The Effect of Varying the Causes of Environmental Problems on Stated Values: Evidence from a Field Study[*]

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Abstract

Standard applications of utility theory assume that utility depends solely on outcomes and not on causes. This study uses a field experiment to determine if alternative causes of an environmental problem affect willingness to pay to ameliorate it. Making use of a unique sample drawn from the Netherlands, which includes more than 2000 households, we find that people are willing to pay significantly more to correct problems caused by a small group of people for their own gain, rather than by society at large or by nature. This finding suggests that economic agents care about both outcomes and causes when placing a value on a nonmarket good or service. A second result is that stated willingness to pay values obtained via "cheap talk" and "consequential" treatments are lower than comparable values obtained without inclusion of these protocols. These findings may have important implications for economic theorists, empirical researchers, and policymakers.

Key words: field experiment, endangered species, non-market valuation

1. Introduction

Most applications of microeconomic theory treat utility as a function of economic outcomes, such as amounts of goods consumed, levels of pollution experienced, or the number of endangered animals protected. The process by which goods are acquired, the cause of pollution, or the reason why an animal population is threatened is regarded as relatively unimportant. An experimental literature recently has emerged, however, suggesting that people not only care about outcomes, but also about causes (e.g., Fehr and Schmidt [7], Fehr and Gachter [8]). In a related vein, Kahneman *et al*. [12] and Knetsch's [13] findings imply that people not only care about their own payoffs, but also are concerned with "fairness" and devise "rules of acceptable behavior" to shape their own actions, and judgements about actions taken by others. Yet, the extent to which alternative causes of an environmental problem might affect willingness to pay to ameliorate it has been the subject of very little investigation.

This study uses data from a questionnaire administered to a panel of Dutch citizens to test whether stated values to protect a locally threatened species (seals in the Netherlands) are affected by the cause of the threat. Causes presented to respondents were varied across three groups, distinguishing between a natural cause (virus), a global pollutant (greenhouse effect), and actions by local firms (oil and gas drilling). People were willing to pay significantly more to protect seals when they appear to be threatened by an act of mankind (greenhouse effect), rather than an act of nature (virus), and still greater amounts when the threat appears to come from a small group of people (oil and gas drillers) who stand to benefit financially. Also, we address whether stated willingness to pay (WTP) is affected by the way in which values are elicited (i.e., using hypothetical questions with and without cheap talk and consequentialism) and contrast stated WTP values with those obtained by posing the valuation question in a

willingness to accept (WTA) format. Findings are broadly consistent with those from other studies (Cummings and Taylor [6], List [14], Carson *et al.* [2]) in that: (1) stated values obtained via cheap talk and consequentialism devices are significantly lower than comparable values obtained without these treatments, (2) stated values across the cheap talk and consequentialism treatments are statistically indistinguishable, and (3) people require greater compensation to accept the destruction of seals than they are willing to pay to save them.[1]

2. Data and experimental design

Data were obtained from a survey of participants in the CentERpanel, which consists of more than 2,000 households in the Netherlands. Panel members are selected to be representative of the Dutch population. Panelists receive a "netbox" from CentER, Tilburg University, so that they can retrieve and return questionnaires via a television. To ensure a good response rate, before panelists are selected, they are interviewed to investigate their commitment to completing questionnaires to be sent each week. In practice, when given the chance, a large majority of households agree to be part of the CentERpanel. Appendix A provides a summary of our sample and provides comparisons that show the demographic representativeness of our sample.[2]

Our analysis focused on declines in the seal population in the Waddenzee (an estuary in the North of the Netherlands), a problem that has been widely publicized in the Netherlands for many years. The seal population reached a low point of about 300 animals in the 1970s. Currently the number of animals has recovered to some 2,000 seals, but that number is still much lower than the 18,000 seals that lived in the Waddenzee in the beginning of last century.

