Referendum Design and Contingent Valuation: The NOAA Panel's No-Vote Recommendation

Richard T. Carson, W. Michael Hanemann,
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Abstract

In 1992 the National Oceanic and Atmospheric Administration (NOAA) convened a panel of prominent social scientists to assess the reliability of natural resource damage estimates derived from contingent valuation (CV). The product of the Panel's deliberations was a report that laid out a set of recommended guidelines for CV survey design, administration, and data analysis.

One of the Panel's recommendations was that CV surveys should employ a referendum approach. This method describes a choice mechanism that asks each respondent how they would vote if faced with a particular program and the prospect of paying for the program through some means, such as higher taxes. The Panel also recommended that CV referendum questions which commonly use only "for" or "against" answers should be expanded to explicitly offer an "I would-not-vote" response.

The purpose of this paper is to consider the effects of such a "would-not-vote" option. In developing the test, we followed the important elements of the NOAA Panel guidelines for the design and administration of a CV survey and use what was acknowledged(by the Panel) as the most carefully developed CV questionnaire to that time, that is, the State of Alaska's study of the Exxon Valdez oil spill. Our findings suggest that when those selecting the "would-not-vote" response are treated as having voted "against" the offered program, offering the option does not alter: (a) the distribution of "for" and "against" responses, (b) the estimates of WTP derived from these choices, or (c) the construct validity of the results.

Key Words: contingent valuation, natural resource damages, passive use, Exxon Valdez, reliability

JEL Classification No(s).: D60, D61, K32, Q28

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1. INTRODUCTION

The increasing use of contingent valuation surveys to present respondents with

economic tradeoffs for proposed programs has generated debate over the validity of this

approach for measuring values for non-market environmental resources. As part of the efforts

to develop regulations for damage assessment under the Oil Pollution Act of 1990, the

National Oceanic and Atmospheric Administration (NOAA) appointed a Panel of leading social

scientists, co-chaired by Kenneth Arrow and Robert Solow [see Arrow et al. 1993], to assess

whether CV was capable of providing estimates of lost passive use values reliable[2] enough for use in the assessment of natural resource damages. The Panel's report included a set of Guidelines, recommendations for future research and a general conclusion that:

"...CV studies can produce estimates reliable enough to be the starting point of a judicial process of damage assessment, including lost passive use values."
[Arrow et al., 1993, p. 4610]

One of the Panel's recommendations was that CV surveys should employ a referendum approach. This method describes a choice mechanism that asks each respondent how they would vote if faced with a particular program and the prospect of paying for the program through some means, such as higher taxes. As Portney [1994] recounts, the Panel felt that the referendum format resembled the way people actually make choices regarding public programs. The Panel believed that adopting this format for CV would make individuals' responses more reflective of their "true" preferences.

The Panel also recommended that CV referendum questions which commonly use only "for" or "against" answers (though interviewers are often instructed to accept "don't know" or "not sure" responses) should be expanded to explicitly offer an "I would-not-vote" response.

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[2] As used by the NOAA Panel, the reliability of a measure is the degree to which it measures the theoretical construct under investigation. However, in the empirical social sciences, this preceding definition pertains to *validity*, whereas reliability is defined as the extent to which the variance of the measure is not due to random sources and systematic sources of error. To avoid confusion and to maintain consistency with the NOAA Panel we are using the term reliability in this paper as meaning validity.

The text of their report and subsequent discussion [Schuman, 1994] indicates that their

objective was to mimic the practice of voting in which people can decide not to participate in

the referendum.

There have been many studies in the survey research literature of offering explicitly

respondents a "not-sure" or "don't know" response option,[3] but there has been no research

conducted on the impact of a "would-not-vote" option in the context of a CV study. Several

authors, including Schuman [1994], have conjectured, based on the results of the past studies,

that offering a "would-not-vote" option would lower estimates of willingness to pay (WTP)

derived from respondents' choices.

The purpose of this paper is to consider the effects of such a "would-not-vote" option.

In developing the test, we followed the important elements of the NOAA Panel guidelines for

the design and administration of a CV survey and use what was acknowledged (by the Panel)

as the most carefully developed CV questionnaire to that time, that is, the Carson et al. [1992]

study of the Exxon Valdez oil spill conducted for the State of Alaska. Our findings suggest

that when those selecting the "would-not-vote" response are treated as having voted "against"

the offered program (Schuman's recommendation for a conservative coding),[4] offering the

option does not alter: (a) the distribution of "for" and "against" responses, (b) the estimates of

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[3] See Schuman and Presser [1981] for a detailed overview of the early literature and specific tests of offering "not sure" or "don't know" responses, and Gilljam and Granberg [1993] for a recent discussion in the context of another set of survey results concerning nuclear power in Sweden.

