has four levels (0, 1, 2, 3) and the level in the first alternative is 1, the level in the second alternative is 3.

[6] As a referee pointed out, a question like this, which collects information regarding ignored attributes after the decisions have been made, is of course vulnerable to potential biases. Unfortunately, this is an unavoidable restriction, at least in mail surveys.

3. Econometric model and interpretation of WTP

In the analysis of the responses, we apply a random parameter logit model (Train, 2003). The utility of alternative *i* for individual *j* is divided into a deterministic and a random part:

$U_{ijt} = \beta_j' x_{it} + \varepsilon_{ij}$,

where x_i is a vector of attribute levels of alternative *i*, β_j is the corresponding individual parameter vector, and ε_{ij} is an error term. We let all the attribute parameters except the cost parameter be normally distributed, including the alternative specific constant for the opt-out alternative. Furthermore, we assume that the utility coefficients vary among individuals but are constant across the choice situations for each individual. This reflects an underlying assumption of stable preference structures for all individuals. In order to allow for observed heterogeneity, we include a number of socio-economic characteristics interacting with the alternative specific constant as well.[7]

The information about which attributes a respondent ignores can be used to restrict attribute parameters to zero (Hensher et al., 2005). The probabilities in the likelihood function are then only a function of the attribute parameters that have been considered.[8]

We estimate two models for each environmental objective: The first is a standard model where we do not put any restrictions on the parameters, while we in the second model restrict all ignored attribute parameters to zero.[9] Our main interest lies in the WTP estimates. Since

[7] We also estimated models were the socio-economic characteristics interact directly with the attributes, but most of the interaction terms were insignificant.

[8] In our setting this is exactly the same as setting the attribute levels to zero. Since a respondent ignored or considered an attribute for the whole choice set, it does not matter how we specify it.

[9] Since the cost parameter is fixed, we set the cost attribute levels to zero when the cost attribute is ignored.

we assume that utility is linear in the attributes, the marginal WTP is simply the ratio between the attribute parameter and the cost parameter. One problem with reporting marginal WTPs is that the attributes are measured in different units for the different environmental objectives, and it is thus difficult to compare the magnitudes between different attributes and objectives. Therefore, we will estimate the WTP for an improvement of the attribute from the current level (opt-out) to the best possible level (the highest level of the attribute) in the experiment.

However, one should be careful when comparing the WTPs in the models with and without restriction of ignored attribute parameters to zero. For the model without restrictions (where we do not use the follow-up question), the WTP is the average WTP for the whole sample. For the restricted model, where we restrict the parameters of ignored attributes, the WTP is the average WTP for the conditional sample of respondents who considered the cost attribute and the environmental attribute in question. Therefore, a direct comparison of the WTPs from the two models could be misleading. Actually, a direct comparison of the estimates implies an assumption that those who ignore a certain attribute generally have the same preferences as those who did not ignore the attribute, since the conditional and unconditional WTPs in the second model then are the same. If we instead assume that respondents only considered attributes for which they have a positive WTP, then those who did not consider the attributes have a zero WTP and the conditional and unconditional WTPs are not the same in the second, restricted, model.[10] The respondents who did not consider the cost attribute are a rather special case. Strictly speaking, we cannot infer their WTP since we cannot estimate their

[10] In this case, the model is similar to one of Carlsson and Kataria (2008), although they only allow for two groups of responses: (i) positive WTP for all attributes and (ii) zero WTP for all attributes. What this means is that the distribution of the random parameter has a probability point mass at zero. For a single attribute, the model is also related to the so-called spike models in contingent valuation (Kriström, 1997; Haab, 1999; Clinch and Murphy, 2001).

marginal utility of money. One interpretation of their behavior is that they protested against making a trade-off between money and the environment, and another is that there is extreme yea-saying, which should exclude them from the welfare analysis. However, we want to know whether they are different in their marginal trade-offs among the other attributes and we therefore still include them. Therefore, an alternative way to deal with these respondents in the welfare analysis is to make some assumption about their marginal utility of money and still include them.

Given the above discussion, we have three different scenarios for the restricted model: (i) All respondents have a positive WTP. We assume that those who ignored the cost attribute do not differ from those who did not. (ii) Only respondents who considered the environmental attribute have a positive WTP. Again, we assume that those who ignored the cost attribute have the same mean marginal utility of income as those who did not. (iii) Only respondents who considered the environmental attribute and the cost attribute have a positive WTP. In the analysis we will present and compare the results for all three scenarios. This allows us to put limits on the WTP associated with the uncertainty regarding different ways of treating those who ignored attributes.[11] The traditional way to deal with this issue in the literature is assuming that all respondents have positive WTP and that those who ignore a certain attribute generally have the same preferences as those who did not ignore the attribute. We make this assumption more explicit and discuss alternative interpretations.

[11] When using WTP estimates from the sample to infer benefits to the population as a whole, similar kinds of extreme assumptions are not unusual as it is generally difficult to elicit preferences for non-respondents; see Mitchell and Carson (1989) for a discussion.

