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Protest Bidders in Contingent Valuation

John M. Halstead, A.E. Luloff, and Thomas H. Stevens

Protest bids are often excluded during analysis of contingent valuation method data. It is suggested that this procedure might introduce significant bias. Protest bids are often registered by respondents who may actually place a *higher-* or *lower*-than-average value on the commodity in question but refuse to pay on the basis of ethical or other reasons. Exclusion of protest bids may therefore bias willingness to pay (WTP) results, but the direction of bias is indeterminate a priori.

The contingent valuation method (CVM) of estimating values for nonmarket goods has gained widespread acceptance in the economics community. Mitchell and Carson (1989, p. 2), for example, state that "as things now stand, contingent valuation represents the most promising approach yet developed for determining the public's willingness to pay for public goods." Yet, critics and proponents alike are constantly questioning the validity of the CVM.

This article examines the problem of protest bids. Several types of protest to the CVM may occur. Individuals who object to the survey may simply not respond; some may give positive, but invalid bids (outliers); while others may state a zero value for a good that they actually value (protest zero bids). There are several possible reasons for this behavior; some respondents may feel that it is unethical to place a monetary value on public goods such as wildlife or environmental quality, while others may argue that these goods should be provided "free of charge." The central focus of this article is to determine whether respondents who give protest zero bids differ from other bidders and what the consequences of these potential differences might be. The likely consequences of previously used approaches to account for protest zero bids are examined, and an attempt is made to determine which is the most appropriate.

The first section discusses the problem of bias caused by protest bids in CVM and explores the treatment of protest bids in empirical studies. The second section uses discriminant analysis of a study of wildlife values in New England to determine whether protest zero bidders can be effectively characterized by sociodemographic factors. Implications of various methods of treating protest zero bidders are then examined, and conclusions are drawn about the bias that might be introduced and how this bias might be mitigated.

Protest Bids and Bias in Contingent Valuation

The Nature of Protest Bids

Deviations of stated willingness to pay from "true" values may be caused by a number of factors. These biases can be grouped into three broad categories: (1) biases caused by or in response to the survey instrument itself, such as strategic bias, starting-point bias, or scenario misspecification (Mitchell and Carson; Cummings, Brookshire, and Schulze); (2) biases caused by nonresponse (either in whole or in part) to the survey, usually termed "nonresponse" bias (Dalecki, Ilvento, and Moore; Shultz and Luloff); and (3) "protest" bias.

Protest bias occurs whenever individuals who oppose or do not approve of the survey fail to respond, give invalid but positive bids (outliers[1]),

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[1] In general, outliers—extremely high or low responses to WTP ques-

or place a zero value on a good that they actually value. The problem of protest zero bids is of particular concern in dichotomous-choice contingent valuation, since a "no" response may be *misinterpreted* as willingness to pay less than the stated amount, rather than as a protest.

Protest zero bids are quite common in contingent valuation. For example, Reiling et al. (1989) classified 11% of nonzero sample responses and 24% of zero bids in their study of black fly control as probable protest bids, while Desvousges, Smith, and McGivney identified nearly half of the zero bids in their study of water quality as protest zero bids. Rowe and Chestnut cite several studies with protest zero bid rates of 50% or higher. In a study of actual contributors and noncontributors to the Virginia nongame wildlife checkoff program, Ferguson found that nearly 27% of noncontributors who were aware of the checkoff program did not contribute due to protest reasons. As Nash (p. 680) notes, these "blanks and 'no answers' cannot be easily incorporated or dismissed."

Identification of Protest Bids

All bids must be scrutinized for invalid responses. One procedure for identifying positive, but invalid, protest bids involves iterative elimination of observations from the data set and recalculation of regression coefficients (Desvousges, Smith, and Fisher; Reiling et al. 1989). An observation is usually classified as an outlier if it results in a 30% or more change in the estimated value of the income coefficient.[2]

All zero bids also must be carefully examined and classified as either legitimate zero bids or protest bids (Freeman). Preferably, protest zero bids could be identified through personal interviews; however, given the expense of personal interviews, many willingness to pay (WTP) surveys are now conducted by mail, which precludes this as a possibility. Protest zero bids are usually identified by follow-up questions that examine the respondents' motivation for providing zero bids. Reasons often cited for zero bids include disagreement with or distaste for the vehicle of payment used in the survey instrument, ethical reasons, or the belief that the good should be provided by means other than personal payments (Freeman; Mitchell and Carson; Sagoff).