[4] A common practice in applied CV research has been to drop the "don't know" from the analysis. Under this approach, offering a "would-not-vote" response and treating them as comparable to "don't know" responses could increase the estimated WTP measure. The proposal to include "would-not-vote" as against responses was not the Panel's recommendation. It was a suggestion made later by Schuman [1994].

WTP derived from these choices, or (c) the construct validity of the results.[5]

Section 2 outlines our basic hypothesis and the survey procedures. The third section describes our results, and the last section summarizes our conclusions and their implications.

2.   HYPOTHESES AND SURVEY PROCEDURES

A.   Background

There are at least two arguments that suggest hypotheses about the effects of implementing the NOAA Panel's recommendation. The first follows from the survey research literature dealing with "filter" questions [Schuman and Presser, 1981]. If the "would-not-vote" option is comparable to a "don't know" filter, then it should substantially increase the "would-not-vote" responses, though it may not alter the ratio of "for" and "against" votes.[6] The Schuman-Presser analysis of attitudes for example, found that explicitly offering a "don't know" option did not affect the marginal distributions of the other response categories. Their result was generally insensitive to the subject of the questions they studied, and it likely underlies Schuman's suggestion that recoding these responses as "against" the program would lower the implied willingness to pay estimates.

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[5] Construct validity refers to the degree to which a measure relates to other measures predicted by theory. As a rule, two forms of construct validity are considered: convergent validity and theoretical validity. The former refers to whether the measure of interest is correlated with other measures of the same theoretical construct and is not applicable to the research proposed here. For an example of a test of convergent validity comparing CV estimates to indirect estimates, where it is possible to obtain both in each study see Carson et al. [forthcoming].

[6] In what follows, we have treated the voluntary reporting of "not sure" or "would-not-vote" as equivalent. We did undertake separate analyses of their effects in our evaluation of the "would-not-vote" responses and our primary conclusions are unaffected by separating them. There are a small number of responses in the two categories so it is difficult to distinguish separate factors influencing respondents' decisions to indicate "don't know" versus "would- not-vote."

A second interpretation would hold that "not sure" and "would-not-vote" responses are expressing indifference.[7] Under this view, offering the "would not vote" would not affect the number of respondents responding "for" and "against." They would be drawn from "not sure" or "don't know" categories. This argument follows from the axioms of conventional preference theory. Each individual is assumed able to evaluate every possible bundle as preferred, inferior, or equivalent (indifferent) to another bundle. Under the indifference view, recording "would-not-vote" responses as votes "against" would also lead to more conservative estimates of WTP.[8]

B.   Survey Procedures

Our test of the effects of offering the "would-not-vote" option was conducted as part of a larger experimental design.[9] The analysis used the questionnaire developed to evaluate the Exxon Valdez oil spill and described at length in Carson et al. [1992].[10] The only modifications made to the questionnaire resulted from the change in the dates of the two

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[7] This argument is comparable to the approach followed in the literature reporting micro estimates of the demand for public education. The format of these survey based estimates is comparable to referendum CV surveys except the questions are posed as "more," "less," or "the same" as the current amount of expenditures. Not sure could be interpreted as preferring no change in the status quo. See Bergstrom, Rubinfeld, and Shapiro [1982] for an example of these applications of CV to public education.

[8] Other studies have experimented with offering more than "for" and "against" responses. See Ready, Whitehead and Blomquist [1991] as an example. As a rule these have been designed to parallel the framing used in attitude questions and not the decision process associated with referenda. There is no basis for relating their findings to those with a format designed to more closely correspond to voting choices.

[9] The entire design is described in Carson et al. [1994] and [1995].

[10] See Carson et al. [1992] for a discussion of the questionnaire development.

surveys (1991 for Carson et al. and 1993 for our analysis). The National Opinion Research

Center (NORC) of the University of Chicago completed 1,182 nation-wide face-to-face

interviews of adult respondents in English speaking households in 34 counties throughout the

United States.[11] Of the 1,182 total surveys completed, 622 households were randomly

assigned to either the original Alaska questionnaire or the version that included an explicit

"would-not-vote" option.