4. Results

We use survey responses from a mail questionnaire sent out in June 2007 to a random sample of 3,000 men and women aged 18-75, selected from the Swedish census registry. Focus groups and several small pilot studies were also conducted before the main survey (1,000 questionnaires) for each objective was sent out. A single reminder was sent out three weeks after the main survey. In total 955 individuals returned the questionnaire, of which 304 (Marine environment), 342 (Lakes), and 309 (Air) were available for analysis due to non-responses to various questions.[12] Not everybody answered all six choice sets. However, we still chose to include these individuals in the analysis. As explained, following the CE the respondents stated whether they had ignored one or more attributes for whatever reason. Table 2 presents the descriptive statistics for the whole sample.

>> Insert Table 2 here

Comparing the descriptive statistics of the respondents with the national statistics, we find that the share of respondents who are women and the share of respondents with a university education are significantly higher, although only slightly, in this study than in Sweden as a whole (Statistics Sweden, 2008). However, there is no significant difference between the

[12] The total response rate is 32 % and is corrected for those who had moved and who for other reasons did not received the questionnaire.

mean age of the respondents and the mean age of this age group at the national level.[13] All these comparisons are tested with the bootstrapping method.[14]

Table 3 shows the shares of respondents who ignored the different attributes.

>> Insert Table 3 here

As seen in Table 3, the cost attribute and the cultural assets attribute are the most commonly ignored attributes. Compared with for example Hensher et al. (2005), the fraction of respondents who ignored an attribute is higher in our study. An exception is their attribute "uncertainty of time," which in their study was ignored by 37%. Campbell et al. (2006 and 2008) have similar results, although in total we have more respondents who ignored at least one attribute. This is reported in Table 4, which shows the fractions of respondents who ignored 1-5 attributes.

>> Insert Table 4 here

[13] About 17% of people aged 18-74 in Sweden have at least three years of university education, while the corresponding share in our sample is 21 % (Statistics Sweden, 2008). Furthermore, 53 % of the sample are women, while women represent 49 % of people aged 18-74 years in Sweden (Statistics Sweden, 2008).

[14] One thousand samples were bootstrapped by randomly drawing observations with replacement as many times as there are observations in the original sample. The differences between the means are calculated 1,000 times for each variable. By using the percentile method and the 95 % confidence interval, it can be shown whether the means significantly differ at the 5 % significance level. The advantage of the percentile method is that it makes no assumptions of the underlying distribution (Efron and Tibshirani, 1998).

Table 4 shows that a majority of the respondents ignored at least one attribute in the questionnaire on Balanced Marine Environment and Flourishing Lakes and Streams, while a little less than half did in the questionnaire on Clean Air. Moreover, it is quite uncommon that people ignored more than two attributes.

Willingness to pay estimates: Treatment of ignored attributes

We now turn to the results of the random parameter models. All models are estimated with simulated maximum likelihood using Halton draws with 500 replications with Nlogit 4.0; see Train (2003) for details on simulated maximum likelihood and Halton draws. All random attribute parameters are normally distributed. The full model results are presented in Appendix A. Table 5 reports the WTP estimates for the three environmental objectives. Remember that this is the WTP for an improvement of the attribute from the current level (opt-out) to the best possible level (the highest level of the attribute). The first model is the standard model where we do not restrict the parameters. In the second model, all attribute parameters ignored by the respondent are restricted. The WTP reported in the table is for the groups of respondents who considered the environmental attribute in question and the cost attribute. Note that we only report the population mean WTPs, i.e. marginal WTP is estimated as the ratio between the mean parameter of the attribute and the cost parameter. The standard errors of the WTP estimates are calculated using the Delta method, which involves a first-order Taylor series of the WTP expression (Greene, 2003).

>> Insert Table 5 here

Table 5 reveals that there are no systematic differences in WTP between the two model specifications for any of the CEs. Using t-tests we cannot reject the hypothesis of equal WTP

estimates between the two models for any of the attributes. This is in sharp contrast to previous studies comparing models with and without consideration of ignored attributes (DeShazo and Fermo, 2004; Hensher et al., 2005; Campbell et al., 2006 and 2008). Furthermore, accounting for ignored attributes does not result in less taste variation in the model. We calculate the coefficient of variation, the ratio of the standard deviation to the mean, for the six models in Table A1, and although there are differences between the models, there is no systematic pattern in the differences.

Are the attributes really ignored?

There are two aspects of ignored attributes that we now want to explore. The first is to what extent we can assume that the coefficients of ignored attributes are zero. The second is the implications of different assumptions about the preferences of those who ignored attributes. The first aspect is investigated by estimating random parameter logit model where we for each attribute estimate two coefficients: A coefficient for respective attribute and a coefficient capturing an interaction between the attribute and a dummy variable equal to one if the attribute was ignored.[15] If the interaction term is insignificant, this means that there is no significant difference in preferences between the two groups of respondents. In addition the sum of these two coefficients is the estimated preference for the attribute of respondents who stated that they ignored the attribute. Consequently, if the WTP is zero, then the sum of the two coefficients should not be significantly different from zero. All models are again estimated with simulated maximum likelihood using Halton draws with 500 replications. Table 6 presents the results.

>> Insert Table 6 here

[15] This approach was suggested to us by an anonymous referee.