[1] Of course, it is an open question how these hypothetical payments would compare to the case of real payments debated by Cummings *et al.* [4] on the one side and Haab *et al.* [10] on the other. Institutional restrictions on how the panel could be used prevented us from asking respondents to make actual cash payments to protect seals.
[2] Additional information regarding the panel is available at www.centerdata.nl.

The seal population is threatened by three possible and distinct developments. First, new diseases (especially certain viruses) have taken a severe toll on the population in the past and continue to pose a serious threat.[3] Second, climate change and the associated rise of the sea level might trigger the disappearance of the seal's breeding grounds. Third, commercial oil and gas drilling may have the same effect, not because the sea level rises, but because the land level falls. The threat from viruses represents the case in which the seal population may be harmed by natural causes for which no societal group is responsible, whereas with oil and gas drilling, actions taken by a comparatively small group of people for private gain contribute directly to the species hardship. Climate change represents an intermediate situation in which virtually everyone is to some extent responsible for the problem.

In the survey, members of CentERpanel were randomly assigned to one of three groups of equal size. After a brief introduction (common to all groups), in which attention was directed to the declining seal population, each group was presented a script in which one of the three types of threats was highlighted along with a plausible mitigation measure. These scripts, labelled virus, climate change, and oil and gas drilling, are shown below in translation to English from Dutch.

1. Virus: A number of factors continues to threaten the seal population. One important threat is a new virus that undermines the species' resistance to various diseases. The origins of the virus are unknown, but it is regarded as a "natural enemy" of the seal population. The spreading of the virus is a natural process, independent of human actions. It is possible that, without any preventive actions, the seal population in "de Waddenzee" falls by some 50%. An effective preventive measure would be a vaccination program.

2. Climate change: A number of factors continues to threaten the seal population. One important threat is climate change, mainly caused by burning of fossil fuels. Climate change (or the greenhouse effect) is a global problem because all people using fossil

[3] As a matter of fact, one of these three threats did affect the seal population shortly after completing the data gathering process. A virus has killed a significant share of the population and experts predict that as much as half the population might die as a result.

fuels are responsible for the emissions of carbon dioxide in the atmosphere (and not simply people in the Netherlands). An important risk of climate change and the associated rise of the sea level is that breeding grounds will be submerged for longer periods. This will negatively impact on the ability of female seals to deliver and feed young seals. It is possible that, without any preventive actions, the seal population in "de Waddenzee" falls by some 50%. An effective preventive measure would be elevating the existing sand banks by adding sand to them.

3. Oil and gas drilling: A number of factors continues to threaten the seal population. One important threat is drilling for gas by oil and gas companies in "de Waddenzee." An important risk of gas exploitation is that the land level will fall so that breeding grounds will be submerged for longer periods. This will negatively impact on the ability of female seals to deliver and feed young seals. It is possible that, without any preventive actions, the seal population in "de Waddenzee" falls by some 50%. An effective preventive measure would be elevating the existing sand banks by adding sand to them.

Respondents in each group were then asked to value conservation measures (vaccinations or elevating sand banks, depending on treatment type) to protect the seal population from further harm. The three causes (virus, climate change, and oil and gas drilling) were crossed with four methods of eliciting values, providing us with a 3x4 experimental design. Three of the value elicitation methods were aimed at obtaining WTP (hypothetical, hypothetical/cheap talk, and consequentialism), and the fourth method elicited WTA. In each case, respondents were asked one referendum-type valuation question. Follow-up questions were not used because questionnaires used in CentERpanel are not interactive. Scripts used are shown below, again in translation to English from Dutch.

1. Hypothetical: The government can decide to take special measures to protect the seal population from the above-mentioned threat. Such measures, however, are costly. Would you be willing to pay a one-time amount of DFL X to support protection of the seal population? All the money would be used to finance a vaccination program/elevation of sand banks (choose appropriate case).

   "yes"
   "no"

2. Hypothetical/Cheap Talk: The government can decide to take special measures to protect the seal population from the above-mentioned threat. Such measures, however,

are costly. Would you be willing to pay a one-time amount of DFL X to support protection of the seal population? All the money would be used to finance a vaccination program/elevation of sand banks (choose appropriate case).