The two versions of the questionnaire used as the basis for the split sample analysis

described the condition of Prince William Sound before the Exxon Valdez spill, as well as the

damage caused by the spill. Respondents were then told that a plan had been proposed to

prevent a future oil spill causing the same magnitude of damage as the Exxon Valdez to Prince

William Sound. The plan involved setting up a fleet of escort ships that would guide oil

tankers into and out of the sound and could prevent the spread of oil if some were spilled.

Respondents were told that implementing the plan would cost their households a specified

dollar amount, to be paid as a one-time addition to their federal income tax (either $10, $30,

$60 or $120, randomly assigned to each respondent). In the standard version, respondents

were asked to answer the referendum vote question and were not given the explicit "would-

not-vote" option. Three hundred respondents received the standard version. Another 322

people were asked the same question with the addition of an explicit "would not vote" option.

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[11] Although the counties are both urban and rural from all regions of the US, they were chosen on the basis of interviewer availability from the NORC national master frame.

3.   RESULTS

Our analysis considers the effects of the "would-not-vote" option on: (a) the fraction of respondents selecting answers other than "for" or "against" the proposal; (b) differences in WTP estimates across the two samples; and (c) tests of construct validity. When the "would-not-vote" option was offered, the percentage of the sample selecting other than a "for" or "against" response significantly increased (p - value < 0.01) from 6.7% (20 of 300 respondents) to 17.7% (57 of 322 respondents). This confirms the Schuman conjecture that this type of filter would lead to a significant increase in the proportion of respondents selecting these types of answers.

To evaluate the effect of a "would-not-vote" option on estimates of WTP, we first consider the distribution of "for" and "against" responses by tax amount, conservatively recoding the "not-sure" and "would-not-vote" responses as "against." If the distribution of "for" and "against" votes is not affected by the inclusion of the "would-not-vote" option, then the estimates of WTP should be similarly unaffected. **Table 1** reports the results of this test with the relevant chi-square tests. In contrast to the hypothesis suggested by both frameworks described above, offering the "would-not-vote" option did not significantly affect the distribution of respondent votes at any of the tax amounts.

Two different approaches were used to test for split sample differences in estimates of WTP for the prevention program, a median WTP based on a Weibull hazard model specification and a lower-bound estimate of mean WTP based on a Turnbull model specification.

Table 1: Effects of "Would-Not-Vote" Option on Choices with Conservative Recoding

Choice[a]	Standard Version (%)	Would-Not-Vote Offered (%)
Tax Amount = $10	$\chi^2 = 0.58$; p-value = 0.45	
Vote For	67.8%	73.2%
Vote Against	32.2%	26.8%
n	87	82
Tax Amount = $30	$\chi^2 = 0.66$; p-value = 0.42	
Vote For	56.1%	49.4%
Vote Against	43.9%	50.6%
n	66	87
Tax Amount = $60	$\chi^2 = 0.27$; p-value = 0.60	
Vote For	49.4%	45.2%
Vote Against	50.6%	54.8%
n	81	73
Tax Amount = $120	$\chi^2 = 0.46$; p-value = 0.50	
Vote For	33.3%	38.8%[b]
Vote Against	66.7%	61.3%
n	66	80

[a] n = number of observations

[b] Percentages do not add to one due to rounding error (e.g., percentages are 38.75 and 61.25 respectively.

A Weibull hazard model, comparable to that discussed in Carson et al. [1992], was applied to the responses from the first discrete choice question. As shown in **Table 2**, there was no significant difference in the estimated parameters of the model across the split samples or in the implied estimates for the median. The table also reports the Turnbull [1976] lower bound mean.

The Turnbull model estimates the fraction of the WTP distribution lying in each of the intervals

defined by the tax amounts.[12] The estimated lower bound mean uses these fractions to weight

the lower end-point of the relevant interval. The unobserved mean is bounded from below by

the estimated lower-bound mean.

Table 2. Effects of Would-Not-Vote on WTP Estimates

| Sample | N | Weibull Hazard Model[a] | | | Median[b] | Turnbull Lower Bound Mean[c] |
		Location	Scale	log (L)		
Standard	300	4.73 (15.28)	.90 (3.74)	-198.35	46.03 [30.40-69.68]	52.81 (4.08)
Would-Not-Vote	322	4.71 (16.53)	.90 (3.92)	-212.89	45.54 [30.64-67.70]	54.01 (3.89)
Combined	622	4.73 (22.51)	.90 (5.42)	-411.25	45.77 [34.38-60.95]	53.50 (2.82)
LR[d]				0.02		

[a]   The numbers in parentheses below the estimated parameters are asymptotic Z statistics for the null hypothesis that the relevant parameter was zero.