Interestingly, many coefficients of the interactions terms are insignificant. This means that for a number of attributes, there is no significant difference in preferences between respondent who said they ignored an attribute and respondent who said they did not ignore an attribute. In particular the interaction terms for the cost attribute, (i.e., the attribute that is most often ignored) are never significant. For the other attributes, 8 out of 10 interaction coefficients are insignificant. This in turn implies that for a number of attributes, the sum of the two coefficients are significantly different from zero, implying a positive WTP despite that they stated that they ignored the attribute. Thus, it is not clear whether all respondents who claimed to have ignored the corresponding attribute really did so. One possibility is that they put less weight on the attribute, or that they ignored it in some choice sets. It also implies that it is not straightforward to assume that the coefficient actually should be zero for the ignored attribute. In either case, it seems that the respondents adopted some kind of simplifying decision strategy that deviates from the traditional view of rational respondent behavior. This in turn has important implications for the welfare analysis. This leads us in to the second aspect that we wish to discuss.

Implications of ignored attributes

In the cases when respondents really did ignore an attribute(s), we have to be careful when comparing the estimated WTPs in the two different models. For the model without restrictions, the WTP is the average marginal WTP for the whole sample. For the model where we restrict parameters of ignored attributes, the WTP is the average marginal WTP for the conditional sample of respondents who considered the cost attribute and the environmental attribute in question. The difference between the conditional and unconditional WTP depends on the assumptions we make and the share of respondents who ignored an attribute. Table 5 also reports the shares of respondents who considered the environmental

attribute in question and the cost attribute. The shares vary from 52 to 69 percent. We also report the shares of respondents who considered the environmental attribute in question, irrespective of whether they ignored the cost attribute. These shares are of course larger (in some instances very much so), which may have important implications.

Table 7 presents the estimated unconditional WTP for the restricted models, using the three different ways of treating those who ignored attributes as mentioned in Section 3: (i) all respondents have a positive WTP, (ii) only respondents who considered the environmental attribute have a positive WTP,[16] and (iii) only respondents who considered the environmental attribute and the cost attribute have a positive WTP.

>> Insert Table 7 here

Obviously, the unconditional WTP is substantially lower in the restricted model when we assume that those who ignored the attributes have a zero WTP. For example, if we assume that also those who ignored the environmental and the cost attribute have a positive WTP, then the unconditional WTP is 621 SEK for animals and plants for a Balanced Marine

[16] In (i) and (ii) we assume that those who ignored the cost attribute do not differ from those who did not. We tested whether the respondents who ignored the cost attribute made different trade-offs among the non-monetary attributes than other respondents, but found no significant differences. This was done by interacting the non-monetary attribute parameters with the dummy variable equal to one if they ignored the cost attribute. All the interaction terms were insignificant. Interestingly, this result differs from that of a somewhat similar experiment in Carlsson et al. (2007) where half of the respondents answered a standard CE while the other half answered a CE in which the cost attribute was held constant. The marginal rates of substitution among the attributes were significantly different between the two experiments. One explanation, according to the authors, is that the cognitive burden increases when the cost attribute varies. Another possible explanation is that the preferences between the cost attribute and the other attributes are not weakly separable.

Environment. If only those who considered the attribute have a positive WTP, then the unconditional WTP is 541 SEK.[17] If we instead assume that those who ignored the cost attribute and the environmental attribute have a zero WTP, then the unconditional WTP is even smaller: 404 SEK. This pattern is similar for all attributes, and the effect depends entirely on the share of respondents who considered the attributes. For the Balanced Marine Environment objective, the difference in WTP between (i) and (iii) is significant (using a t-test) for all attributes except one. For the Flourishing Lakes and Streams objective, the difference in WTP is not significant for any of the attributes, not even if we compare (i) and (iii). For the Clean Air objective, there is only a significant difference between (i) and (iii) for one attribute: animals and plants. Thus, the differences between WTPs are significant for half of the attributes and only when we compare the two extreme cases: that all respondents have a positive WTP and that only those who considered both the environmental and the cost attributes have a positive WTP. Thus, in our study, the welfare estimates will not be significantly different unless the share of respondents who ignored the attributes is sufficiently large.

Hence, how we interpret the answer to the follow-up question is going to be crucial for the welfare analysis. The problem with our approach is that we do not know why respondents ignored certain attributes. As discussed in the introduction, there are several different reasons for respondents to state that they ignore an attribute. However, it is safe to say that those who ignored the cost attribute do not have zero marginal utility of money, although the survey provides us with no information about the actual value. This is also confirmed in the logit

[17] The calculations are made by multiplying the conditional mean WTP of 621 SEK for endangered species with the share of respondents who considered the attribute (87 percent). The other estimates in Table 7 are calculated in a corresponding way.

models with separate cost coefficients for the two groups of respondents. The result still allows us to put limits on the WTP associated with the uncertainty regarding different ways of treating those who ignored attributes. Hence, different respondents can ignore attributes for different reasons, and the minimum and maximum value for each attribute in Table 5 reflects the lower and upper limit of the WTP.

Can we explain why some people ignored attributes?