Note: this is a hypothetical question! You don't have to actually pay the money. In general, people experience difficulties answering hypothetical questions. People typically bid more money then they are really willing to pay.

One reason why people might be tempted to bid too much is as follows. People try to accept or reject a bid based on their evaluation of the "true value" of the commodity (in this case, seal conservation in "de Waddenzee"). But if people should actually make the payment, they also consider that they can spend their money only once and that money spent on seal conservation is not available for other purchases.

When answering the bid question below, try to think whether you are really willing to pay this amount for the conservation of seals. Try to imagine that this amount of money is no longer available to finance other purchases.

Would you be willing to pay a one-time amount of DFL X to protect the seal population?

"yes"
"no"

3. Consequentialism: The government can decide to take special measures to protect the seal population from the above-mentioned threat. Such measures, however, are costly. Would you be willing to pay a one-time amount of DFL X to support protection of the seal population? All the money would be used to finance a vaccination program/elevation of sand banks (choose appropriate case).

   Note: the results of this study will be made available to policy makers, and could serve as a guide for future decisions with respect to taxation for this purpose. It is important that you think before answering the question.

   Would you be willing to pay a one-time amount of DFL X to protect the seal population?

   "yes"
   "no"

4. Willingness To Accept: Assume that no special measures are taken to protect the seal population from the above-mentioned threat. Further, assume that the government tries to compensate the Dutch people for the resulting loss of "nature." If the government offers to pay you a one-time amount of DFL X, would you feel fully compensated for the reduction in the seal population?

"yes"
"no"

Within each of the 12 experimental design cells, respondents were randomly confronted with bid levels drawn from the set (DFL 10, 40, 80, 120, where DFL 2.2 ≈ Euro 1≈ US$1).

Three additional points should be made regarding the elicitation of values for protecting seals. First, the hypothetical/cheap talk script is a shortened and revised version of the scripts used by Cummings and Taylor [6] and by List [14]. While their scripts were longer and describe hypothetical bias in some detail, we opted for a shortened version in an attempt to minimize the amount of text that respondents had to read. We note that Cummings and Taylor's [6] and Poe *et al.*'s [16] short cheap talk treatments did not eliminate hypothetical bias. Our script could meaningfully be thought of as in the spirit of these shorter scripts. Second, our use of consequentialism followed as closely as possible Carson *et al.* [2] and Cummings and Taylor [5], who use randomization devices to provide subjects with uncertainty about whether the exercise will actually be economically binding. To ensure that we were not misleading the subjects, before running the treatments, we contacted policymakers in The Netherlands to let them know about our research agenda and informed them that we would pass along our results when complete. Third, at the end of the survey, respondents answered an open-ended debriefing question requesting additional comments about the questionnaire. Responses to this question did not suggest that respondents misunderstood or misinterpreted any of the survey questions, including the valuation questions.[4]

[4]A tabulation of these responses, however, suggests that some people are opposed to paying for environmental problems caused by oil and gas firms. One conjecture is that these respondents might provide a value because it is the only available way to register their unhappiness with the situation. However, only 33 of 466 respondents who received the oil/gas drilling script in one of the three WTP formats stated that they thought firms should pay and they should not, and of these persons, 31 refused to pay the bid value presented. We thank Mark Dickie for encouraging our investigation of this point.

In theory, the added level of consequentialism should provide agents with an incentive to state their true preferences (see, e.g., Carson *et al*. [2]). Thus, if the cheap talk script and the use of consequentialism yield similar valuation figures, then the evidence suggests that they are both providing estimates of true value. Yet, because we could not use actual treatments for real money with the CentER panel, this remains speculative, but given that both protocols have yielded responses close to actual values in previous studies (e.g., Cummings and Taylor [6], List [14], Carson *et al*. [2]), evidence would at least be in line with the truthful revelation conjecture.