[b]   The numbers in brackets below the estimated median correspond to the 95% confidence interval.

[c]   The numbers in parentheses are estimates of the asymptotic standard errors.

[d]   The Likelihood Ratio (LR) statistic is distributed as an asymptotic chi square with 2 degrees of freedom. The test cannot reject the null hypothesis of equal parameters in the model underlying the observed choices with and without the would-not-vote option.

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[12]   The Turnbull [1976] non-parametric, maximum likelihood estimator for interval-censored data uses respondents' choices to the voting questions to estimate the latent willingness-to-pay implied by each respondent's choice (i.e., vote). As noted above, an individual's answer to a single question will distinguish either a lower or upper bound for his or her WTP. By combining respondents' choices, we obtain estimates for the relative frequency of responses at different WTP intervals, $(0, W1AMT_i)$ and $(W1AMT_i, \infty)$, where $W1AMT_i$ is one of the four tax amounts administered to the different sub-samples. The first pair, $(0, W1AMT_i)$, defines the interval identified by $W1AMT_i$ as an upper bound and, the second pair, $(W1AMT_i, \infty)$, with $W1AMT_i$ as a lower bound. The five intervals defined by W1AMT are: (1) $0 to $10, (2) $10 to $30, (3) $30 to $60, (4) $60 to $120, and (5) above $120.

Table 3: Selecting Would-Not-Vote and Its Effect on Construct Validity of CV[a]

Independent Variables	Probit	Multinomial Logit	
	Select Would-Not-Vote	Against Plan	Would-Not Vote
Tax Amount	.003 (0.99)	.017 (4.72)	.015 (2.66)
Log (income)	-.222 (-1.40)	-.205 (-0.97)	-.595 (-1.83)
Self Identifies as Strong Environmentalist (=1)	-.269 (-0.94)	.084 (0.26)	-.431 (-0.71)
Would Like to Visit Alaska (=1)	-.685 (-2.31)	-.511 (-1.62)	-1.565 (-2.42)
Protecting coastal areas from oil extremely important (=1)	-.169 (-0.66)	-.333 (-0.93)	-.407 (-0.78)
Government should set aside a "very large amount" or a large amount of wilderness (=1)	-.485 (-2.04)	-.678 (-2.28)	-1.308 (-2.69)
Caucasian (=1)	.086 (0.28)	-.649 (-1.67)	-.148 (-0.24)
At least College Education (=1)	-.525 (-1.37)	.486 (1.39)	-.666 (-0.79)
Below High School (=1)	-.079 (-0.24)	.335 (0.69)	-.095 (-0.14)
Names Exxon Valdez as major environmental accident caused by humans (=1)	-.157 (-0.60)	.110 (0.36)	-.401 (-0.75)
Respondent thinks less damage in absence of escort plan (=1)	.496 (1.92)	1.355 (3.75)	1.539 (2.84)
Respondent thinks will be more damage in absence of escort plan (=1)	-.130 (-0.34)	-.969 (-2.20)	-.856 (-1.45)
Respondent thinks will be great deal more damage (=1)	-	-1.223 (-2.24)	-34.164[b] (-0.00)
Respondent thinks proposal will prevent some damage (=1)	.318 (1.13)	1.471 (3.71)	1.546 (2.56)
Respondent spontaneously protests payment, thinks Exxon should pay all the cost (=1)	-.150 (-0.41)	.984 (2.43)	.418 (0.56)
Respondent thinks Valdez spill more serious prior to interview (=1)	-.287 (-1.08)	.141 (0.46)	-.359 (-0.65)
Intercept	1.366 (0.88)	1.550 (0.72)	5.060 (1.60)
Pseudo R^2	.189	-	-
Test of Equality (χ^2, df = 20)	-	18.34 p-value =.304	
n	322	322	

Table 3 (continued)

[a] The numbers in parentheses below the estimated coefficients are asymptotic Z statistics for the null hypothesis that the relevant parameter was zero.

[b] This large estimate for the coefficient for the effect of believing a new spill would create a great deal more damage on the likelihood of selecting the would-not-vote option. This arises because of the split of respondents between "for," "against," and "would-not-vote" choices in the two sub groups defined by this variable as detailed below:

	Respondent thinks a great deal more damage	
Choice	No	Yes
For	142	25
Against	119	6
Would-not-vote	30	0
Total	291	31

An absence of respondents selecting the "would-not-vote" option who also felt there would be a great deal more damage is consistent with *a priori* expectations and the reasons why this measured coefficient is large and insignificant. There is no basis for discrimination on this dimension.