One interesting question is whether there are systematic differences between respondents who ignored and those who did not ignore attributes when making choices. In order to investigate this, we estimate multivariate probit models with 50 draws using the GHK simulator for each environmental objective, where each model includes all the attributes for the specific objective. The dependent variables are equal to one if a respondent ignored the attribute considered. All the regression equations are estimated simultaneously to explore if there are common unobserved effects that explains ignorance of attributes. Table 8 presents the results.[18]

>> Insert Table 8 here

The results in Table 8 show that few of the coefficients are significant. This finding is in line with the results of Sælensminde (2001, 2002), who shows that education is the only one of the included socio-economic variables that is significant, indicating that inconsistent choices seem to be difficult to explain in general. Moreover, Johnson and Desvousges (1997) find no

[18] We also ran all the regressions with age and income dummies and age in a quadratic form to see whether there are some categorical or nonlinear effects, but found this to not be the case. When using a dummy variable for the older respondents (at least 60 years) we find that older people are more likely to ignore the Animals and plants attribute in the Balanced Marine Environment object.

attitudinal or socio-economic differences that could explain why some of their respondents gave inconsistent or invariable responses. The only significant results we find are that people with a university education are less likely to ignore a Cultural assets attribute than those with lower levels of education, and the older the respondent is, the more likely it is that he/she ignored the Health and recreation attribute in the Flourishing Lakes and Streams objective. At least the first result seems plausible, educated people and people from high socio-economic groups are more likely to consume cultural assets (O'Hagan, 1995). Moreover, we also find that respondents who live in rural areas and respondent who have at least one child are more likely to ignore the cost attribute in the Balanced Marine Environment objective. Interestingly, none of the coefficients in the Clean Air objective is significant.[19] Moreover, the multivariate probit model gives the correlation coefficients between all the dependent variables, i.e., the ignored attributes. The results show correlations between ignored non-monetary attributes, especially for the Balanced Marine objective, but the non-monetary attributes are never significantly correlated with the cost attribute. The correlations are reported in Table 8.

[19] It is possible that people are more or less likely to ignore attributes depending on how familiar the topic of the survey is to them. Unfortunately, we have no data on whether the respondents live close to a lake or a marine environment and cannot therefore further investigate the objectives a Marine Environment and Flourishing Lakes and Streams. (In Sweden it is quite common that people have summer houses close a lake or along the coast. Knowing whether the respondents have their permanent homes close to a lake or along the coast is therefore not enough to get a picture of how familiar they are with the topics of lakes and marine environment). However, we are able to investigate whether those who live in big cities, i.e., those who might suffer from bad air quality, ignored attributes in the experiment on Clean Air to a different extent than those who live in smaller towns or in rural areas. Interestingly, when analyzing whether a respondent ignored a non-monetary attribute (i.e. when aggregating all the three non-monetary attributes) we find that people living in one of the three biggest cities in Sweden were clearly less likely to ignore non-monetary attributes in the survey on Clean Air.

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Willingness to pay estimates: Implications for the environmental quality objectives

The Environmental Objectives Council has the overall responsibility for coordinating the implementation of environmental quality objectives. It monitors the actions of and policies designed by different governmental bodies in different sectors, and publish an annual progress report. However, past evaluations have made clear that many of the quality objectives are not going to be reached given current policy measures (SEPA, 2006). The government is therefore interested in obtaining more information about citizen preferences regarding the various quality objectives, and the different components of the objectives, in order to better prioritize the objectives. Thus, despite the uncertainty considering the welfare estimates and reasons why people ignore attributes, we also compare and in general terms trace patterns of how Swedish citizens value the different aspects of the environmental quality objectives. The trade-off between the interim targets animal and plants, human health and recreation, and cultural assets provides information about what targets should be prioritized.

We find that even if the content of a same attribute, (e.g. of cultural assets attribute), differs across the different environmental quality objectives making the comparison of attributes harder, people still seems to have clear preferences which attribute they experience as more or less important. Firstly, comparing the interim targets across and within the objectives, people generally seem to be most willing to pay for the attribute animals and plants. In comparison, the WTP for cultural assets-attributes is the lowest across all objectives, and the WTPs are insignificant for both Clean Air and Flourishing Lakes and Streams. Thus, people seem to put

a relatively low weight on cultural assets compared to human health and animals and plants.[20] As shown in Table 5, cultural assets are the most commonly ignored non-monetary attribute for all three environmental objectives. Thus, our results clearly show that there is a negative correlation between the share of people who ignored an attribute and the ranking of the attribute based on the WTP estimates. The WTP for health and recreation is relatively high for the environmental objective Clean Air but not for Flourishing Lakes and Streams. The difference is perhaps not surprising. For Clean Air we look at improvements that affect human health while for Lakes and Streams we look at recreational improvements. The WTP for reducing the number of premature deaths is still low compared with for example values of statistical life estimates. With a population of 9 million people, the WTP estimate implies a value of statistical life of 2.2 million SEK, while studies using the contingent valuation method for reducing traffic accidents have arrived at values around 20 million SEK (Person et al., 2001).

Finally, sixteen percent of the marine objective responses were opt-outs, while the corresponding shares for the air and lake objectives were 11 and 19 percent respectively. Thus, the respondents opted for the current environmental situation more often in the case of the Flourishing Lakes and Streams objective compared to the other two objectives. By using interactions between socio-economic variables and the opt-out alternative (results are reported in Table 6), we find that females and respondents with primary education are more likely to choose opt-out in the marine objective, i.e. they are satisfied with the today's' situation, while the older a respondent is the less likely it is that he/she chooses the opt-out alternative in the

[20] That Cultural assets are lowest ranked across all the objectives is in line with the results by Pearce et al., (2002). In their review of existing studies of cultural heritage they conclude that cultural heritage preservation is typically ranked low amongst competing public issues.

Balanced marine environment objective and Clean air objective. Only one interaction variable is significant in the Flourishing lakes and streams objective; respondents with university education are less likely to choose opt-out.