A preliminary version of the questionnaire was administered to 100 panelists who were randomly selected for a pilot test. Among other things, the pilot was used to establish that the questions were understandable and that the bid levels used in the experiment roughly spanned the range of WTP values expressed by CentER panelists. The instrument was then revised and sent to all panelists who did not participate in the pilot experiment in September 2001. Panelists had 5 days to complete the survey 'on line,' and no subject participated in more than one treatment.

The final sample included 1819 panelists, giving a response rate of more than 95%. All panelists who responded answered all of the questions presented. Table 1 provides a summary of the number of respondents in each treatment cell and can be read as follows: in the "hypothetical-virus" treatment in row 1, column 1, 42 subjects responded to the Dfl 10 question, 35 to the Dfl 40 question, etc. Table 2 presents means of selected variables pertaining to the 1819 panelists included in the sample. As shown, the panelists average 46.5 years of age, earn an average gross income of Dfl 8150 per month, and live in households with an average of 2.59 household members (with an average of 0.82 children). The sample

consists of more males than females (55% vs. 45%) and 76% of panelists have a partner living with them.

Because treatment assignment was random, there should be no difference in respondent characteristics between the 12 treatment cells. In the cases of age, whether a partner is present, and gender, the homogeneity null was never rejected using a two-tail difference between means tests at the $p < .05$ level assuming unequal population variances (Sheskin 1997). For respondents' gross income, the null hypothesis of no difference between cell means was rejected in one of the pair-wise comparisons, but this outcome appears to be due to one sample member that earned a much higher income than any other sample member. Mean numbers of household members and mean numbers of children present in the household, however, exhibited more variation between treatment cells and the null hypothesis of no difference between means of these variables was rejected in a few instances. Details of these tests are available from the authors on request.

3. Analysis

Analysis of the data begins by comparing fractions of respondents across treatments that stated they would pay the amount presented in the survey to prevent further harm to the seal population in de Waddenzee. These comparisons, presented in Table 3, should be considered only as suggestive because they do not completely control for the bid value presented to respondents. As shown in Table 1, the percentage of respondents that were shown the four bid values differs somewhat between treatment cells (because of the less that 100% response rate), and as demonstrated momentarily, the likelihood that a respondent would offer to pay the amount presented is smaller for larger bid values. Nevertheless, it is useful to obtain at least a rough idea about treatment effects before proceeding with a more detailed analysis.

The most striking difference reported in Table 3 is between WTA and the three methods of eliciting WTP. Only 10-15% of respondents stated that they would voluntarily accept the bid value in lieu of taking further protective action for the seals, whereas the fraction of respondents who reported that they would pay the bid value to support greater protective efforts was never less than 36% (the hypothetical/cheap talk—virus cell) and frequently above 50%. In any case, null hypotheses of equal proportions are rejected at the $p < .01$ level when comparing WTA with any of the WTP measures. This outcome is consonant with findings in previous field studies, which show that gains are valued differently than losses (see Horowitz and McConnell [11] for a review). Also, among WTP treatments, respondents appear to more frequently agree to pay the stated bid value when: (1) oil and gas drilling, rather than a virus or climate change, is responsible for the declining population of seals, and (2) the valuation question is framed without using cheap talk or consequentialism.[5]

Because differences between WTA and WTP values for environmental attributes have been considered at length elsewhere (again, see Horowitz and McConnell [11]), the remainder of this section considers the nine WTP treatment cells using equation (1), in which the natural logarithm of WTP to protect seals (Y) is expressed in terms of treatment effects (X) and controls (Z)

$$Y = X\beta + Z\gamma + u \qquad (1)$$

where β and γ are coefficients to be estimated and u is a normally distributed disturbance with variance σ^2. Specifying equation (1) in log-linear form has the advantage that predictions of negative WTP values are ruled out. In the data described above, however, values of WTP are

[5] Pair-wise differences between proportions among WTP treatments, however, generally are not significant at conventional levels, except when one of the treatment cells considered is Hypothetical/Cheap talk—Virus.

latent and we instead observe whether respondents stated they would or would not pay a particular bid value. In consequence, our analysis is based on a binomial probit regression in which the response to this yes/no question, denoted y, is the dependent variable and X and Z are explanatory variables.