Several studies have attempted to examine the factors that motivate protest bidders. Smith and Desvousges constructed a probit model to explore the determinants of nonzero bids in their study of risk-reducing behavior regarding hazardous wastes in Acton, Massachusetts. Their results indicated that the probability of a zero bid decreased with education and risk of exposure, and increased with greater knowledge of the issue. Musser, Waddington, and Shortle used a logit model to examine determinants of protest zero bids in their study of farmland preservation in Pennsylvania. The authors found that respondents with higher education levels, age, and income were less likely to register protest zero bids. In addition, beliefs by the respondent that development was "good," preservation of farmland was not necessary, and that it was important to preserve open space all decreased the probability of a protest zero bid.[3]

Treatment of Protest Zero Bids in Empirical Studies

Because protest zero bids can represent a high percentage of total survey respondents, some efforts have been made to avoid this problem through careful survey design (Sutherland and Walsh; Walsh, Loomis, and Gillman). However, it is not always possible to eliminate all protest bids. Sagoff (p. 62) interprets protest zero bids as simple "refusals to sell"; if this is indeed the case, it would be difficult to reduce the number of protests through improved survey design.

Traditionally, there have been three principal means of dealing with protest zero bids: (1) drop them from the data set; (2) treat the protest bids as legitimate zero bids and include them in the data set; or (3) assign protest bidders mean WTP values based upon their sociodemographic characteristics relative to the rest of the sample group. This last approach uses econometric techniques similar to those employed to account for missing data in regression analysis (Haitovsky). The treatment of protest bids becomes especially important when the benefit aggregation issue is considered; the decision to include protest zero bids in the data can have a significant effect on aggregate value estimates.

Protest zero bids are often simply identified and eliminated from the data set (Freeman; Johnson,

tions—represent from 5% to 10% of total sample bids (Mitchell and Carson).

[2] Income is used because it is common to most theoretical constructs of the CVM.

[3] It should be noted that while Smith and Desvousges included all zero bids (protest and nonprotest) in their probit analysis, Musser et al. directed their attention specifically at protest zero bids.

Bregenzer, and Shelby; Mitchell and Carson). This technique reduces the downward bias caused by including protest zero bids. Unfortunately, a major side effect of this approach is the concomitant loss of potentially useful information with the possible introduction of self-selection bias. This procedure essentially assumes that protest bidders have a mean WTP which is equal to that of sample nonrespondents. However, previous studies indicate that survey nonresponse may be caused by lack of interest in the survey topic (Dillman; Stephens and Hall), while protest bids may be motivated by extreme interest in the subject matter. Freeman noted that many nonrespondents are poorly educated and have low incomes, while Liu and Smith found that the probability of nonresponse in a study of risk perception in Taiwan increased with education and income. Regardless, doubt is cast on the practice of treating protest bidders in the same fashion as nonrespondents.

A second technique is to assign mean sample values to protest zero bidders or to assign adjusted values based on analysis of sociodemographic characteristics. If the protest zero bidders' sociodemographic characteristics are similar to those of the general population, there may be a basis for extrapolating mean sample WTP to the population as a whole, as done by Walsh, Loomis, and Gillman. Loomis (1987b) advocates a method of weighted least squares to derive aggregate benefits for the population (including nonrespondents). However, protest zero bidders may be very different from nonrespondents. Such treatment does not in itself obviate the concern for bias.

A third approach simply includes protest bids in the data set on the basis that these bids are legitimate zero valuations. McGuirk, Stephenson, and Taylor (pp. 1–2) have argued that protest bids "should be considered legitimate WTP bids as respondents are essentially valuing a proposed policy, not just a commodity." Randall notes that WTP estimates are based not only on the value of the commodity being offered, but also on the means by which the public good will be provided and the method of payment for the good, so that the strict valuation of the good cannot be separated from the public policy issues associated with its provision. Following this line of argument, a protest bid may occur when distaste for the means of provision or payment offsets personal valuation of the good. However, if a CVM survey is primarily concerned with obtaining a value for the good in question and/or the survey instrument reflects an attempt to realistically frame a contingent market rather than to evaluate a potential policy option, this argument may not hold. In such a case, protest bids are not legitimate zero bids.

Profile of Protest Bidders in CVM

The preceding section has described the typical procedure for the treatment of protest bids—they are usually dropped from the analysis. If protest bidders are the "same" as other respondents, this may be a valid procedure. However, potential problems arise if protest bidders differ substantially from other respondents. Therefore, it is important to test for differences between protest bidders and other survey respondents. This study used discriminant analysis to examine survey responses to a study of wildlife valuation in New England to determine whether protest zero bidders and other respondents can be classified according to key individual traits that are generally recognized as having significant impacts on respondents' WTP.

The Case Study

A CVM survey about the value of bald eagles, coyotes, and wild turkeys in New England was mailed to 1,500 randomly selected households in the spring of 1989. The survey included general questions about outdoor activities and the importance of wildlife, valuation questions, and several follow-up questions to identify protest bids and to examine the consistency of the results obtained from the valuation questions. The total design method suggested by Dillman was followed throughout.