5. Conclusions

People for various reasons often ignore certain attributes when participating in stated preference studies. When investigating individuals' WTP in a CE it is important to be aware of which attributes a respondent has considered and which ones he or she has ignored. For example, if a respondent ignores the cost attribute, it is not possible to estimate his or her marginal WTP for the other attributes in an experiment. This implies that studies that do not take into account whether respondents considered the cost attribute are likely to give biased welfare estimates and therefore potentially lead to wrong policy implications.

The present study shows that the shares of respondents who considered both the environmental attribute and the cost attribute are between 52 and 69 percent. Therefore, what assumption we make about the WTP for those who ignored environmental attribute is crucial. If we assume that the marginal WTP is zero, the unconditional marginal WTPs are found to be substantially lower than if we assume that these respondents generally have the same preferences as those who did not ignore the corresponding attribute; i.e. if we assume that all respondents have positive WTPs. These findings can be interpreted in the light of different behavioral assumptions; our analysis shows that it becomes crucial to distinguish between the case when respondents ignore attributes for simplicity reasons and the case when respondents ignore attributes due to a zero WTP. This way we obtain an upper and a lower limit on the WTP estimates, depending on how we treat the respondents who ignored attributes.

However, using the respondents' own statements about whether an attribute was ignored in order to restrict parameters to zero, we find no significant differences in mean marginal WTP between the models for the whole sample and the models where we estimate WTP only for those who considered the attribute in question and the cost attribute. Moreover, we also find that for most of the non-monetary attributes, and for all the cost attributes, there are no significant differences in preferences between respondents who claimed to have ignored an attribute and respondents who said that they have not done that. However, we also find that the most commonly ignored attributes always have the lowest rankings in terms of WTP across all three environmental objectives. We therefore conclude that even if the coefficients of the attributes are not zero for the groups of subjects who claimed to have ignored the attribute, they seem to put less weight on those attributes than on others. This opens up for future work about modeling ignorance of attributes where our results show that restricting the individual parameter for the ignored attributes to zero might be too restrictive as many respondents probably just put less weight to the attribute the claim to have ignored. One way to deal with this would be to use the estimated probabilities from the models explaining the likelihood of ignoring attributes, as interaction terms in the econometric analysis of the CE responses. Ultimately this could be done simultaneously, but it would be daunting enough to do this in a two-stage procedure. In particular it would require that we are able to explain why subjects state that they ignore attributes, and if these variables also explain the variation in WTP, we would need to find proper instruments to deal with the endogeneity problem.

What we also show in this paper is that the reason why an attribute is ignored is equally important. This point to a number of important and difficult areas for future research. First of all, it is important to be able to find ways to discriminate among different reasons for ignoring attributes, since this is of relevance for welfare analysis. This is not as straightforward as it

seems, since there are many reasons why respondents ignore attributes. Second, it is of interest to investigate how the share of respondents who ignore attributes is related to the number of attributes and the general complexity of the CE.

Considering the Swedish environmental objectives, generalizing the outcome of our results they suggest that people have the highest willingness to pay for improvements concerning conservation of animals and plants, and for a direct impact on human well-being in terms of for example health. Recreational aspects seem to have lower priority, and cultural assets seem to be the least important when comparing people's WTP for the interim targets, both across and within the environmental objectives. This reveals some important information about citizens' preferences and trade-offs that they make.

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Table 1. Attributes and levels in the CE. The first level for each attribute is the opt-out level.

	Attributes	**Levels**	
	Survey 1 Marine Environment	*Opt out*	*Improvement*
Animals and plants	Number of endangered species	35	5, 15, 30
Discharge of oil and chemicals	Increase in surveillance of oil and chemical discharges	0%	10, 40%
Catch and growth of fish stock	Measure to increase the fish (cod) stock	0%	10, 40, 70%
Cultural assets	Number of fishermen at risk of losing their jobs	800	200, 600
	Survey 2 Lakes and Streams	*Opt out*	*Improvement*
Animals and plants	Number of endangered species	40	10, 20, 30
Human health and recreation	Share of lakes suitable for swimming	86%	90, 98%
Cultural assets	Share of unprotected ancient remains in water/ at coast	30%	40, 60, 80%
	Survey 3 Clean Air	*Opt out*	*Improvement*
Animals and plants	Number of acidified waters (due to bad air quality)	17000	3000, 8000, 14000
Human health and recreation	Number of premature deaths (due to bad air quality)	5000	1000, 2500, 4000
Cultural assets	Reduction, in percent, of number of damaged buildings (due to bad air quality)	0	10, 40, 60%
	All surveys	*Opt out*	*Improvement*
Cost[a]	Cost per year (SEK), same in all surveys	0	100, 300 600, 800, 1000

[a.] At the time of the survey 1 USD = 6.7 SEK.

Table 2. Descriptive statistics.

	Description	Mean	Standard deviation
Age	Age in years	48.86	15.78
Female	= 1 if female respondent	0.52	0.50
Have at least one child	= 1 if at least one child in the household	0.30	0.46
Household income per month	Income in SEK per month	24 742	13 070
Only primary education	= 1 if respondent only has primary education	0.20	0.40
University education	= 1 if respondent has university education	0.32	0.47
Lives in rural area	= 1 if respondent lives in a rural area	0.36	0.48
Lives in large city	= 1 if respondent lives in a large city	0.27	0.44
Member of environmental organization	= 1 if respondent is a member of an environmental organization	0.07	0.25

Table 3. Share of respondents who ignored a certain attribute.