In general, the binomial probit model is over-parameterised, so that only estimates of normalized coefficients (β/σ and γ/σ) can be obtained (Greene [9]). Cameron and James [1] have shown, however, that when bid values are varied across respondents, the level of the bid can be included in the probit regression and its coefficient gives a point estimate for $-1/\sigma$. This is an important result because an estimate of σ permits estimates of the coefficient vectors β and γ to be recovered. These coefficient vectors, in turn, can be interpreted in terms of equation (1) as a set of marginal effects of covariates (X) on WTP. As previously discussed, our study randomly varied bid values across respondents in each treatment cell; thus we are able to take advantage of this insight. On the other hand, Cummings *et al.* [4], in their experimental comparison of hypothetical and actual WTP values, presented each subject with the same bid value. Hence, in their study it was not possible to identify the scale (or variance) parameter.

Results from the binomial probit regression are shown in Table 4. These results are broadly consistent with the analysis of means presented in Table 2. Because equation (1) is in log-linear form, the natural logarithm of the bid value is entered as an explanatory variable. The first column of Table 4 lists the covariates, the second column presents means from the 1386 sample members that were assigned to one of the three WTP treatments, the third column presents binomial probit estimates of the normalized coefficients (β/σ and γ/σ), the fourth column presents estimates of the unnormalized coefficients (β and γ) with standard errors

computed by Taylor series expansion, and the fifth column presents point estimates of marginal WTP. Covariates included in the regression are of two types, treatment cell dummy variables and controls for respondent characteristics (gender, age, schooling, and gross household income).

Before considering results for treatment effects, five aspects of the results presented in Table 4 warrant discussion. First, respondents are significantly less likely (at the $p < .01$ level) to pay higher bid values than lower bid values, as would be expected. This result is reassuring as an internal consistency check in that it suggests that the demand curve for seal protection is downward sloping. Second, while control variables (gender, age, schooling, and income) appear to be largely unimportant, one insight gained is that women's WTP functions to protect seals are on a higher plane than men's WTP functions. Third, we tested the sensitivity of results presented in Table 4 by including different combinations of variables listed in Table 2 (which exhausted information about respondents available in CentERpanel) and using an alternative definition of income (after-tax household income). In these regressions, coefficients of controls other than for gender always were insignificant at conventional levels and coefficients of $\log_e$(bid value) and the treatment effects were quite similar to those reported in Table 4. One potential reason why control variables are relatively unimportant in this analysis is that the bid values presented to respondents are small relative to household income.

Fourth, as described above, the coefficient of $\log_e$(bid value) is a point estimate for $-1/s$, so that an estimate of s across all treatments (see Column 4) is (1.0/0.307)=3.26. In this context, a question arises whether s varies across different treatments, creating the type of heteroskedasticity problem highlighted by Haab *et al*. [10] in their comment on Cummings *et*

al. [4]. Our empirical results suggest that heteroskedasticity does not play an important role. We ran several other regressions (not shown here), specified in the same manner as equation (1), except that the price variable was interacted with treatment effects. A likelihood ratio test indicates that the null hypothesis that coefficients of these interaction terms are jointly zero is not rejected at the $p < .05$ level. We conclude that values of s across all treatments are statistically indistinguishable. Fifth, we also ran regressions in which treatment effects were interacted, but these regressions tell a quite similar story about WTP as the regression presented in Table 4.