Both the test of the parameters of the Weibull hazard model and the Turnbull lower-bound mean are consistent with the conclusions drawn from the contingency table results. That is, there is no significant difference between the estimates of willingness to pay between the two samples when a conservative coding scheme is used to interpret respondents' "would-not-vote" choices as "against."

The last "would-not-vote" issue concerns who selects this response and whether a test of construct validity would support the recoding of these responses to "against." **Table 3** summarizes these findings. The first column is a probit model describing those who select the "would-not-vote" option (coded as 1 if a respondent indicated "would-not-vote" or reported "not sure" and 0 if a respondent voted "for" or "against"). The definitions for the independent variables correspond to those used in Carson et al.'s [1992] evaluation of construct validity for

the original Alaska survey. We added three variables associated with the respondent's

education and dropped two from the original set because there was no discrimination in those

selecting the "would-not-vote" answer.[13]

Overall, few variables appear to be associated with the decision to select a "would-not-

vote" response. The respondent's evaluation of the plan, interest in visiting Alaska, and belief

that the government should protect wilderness areas all had plausible effects on the selection.

None of the remaining variables were significant determinants of this decision. Thus, there was

little basis for determining the characteristics of those selecting the "would-not-vote" (or "not

sure") responses. One reason for this limited ability to explain these responses follows from the

model itself. Our coding of the responses includes the "for" or "against" choices in the same

category--as selecting the voting option. This is not likely to be correct. Indeed both the

original Carson et al. analysis and our analysis suggest that several variables are important

determinants of these different decisions. Often their effects arise in opposite directions for the

"for" and "against" choices. This confounds attempts to explain respondents selecting "would

not vote" over the choices associated with voting--either "for" or "against" decisions.

The next two columns of Table 3 relaxes the "for" and "against" comparability

assumption by using a three outcome, multinomial logit framework, distinguishing "for",

"against", and "would-not-vote" (with the "for" category serving as the base or reference

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[13] The two variables dropped correspond to qualitative variables (0,1) identifying those respondents who think there would be no damage from another oil spill and those indicating the proposal will not reduce the damage at all. The education variables were added to take account of Krosnick's [1991] arguments that "not sure" responses may be related to satisficing behavior in answering attitude questions.

outcome). This model confirms the earlier Carson et al. analysis. The economic, attitudinal, and program related variables are significant determinants of respondents' choices. Moreover, this formulation allows the proposed recoding of the "would-not-vote" (and "not sure") responses as an "against" vote to be tested. This is accomplished by testing the restriction that the coefficients of "against" and "would not vote" are equal for each variable. As the chi-square statistic at the bottom of Table 3 indicates, this hypothesis cannot be rejected. Thus, tests of the construct validity of CV responses for this survey would not be influenced by the proposed conservative recoding of "would-not vote" and "not sure" responses.

4.   IMPLICATIONS

Offering a "would-not vote" option in referendum format CV surveys significantly increased the fraction of respondents who chose not to vote "for" or "against" a proposal offered to them in a CV choice. However, it also seems that these respondents would have voted "against" the proposal if the "would-not-vote" option had not been offered. This conclusion follows from the results of three separate tests. The first considered the distribution of "for" and "against" responses with the standard form of the question, recoding "would-not-vote" and "not sure" responses as "against." The marginal distributions by tax amount were not significantly different.

The second type of test considered how these responses would influence a simple Weibull hazard model used to estimate willingness to pay. The estimated model's parameters were not significantly different across the split samples. Median and lower bound mean estimates for WTP were also found to be comparable in the two formulations for the referendum question. Finally, we considered the effects of the recoding on judgments about

the construct validity of CV responses. Using the original construct validity specification

proposed by Carson et al. [1992] as the basis for an expanded model within a multinomial logit

framework, we cannot reject the null hypothesis that the coefficients for determinants of voting

"against" equal those of selecting the "would-not vote" (or "not sure") option.

Although these results relate to only one CV survey, taken together with Schuman and

Presser's findings that filter questions are generally insensitive to the subject of the question,

they suggest that offering a "would-not-vote" option in CV surveys (as proposed by the

NOAA Panel's guidelines) is not likely to alter the conclusions derived from such surveys in

relation to what they would be without them.

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