	Balanced Marine Environment	**Flourishing Lakes and Streams**	**Clean Air**
Animals and plants	0.13	0.11	0.13
Health and recreation		0.13	0.18
Cultural assets	0.21	0.18	0.27
Oil and chemical spills	0.12		
Fish stock	0.11		
Cost	0.24	0.24	0.31

Table 4. Share of respondents who ignored attribute combinations.

	Balanced Marine Environment	**Flourishing Lakes and Streams**	**Clean Air**
Ignored at least one attribute	0.54	0.58	0.47
Ignored 1 attribute	0.38	0.35	0.33
Ignored 2 attributes	0.09	0.15	0.10
Ignored 3 attributes	0.05	0.07	0.03
Ignored 4 attributes	0.02	n.a.	n.a.
Ignored all attributes	0.00	0.01	0.01

Table 5. Average WTP (SEK) for attributes; standard errors in parentheses.

	Balanced Marine Environment		**Flourishing Lakes and Streams**		**Clean Air**	
	No restriction	Restricting ignored attributes	No restriction	Restricting ignored attributes	No restriction	Restricting ignored attributes
Animals and plants	521***	621***	375***	359***	970***	1017***
	(101)	(122)	(92)	(92)	(116)	(153)
Share considered attribute		87%		89%		87%
Share considered attribute and cost		65%		67%		60%
Health and recreation			230***	218***	756***	959***
			(53)	(52)	(150)	(206)
Share considered attribute				87%		82%
Share considered attribute and cost				67%		57%
Cultural assets	432***	371***	76	110*	81	22
	(71)	(85)	(75)	(78)	(66)	(84)
Share considered attribute		79%		82%		73%
Share considered attribute and cost		57%		63%		52%
Oil and chemical spills	502***	465***				
	(66)	(80)				
Share considered attribute		88%				
Share considered attribute and cost		66%				
Fish stock	529***	502***				
	(85)	(99)				
Share considered attribute		89%				
Share considered attribute and cost		69%				

*, **, *** significantly different from zero at the 10%, 5%, and 1% level respectively.

Table 6. Estimated random parameter logit models and p-values..

	Balanced Marine Environment		**Flourishing Lakes and Streams**		**Clean Air**	
Parameters	Coeff	P-value	Coeff	P-value	Coeff	P-value
Opt-out	-0.404	0.834	-3.7446	0.007	-0.8675	0.566
Opt-out × Female	1.693	0.057	0.3293	0.577	-0.2406	0.769
Opt-out × Age in years/10	-0.652	0.039	0.1927	0.387	-0.5925	0.025
Opt-out × Have at least on child	-0.767	0.444	-0.3659	0.608	1.8951	0.045
Opt-out × Only primary education	2.683	0.021	1.0407	0.173	1.4473	0.231
Opt-out × University education	1.894	0.155	-1.1567	0.091	1.0197	0.285
Opt-out × Lives in rural area	-0.047	0.966	-0.3559	0.597	-0.9329	0.329
Opt-out × Lives in large city	-0.884	0.478	-0.1098	0.879	1.1799	0.206
Opt-out × Member of environmental org.	-0.514	0.791	-1.8083	0.196		
(1) Animals and plants	-0.028	0.000	-0.0230	0.000	-0.0002	0.000
(2) Animals and plants × ignored attrib.	0.018	0.159	-0.0181	0.303	0.0000	0.575
(1) + (2)	-0.010	0.402	0.0410	0.013	0.0002	0.000
(3) Health and recreation			0.0404	0.000	-0.0005	0.000
(4) Health and recreation × ignored attrib.			-0.0170	0.479	0.0004	0.054
(3) + (4)			0.0234	0.297	-0.0001	0.489
(5) Cultural assets	-0.001	0.000	0.0062	0.056	0.0046	0.130
(6) Cultural assets × ignored attrib.	0.000	0.317	-0.0152	0.040	-0.0058	0.310
(5) + (6)	-0.001	0.000	-0.0089	0.185	-0.0012	0.809
(7) Oil and chemical spills	0.018	0.000				
(8) Oil and chemical spills × ignored attrib.	0.004	0.550				
(7) + (8)	0.022	0.001				
(9) Fish stock	0.011	0.000				
(10) Fish stock × ignored attribute	0.006	0.319				
(9) + (10)	0.016	0.003				
(11) Cost	1.503	0.000	-2.0653	0.000	2.4815	0.000
(12) Cost × Ignored attribute	0.169	0.505	0.2727	0.297	0.4139	0.366
(11) + (12)	-1.334	0.000	-1.7926	0.000	?	?
Standard dev.						
Opt-out	6.079	0.000	3.6833	0.000	4.6233	0.000
Endangered species	0.041	0.000	0.0624	0.000	0.0002	0.000
Health and recreation			0.0559	0.004	0.0011	0.000
Cultural assets	0.001	0.182	0.0309	0.000	0.0003	0.977
Oil and chemical spills	0.010	0.118				
Fish stock	0.012	0.000				
No. individuals	296		334		310	
McFadden pseudo R-squared (No coeff.)	0.34		0.30			

Table 7. Unconditional WTP for attributes (in SEK) under various assumptions of the WTP of those who ignored the attribute and cost; standard errors in parentheses.