A modified dichotomous-choice economic valuation question confronted each individual with a specified amount of money, N, (randomly selected within fixed intervals over a range of $5 to $150), which she/he could contribute for wildlife preservation and/or management. The sample was partitioned into five groups, each of which received an identical questionnaire except for the valuation question. The first group received a valuation question about bald eagles, the second group was asked about coyote control, the third was asked about wild turkeys and bald eagles combined, the fourth focused on coyote preservation, and the final group was asked to value wild turkeys. For example, the bald eagle valuation question was specified as follows:

> Habitat protection and management efforts sponsored in part by state, local, and federal governments have helped to return some wild-

life species from the brink of extinction. The bald eagle and the wild turkey, for example, have both been brought back to New England.

Suppose that budget cuts eliminate these programs and that a private trust fund for the management of the *BALD EAGLE* is set up to *preserve and protect the BALD EAGLE* population in New England (assume that the *BALD EAGLE* will not *continue to exist* in New England unless this *is* created). Would you contribute $*N* per year over the next five years to this fund?

If respondents answered "no" to the valuation question, they were confronted with a choice of one of the following series of statements:

a. The amount is too much; I would donate $__ per year over the next five years (please write in the maximum dollar amount that you would contribute).

b. The bald eagle should be preserved in New England but the money should come from taxes and license fees (from game species) instead of donations.

c. The bald eagle is not worth anything to me.

d. Bald eagle preservation is important to me but I refuse to place a dollar value on it.

e. Other, please explain.

Respondents were also given an opportunity to bid an amount greater than the stated value, *N*. Responses could therefore be treated as derived from either an open-ended or dichotomous-choice format.

The survey response rate was 37.5%, which is somewhat below average for academic surveys of the general population (Loomis; Mitchell and Carson).[4] The extent to which nonresponse was motivated by protest is not known. However, this CVM involves choice between income and moral principle (existence of wildlife), which, as noted by Opaluch and Segerson, may be a factor associated with several abnormalities, including high nonresponse rate.

Average bids and equivalent surplus estimates for all species combined are presented later in the paper in Table 5, along with relevant information on functional form. Separate estimates for each species and details of the estimation procedure are given in Stevens et al. Although these value estimates appear consistent with previous studies (see, for example, Bowker and Stoll), the majority of respondents were not willing to pay any money for wildlife, even though most said that bald eagles, coyotes, and wild turkeys are either somewhat or very important to them. This suggests that many respondents may have protested this CVM. All bids (n = 305) were therefore analyzed for outliers and for protest zero bids. No outliers were detected, but about one-half of all zero bids appeared to be protest zero bids.

Sixty-eight percent (207) of all respondents entered zero bids. Responses (b) and (d) (accounting for 98 responses) were classified as protest responses. Response (b) was classified as a protest against the methods of payment and accounted for 63% of protest bids; (d) was considered a protest for ethical reasons and accounted for the remaining 37% of this group. Since these protesters did not choose (c) or (e), the implication is that they do, in fact, value the resource.

Although this type of approach has frequently been used to identify protest zero bids (see Reiling et al. 1989; Desvousges, Smith, and McGivney), there are a number of potential problems. First, the question asking respondents about motivations underlying zero bids included a series of fixed-response categories. Previous research suggests that respondents "construct" preferences during the process of elicitation and that information conveyed to respondents influences results. Both of these issues raise questions about the extent to which respondents might be prompted or led by placement and wording of fixed-response categories (see Tversky and Thaler; Samples, Dixon, and Gowen). Also, some respondents might have selected (b) or (d) simply because they seemed most palatable. Although this is a concern, the majority of respondents bidding zero in this CVM did *not* select (b) or (d); the open-ended category, (e), was selected by 42% of all zero bidders and category (c) was chosen by 10%. Results obtained from fixed-response categories must be carefully interpreted, however.[5]

Discriminant Analysis to Classify Protest and Nonprotest Bidders

Discriminant analysis is a multivariate statistical technique that allows the researcher to ascertain differences between two or more groups with re-

[4] However, a survey of response rates of 16 recent CVM studies revealed that 9 had response rates of 45% or less (Mitchell and Carson, p. 281).

[5] One reviewer suggests that protest zero bids should be identified through in-person discussion with respondents conducted by a "discussion facilitator." While this approach would yield much valuable information, it would likely be prohibitively expensive and could contribute to wide variation in interpretation.

spect to several independent variables simultaneously (Klecka; Kachigan). The discrete dependent variable is defined by the number of groups, while the endogenous factors define the multidimensional space between these groups. This linear combination of independent variables, called the discriminant function, maximizes between-group variations while minimizing within-group variations.