Does the source or cause of an environmental problem affect WTP? As typically applied, standard utility theory holds that utility depends solely on outcomes, and that the cause is unimportant. If people value only outcomes and do not care about the cause, we should find that coefficients of the oil and gas drilling and the climate change treatment variables do not differ significantly from the coefficient of the virus treatment variable. Estimates in Table 4 suggest that cause or source of the problem does matter: people care about both causes and outcomes. On average, respondents are, at the margin, willing to pay about DFL 69 more to correct damage done by oil and gas drilling firms than to correct similar damage caused by a natural virus. Notice that this outcome does not appear to reflect a tendency for respondents to say they would pay even though they felt that oil/gas firms should pay instead. Also, marginal WTP to correct damages caused by global society is about half that observed in the oil/gas drilling context. Besides being economically significant, these effects are statistically significant at the $p < .05$ level.

These findings are cautiously interpreted to imply that WTP may be partly governed by fairness considerations. People appear to be willing to pay to correct natural fluctuations in the

seal population, but the situation is considered "worse" when the decline in seal abundance is caused by neglect of ecological integrity when society as a whole consumes fossil fuels. And, the perception appears to be heightened when firms sacrifice nature in their pursuit of profits. Along the three scenarios, from natural causes on one end to oil and gas drilling on the other, a gradient can be distinguished where (*i*) the responsibility can be more clearly assigned and (*ii*) the private gains that cause the seals' demise become more concentrated. In accordance with Kahneman *et al*. [12] and Knetsch [13], this result implies that as the scenarios are considered increasingly unfair, people may be willing to incur greater individual sacrifices to correct the problem. Other explanations for our results, however, are surely possible and additional research is needed to better establish why the cause of environmental problems is an important determinant of WTP.

Does the method for eliciting values affect respondents' WTP? If elicitation method does not matter, we should find that the coefficients of the hypothetical/cheap talk treatment and the hypothetical treatment are not significantly different from the coefficient of the consequentialism treatment. Consistent with results presented in Table 3, Table 4 makes clear that this is not the case. On average, respondents state they are willing to pay an extra DFL 40 when confronted with a purely hypothetical question, as compared to the 'consequentialism' case where they are informed that their decisions can result in future policies.[6] Considering the standard error, this effect is significant at the 1% level. Since heteroskedasticity does not explain this difference, it is tempting to conclude that bids are higher when they are without commitment. Interestingly, the cheap talk treatment gives approximately the same result as the

[6] See List and Shogren [15] for a literature review of the comparison between hypothetical and actual statements of value.

treatment with consequentialism (indeed, they are not significantly different from a statistical perspective). Whether these results suggest that value statements in cheap talk and consequentialism treatments map into actual preferences is open for debate; yet, combined with findings from previous efforts, these results suggest that both cheap talk and consequential treatments can provide plausible value estimates (e.g., Cummings and Taylor [5], Cummings and Taylor [6], List [14], Carson *et al.* [2]).

4. Summary

Whether people care about both outcomes and causes merits serious consideration. From a normative perspective, if both outcomes and causes are important, then a good deal of economic theory should be reconsidered as utility is typically measured over levels, not over levels and what induced that level. In a positive sense, if antecedents are important, then policymakers must take into account this piece of information when crafting optimal policy. We conduct a field experiment using a large Dutch panel, and find that willingness to pay to protect seals from harm is significantly affected by the nature of the threat. The patterns of results suggest that fairness considerations may play a role. In any event, it highlights that attaching values only to outcomes may lead to incorrect policy conclusions and suggests that further research is needed to establish why cause "matters."

A second important finding concerns the method of eliciting WTP. Since it is often difficult to move beyond simple hypothetical surveys, it is of considerable interest to understand whether respondents take the valuation question seriously. In a first attempt at obtaining value statements across a wide variety of contexts, we find that stated values in “cheap talk” and “consequentialism” treatments are significantly lower than stated values in a standard hypothetical question. Interestingly, the cheap talk and consequentialism treatments

yield comparable value estimates, even though the former is admittedly hypothetical, whereas the latter suggests some positive expected cost associated with a positive bid.