	Balanced Marine Environment			**Flourishing Lakes and Streams**			**Clean Air**		
Model	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)
Assumption about those who ignored the attribute	Positive WTP	Zero WTP	Zero WTP	Positive WTP	Zero WTP	Zero WTP	Positive WTP	Zero WTP	Zero WTP
Assumption about those who ignored the cost	Positive WTP	Positive WTP	Zero WTP	Positive WTP	Positive WTP	Zero WTP	Positive WTP	Positive WTP	Zero WTP
Animals and plants	621	541	404	359	320	241	1017	885	610
	(122)	(106)	(79)	(92)	(83)	(62)	(153)	(133)	(92)
Health and recreation				218	190	146	959	787	547
				(52)	(46)	(35)	(206)	(169)	(117)
Cultural assets	371	293	211	110	90	69	22	16	13
	(85)	(67)	(48)	(78)	(64)	(49)	(84)	(62)	(44)
Oil and chemical spills	465	409	307						
	(80)	(70)	(53)						
Fish stock	501	447	346						
	(99)	(88)	(68)						

Table 8. The coefficients of the Multivariate Probit model on the probability of ignoring attributes in the CE; p-values in parentheses.

	Balanced Marine Environment					**Flourishing Lakes and Streams**				**Clean Air**			
	Animals and plants	*Cultural assets*	*Oil and chemic. spills*	*Fish stock*	*Cost*	*Animals and plants*	*Health and recreation*	*Cultural assets*	*Cost*	*Animals and plants*	*Health and recreation*	*Cultural assets*	*Cost*
Constant	-1.051	-0.163	-0.332	-1.099	-1.406	-0.719	-1.771	-0.731	-0.969	-0.912	-0.754	-0.267	-0.810
	(0.037)	(0.696)	(0.548)	(0.085)	(0.001)	(0.109)	(0.001)	(0.097)	(0.035)	(0.054)	(0.120)	(0.480)	(0.040)
Age in years/10	0.073	-0.057	-0.076	0.049	0.059	0.039	0.165	0.004	0.111	0.014	0.036	-0.079	0.084
	(0.354)	(0.433)	(0.443)	(0.633)	(0.365)	(0.629)	(0.050)	(0.961)	(0.120)	(0.867)	(0.599)	(0.201)	(0.144)
Female	-0.073	-0.120	-0.284	-0.124	0.157	-0.224	-0.310	-0.232	-0.178	-0.064	0.119	0.115	-0.064
	(0.777)	(0.553)	(0.286)	(0.644)	(0.340)	(0.276)	(0.155)	(0.188)	(0.300)	(0.774)	(0.593)	(0.523)	(0.705)
Have at least one child	-0.081	-0.342	-0.335	0.177	0.464	0.235	0.216	0.326	0.265	-0.228	-0.228	-0.036	0.042
	(0.778)	(0.159)	(0.367)	(0.625)	(0.031)	(0.385)	(0.477)	(0.164)	(0.207)	(0.432)	(0.417)	(0.865)	(0.835)
Household income/month in 10,000 SEK	-0.115	0.023	-0.082	-0.173	0.013	-0.074	-0.163	-0.026	-0.073	-0.032	-0.072	0.049	-0.051
	(0.257)	(0.778)	(0.509)	(0.218)	(0.864)	(0.479)	(0.193)	(0.785)	(0.316)	(0.760)	(0.409)	(0.516)	(0.449)
Only primary education	0.087	-0.453	0.405	0.365	-0.239	0.164	0.071	-0.088	-0.190	-0.107	0.228	-0.036	-0.026
	(0.804)	(0.151)	(0.280)	(0.360)	(0.363)	(0.556)	(0.788)	(0.706)	(0.413)	(0.739)	(0.408)	(0.891)	(0.910)
University education	0.121	-0.329	-0.032	0.421	0.054	0.043	0.153	-0.444	0.031	-0.285	-0.210	-0.046	0.045
	(0.764)	(0.167)	(0.923)	(0.245)	(0.805)	(0.852)	(0.538)	(0.046)	(0.875)	(0.314)	(0.395)	(0.813)	(0.814)
Lives in rural area	-0.362	-0.344	-0.300	-0.339	0.519	-0.358	0.261	-0.043	-0.167	0.163	-0.159	-0.287	0.031
	(0.204)	(0.181)	(0.326)	(0.258)	(0.021)	(0.165)	(0.268)	(0.831)	(0.388)	(0.497)	(0.458)	(0.167)	(0.875)
Lives in large city	-0.378	0.160	-0.166	-0.575	-0.030	-0.022	0.149	0.094	-0.138	-0.180	-0.375	-0.198	0.157
	(0.275)	(0.526)	(0.609)	(0.343)	(0.907)	(0.937)	(0.610)	(0.685)	(0.540)	(0.569)	(0.183)	(0.354)	(0.431)
Member of environmental organization[A]	0.663	0.007	-0.192	0.694	-0.033	0.138	0.335	0.354	0.093				
	(0.140)	(0.988)	(0.703)	(0.149)	(0.939)	(0.765)	(0.419)	(0.338)	(0.780)				
Correlations between the ignored attributes													
Animals/plants and Oil	0.794												
	(0.000)												
Animals/plants and Fish	0.809												
	(0.000)												
Oil and Fish	0.820												
	(0.000)												
Animals/plants and Health/recreation						0.750				0.711			
						(0.000)				(0.000)			
Animals/plants and Cultural assets	0.246					0.378				0.161			
	(0.135)					(0.008)				(0.309)			
Health/recreation and Cultural assets						0.174				0.057			
						(0.258)				(0.671)			
Oil and Cultural assets	0.131												
	(0.411)												
Fish and Cultural	0.150												

assets	(0.391)													
Animals/plants and	-0.126					-0.065				0.139				
Cost	(0.591)					(0.674)				(0.321)				
Health/recreation						0.017				0.100				
and Cost						(0.895)				(0.421)				
Oil and Cost	-0.050													
	(0.797)													
Fish and Cost	0.084													
	(0.675)													
Cultural assets and	-0.216					0.0185				0.154				
Cost	(0.158)					(0.887)				(0.164)				
No. of obs.	287	287	287	287	287	330	330	330	330	300	300	300	300	

[A]= the variable *Member of environmental organization* is perfectly correlated with the likelihood that the attribute *Animals and Plants* is ignored in the Clean Air regression, and this variable is therefore excluded from the Clean Air regression.

Appendix A

Table A1. Estimated random parameter logit models; p-values in parentheses.

Parameters	Balanced Marine Environment		Flourishing Lakes and Streams		Clean Air	
	No restriction	Restricting parameters	No restriction	Restricting parameters	No restriction	Restricting parameters
Opt-out	-0.132	-0.918	-3.5154	-4.2523	-0.7010	-1.0363
	(0.942)	(0.612)	(0.003)	(0.003)	(0.642)	(0.487)
Opt-out × Female	2.113	1.816	0.1560	0.3139	-0.2885	-0.2489
	(0.023)	(0.039)	(0.772)	(0.590)	(0.713)	(0.737)
Opt-out × Age in years/10	-0.662	-0.611	0.1866	0.3105	-0.5782	-0.5089
	(0.031)	(0.060)	(0.352)	(0.182)	(0.028)	(0.042)
Opt-out × Have at least on child	-0.872	-0.753	-0.4345	-0.2977	1.8492	-1.7432
	(0.385)	(0.446)	(0.498)	(0.671)	(0.042)	(0.048)
Opt-out × Only primary education	2.783	2.702	0.8960	0.9134	1.5670	1.2615
	(0.010)	(0.036)	(0.202)	(0.241)	(0.199)	(0.224)
Opt-out × University education	1.874	1.700	-1.3099	-1.2923	0.9933	0.9373
	(0.113)	(0.143)	(0.043)	(0.055)	(0.275)	(0.260)
Opt-out × Lives in rural area	-0.355	-0.133	-0.4793	-0.3557	1.1774	-1.0447
	(0.737)	(0.900)	(0.418)	(0.571)	(0.222)	(0.220)
Opt-out × Lives in large city	-0.602	-0.788	-0.0534	-0.2318	1.3386	-1.1573
	(0.612)	(0.499)	(0.941)	(0.758)	(0.169)	(0.206)
Opt-out × Member of environmental org.	-0.171	-0.474	-1.7467	-1.8704		
	(0.908)	(0.726)	(0.194)	(0.130)		
Endangered species/ Acidified waters	-0.026	-0.026	-0.0253	-0.0223	-0.0002	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Health and recreation			0.0386	0.0338	-0.0005	-0.0004
			(0.000)	(0.000)	(0.000)	(0.000)
Cultural assets	-0.001	-0.001	0.0031	0.0041	0.0032	0.0007
	(0.000)	(0.000)	(0.313)	(0.162)	(0.231)	(0.791)
Oil and chemical spills	0.019	0.015				
	(0.000)	(0.000)				
Fish stock	0.011	0.009				
	(0.000)	(0.000)				
Cost	1.481	1.264	-2.0172	-1.8588	2.3649	-1.8311
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Standard dev.						
Opt-out	6.122	6.240	3.7790	4.0090	4.4738	4.3881
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Endangered species	0.042	0.035	0.0646	0.0492	0.0002	0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Health and recreation			0.0533	0.0037	0.0011	0.0010
			(0.004)	(0.941)	(0.000)	(0.000)
Cultural assets	0.001	0.001	0.0325	0.0263	0.0002	0.0001
	(0.036)	(0.7994)	(0.000)	(0.000)	(0.988)	(0.992)
Oil and chemical spills	0.012	0.009				
	(0.025)	(0.185)				
Fish stock	0.012	0.012				
	(0.000)	(0.000)				
No. individuals	296	296	334	334	303	303
McFadden pseudo R-squared (No coeff.)	0.34	0.32	0.30	0.28	0.42	0.38

Appendix B

Figure B1. An example of a choice set for the Clean Air objective experiment.

	Alternative 1 (Current situation)	**Alternative 2**	**Alternative 3**
Animals and plants	17,000 lakes are severely acidified because of air pollution	14,000 acidified lakes	3,000 acidified lakes
Human health and recreation	5,000 premature deaths per year due to air pollution	1,000 premature deaths per year	2,500 premature deaths per year
Cultural assets	Air pollution damages buildings	60 % fewer cultural buildings are damaged	40 % fewer cultural buildings are damaged
Increased tax per year and household, during next 5 years	0 SEK	+ 300 SEK	+ 800 SEK

If you could only choose among these three alternatives, which one would you choose?

□ Alternative 1 (current situation)

□ Alternative 2

□ Alternative 3