One might speculate that providing additional information about the consequences of the stated bid (in terms of foregone consumption opportunities or impact on policy-making) triggers a move from one mental map to another––almost as if a switch is flipped. When responding to purely hypothetical questions, people may not provide their full attention. Yet, when reminded of the consequences of their actions, a 'serious' response is warranted. Our results indicate that exactly how people are reminded does not seem to matter much. We suspect this will be a topic of considerable future interest given that the contingent valuation method remains the "only game in town" to gather total values of non-marketed goods and services.

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Table 1: Experimental Design

Subject Type	Hypothetical	Hypothetical with Cheap Talk	Hypothetical with Consequentialism	Willingness to Accept
Natural (virus)	Dfl 10; n = 42 Dfl 40; n = 35 Dfl 80; n = 48 Dfl 120; n = 35	Dfl 10; n = 39 Dfl 40; n = 35 Dfl 80; n = 38 Dfl 120; n = 33	Dfl 10; n = 37 Dfl 40; n = 48 Dfl 80; n = 37 Dfl 120; n = 38	Dfl 10; n=44 Dfl 40; n=29 Dfl 80; n=31 Dfl 120; n=42
Society (climate change)	Dfl 10; n = 32 Dfl 40; n = 35 Dfl 80; n = 42 Dfl 120; n = 36	Dfl 10; n = 34 Dfl 40; n = 46 Dfl 80; n = 47 Dfl 120; n = 38	Dfl 10; n = 38 Dfl 40; n = 34 Dfl 80; n = 36 Dfl 120; n = 39	Dfl 10; n=37 Dfl 40; n=33 Dfl 80; n=37 Dfl 120; n=46
Firm (oil and gas drilling)	Dfl 10; n = 41 Dfl 40; n = 31 Dfl 80; n = 34 Dfl 120; n = 29	Dfl 10; n = 40 Dfl 40; n = 40 Dfl 80; n = 38 Dfl 120; n = 51	Dfl 10; n = 37 Dfl 40; n = 48 Dfl 80; n = 43 Dfl 120; n = 32	Dfl 10; n=42 Dfl 40; n=29 Dfl 80; n=33 Dfl 120; n=30

Notes: Each cell represents four unique treatments. For example, "Dfl 10" in row 1, column 1 denotes that one treatment had 42 subjects answering a dichotomous choice question on whether they would pay Dfl 10 to save the seals when they are threatened by nature and the question is hypothetical.

Table 2: Sample Characteristics[a]

Variable	Mean	Standard Deviation
Respondent is male	0.55	0.50
Respondent's years of age	46.51	14.41
Respondent has only primary education	0.04	0.21
Respondent has secondary education	0.36	0.48
Respondent has vocational training	0.48	0.50
Respondent has university education	0.11	0.31
Household monthly gross income (in Dutch guilders)	8149.59	33203.48
Number of children in respondent's household	0.82	1.11
Number of household members	2.59	1.32
Fraction of respondents with partner in household	0.76	0.43

[a]Sample means and standard deviations based on n=1819

Table 3: Treatment Differences in Payment Probabilities[a]

Treatment	Hypothetical	Hypothetical/ Cheap Talk	Consequentialism	Willingness to Accept
Virus	0.526 (0.038)	0.356 (0.041)	0.501 (0.040)	0.148 (0.029)
Climate Change	0.597 (0.038)	0.503 (0.041)	0.488 (0.041)	0.100 (0.024)
Oil and Gas Drilling	0.593 (0.041)	0.616 (0.038)	0.558 (0.039)	0.122 (0.028)

[a]Standard errors in parenthesis

Table 4: Treatment Effects and Willingness to Pay

Variable	Mean	Normalized Estimates (std. error)	Unnormalized Estimates (std. error)	¶WTP/¶x
Constant	----	1.111 (0.220)	3.61 (0.921)	----
Log(Bid Value)	3.79	-0.307 (0.038)	3.26 (0.163)	----
Oil/gas drilling	0.335	0.312 (0.085)	1.014 (0.303)	68.69
Climate change	0.330	0.169 (0.085)	0.549 (0.259)	34.16
Virus	0.335	-----[a]	----[a]	----[a]
Hypothetical/Cheap Talk	0.317	-0.052 (0.084)	-0.172 (0.277)	-10.70
Hypothetical	0.346	0.200 (0.084)	0.650 (0.284)	40.44
Consequentialism	0.337	----[a]	----[a]	----[a]
Respondent is male	0.549	-0.293 (0.0714)	-0.952 (0.259)	-59.23
Respondent's years of age	46.25	-0.0006 (0.002)	-0.002 (0.0065)	0.12
Respondent has only primary education	0.045	0.022 (0.194)	0.0715 (0.631)	4.45
Respondent has secondary education	0.361	0.063 (0.111)	0.205 (0.379)	12.69
Respondent has vocational training	0.475	0.182 (0.111)	0.592 (0.372)	36.80
Respondent has university education	0.119	----[a]	----[a]	----[a]
Household monthly gross income (in Dutch guilders)	8232.49	0.575E-07 (0.115E-05)	1.950E-06 (3.74E-06)	0.0001

[a]Denotes omitted dummy variable
[b]Standard errors in parentheses.

Appendix A: The CentERpanel (www.centerdata.nl)

The CentERpanel is an Internet-based telepanel. The panel consists of about 2000 households in the Netherlands. Members of the households fill in a questionnaire at their home computers every week. The CentERpanel is representative of the Dutch population, as illustrated in the following tables. These tables use the distribution of the CentERpanel in January 2001, and compared these data to the distribution of the Dutch population (source: Statistics Netherlands 2000).

Table 1: Age categories (age 16 and over)

Age	% CentERpanel	% Stat. Neth.
age 16 through 24	14.0	13.5
age 25 through 34	22.8	20.1
age 35 through 44	22.2	19.7
age 45 through 54	18.9	17.7
age 55 through 64	11.3	12.2
age 65 through 74	8.1	9.4
age 75 or over	2.7	7.4
Total	100.0	100.0

Table 2: Sex

Sex	% CentERpanel	% Stat. Neth.
Male	51.3	49.4
Female	48.7	50.6
Total	100.0	100.0

Table 3: Religion (age 18 and over)

Religion	% CentERpanel	% Stat. Neth. (1998)
no religion	41.7	40.0
(Roman) Catholic	31.9	31.0
protestant [(Ned.) hervormd]	12.5	14.0
protestant [gereformeerd]	8.2	7.0
protestant [evangelisch]	1.5	-
Humanism	.7	-
Islam	.4	-
Other	3.1	8.0
Total	100.0	100.0

Table 4: Education level (age 15 through 64)

Education level	% CentERpanel	% Stat. Neth.
primary school	7.6	13.4
Junior high school [mavo]	7.8	10.3
Junior vocational training [vbo]	11.8	15.1
senior high school [havo/vwo]	12.1	6.8
senior vocational training [mbo]	25.4	32.7
vocational colleges [hbo]	22.8	15.0
university education [wo]	12.5	6.5
Unknown	-	.2
Total	100.0	100

Table 5: Region

Region	% CentERpanel	% Stat. Neth./Nielsen
Three largest cities (Amsterdam, Rotterdam, The Hague)	14.9	20.4
Other West	28.0	27.7
North	11.2	10.5
East	21.2	19.9
South	24.7	21.5
Total	100.0	100.0

Table 6: Province

Province	% CentERpanel	% Stat. Neth.
Groningen	3.5	3.6
Friesland	4.8	3.9
Drenthe	2.9	3.0
Overijssel	6.8	6.8
Flevoland	1.4	1.9
Gelderland	13.1	12.1
Utrecht	5.4	7.0
Noord-Holland	15.6	15.9
Zuid-Holland	18.2	21.4
Zeeland	3.6	2.4
Noord-Brabant	17.7	14.8
Limburg	7.0	7.2
Total	100.0	100.0