Logit analysis could have been chosen to examine the protest bid issue. However, we felt that discriminant analysis was more appropriate since, in this preliminary analysis, the main interest was on differentiating between the two groups (protest and non-protest), rather than addressing variations in probability caused by changes in independent variables (the strength of the logit technique).[6]

Variables Included in the Discriminant Analysis

Previous research efforts on factors influencing WTP for nonmarket goods have identified a number of common variables: education, income, membership in environmental and sportsmen's organizations, age, gender, residence, occupation, outdoor activities, and attitudes about the good in question (see, for example, Walsh, Loomis, and Gillman; Reiling et al.; Sutherland and Walsh). Since these variables have been identified as prime determinants of WTP values, they were used to characterize the profiles drawn by the discriminant analysis; if these truly are the "important" variables influencing WTP, then variances between protest bidders and others caused by differences in these variables should be obtained. Specific variables used in the analysis are described in Table 1.[7]

Since there has been little previous work on protest bid influences, it is difficult to form any a priori hypotheses about the effect of individual variables on respondent behavior. Based on previous efforts of Musser et al., and Smith and Desvousges, one might expect to find that those with higher education and income levels are more likely to register positive (nonprotest) bids; beyond this rudimentary hypothesis, however, we could not predict how protesters and non-protesters might differ.

Table 1. Variables Included in Discriminant Analysis of Protest Bidders

Variable Name	Description
HUNT	1 if respondent hunted, 0 otherwise
MEMB	1 if respondent belonged to an environmental organization, 0 otherwise
NLIVE	1 if respondent lives in a rural neighborhood, 0 otherwise
NGREW	1 if respondent grew up in a rural neighborhood, 0 otherwise
AGE	Respondent's age, in years
GENDER	1 if male, 0 if female
OCC	Respondent's occupation: 1 if managerial/professional, 0 otherwise
INCOME	Respondent's income ($10,000 increments)
EDUC	Education level of respondent: 1 if some college education or more, 0 if high school graduate or less
PRESERVE	1 if respondent felt that as much wildlife as possible should be preserved, 0 otherwise
MIMPT	1 if respondent felt that society has more important problems than preserving wildlife, 0 otherwise
TRIPS	How often respondent makes trips/vacations to see wildlife or nature (1 = often, 4 = never)
SEEREAD	1 if respondent reads books or watches TV programs/movies about wildlife, 0 otherwise
SUBSCRIBE	1 if respondent regularly receives publications on wildlife/environmental issues, 0 otherwise
REAL$	Dollar amount of donations actually made for wildlife management in past year
LABORF	1 if respondent is employed, 0 otherwise
WLINDEX	Wildlife attitude index

Results of the Discriminant Analysis

Results of the discriminant analysis are presented in Table 2. Familiarity with the three species (turkeys, eagles, and coyotes), both through nonconsumptive activity (such as seeing or reading about wildlife) and consumptive activity (hunting), contributed strongly, albeit in different directions, to the discriminant function. Hunters were more likely to be protestors, as were those who were members of a wildlife or environmental organiza-

[6] Press and Wilson note that results of sample classification by discriminant analysis and logit analysis will not differ markedly, even when the distribution of the explanatory variables is non-normal. The logit analyses conducted in this study confirm this finding. However, since discriminant analysis was unable to effectively sort protest and nonprotest bidders, further research on the protest bid problem might use both techniques in the interest of thoroughness.

[7] The nature of the variables included suggested that a collinearity problem might be encountered; however, no evidence of degrading collinearity was found. In any case, the low R^2 of the models used suggests that any deletions in the variable set would not affect explanatory power.

Table 2. Results of Discriminant Analysis: Protest vs. Non-Protest Bidders in New England Wildlife Valuation Study

Endogenous Factors/Standardized Discriminant Function Coefficients	
TRIPS	−.17
SEEREAD	.44
HUNT	−.36
MEMB	−.07
SUBSCRIBE	−.19
REAL$	.46
PRESERVE	.23
MIMPT	.16
NLIVE	.11
NGREW	−.01
AGE	−.42
GENDER	.27
LABORF	.44
OCC	.37
EDUC	.32
INCOME	−.43
WLINDEX	.03
Group Centroids	
Non-Protestors	.23
Protestors	−.48
Summary Measures of the Canonical Discriminant Function	
Canonical Correlation	.31
Wilks' Lambda	.90
Chi^2 for Lambda	30.35
Probability Level	$P < .02$

tion, had taken more trips or vacations to see wildlife or nature, and received a magazine on wildlife or nature, while those who had seen or read about wildlife and had made contributions for wildlife management were less likely to protest. In addition, protestors tended to be older, and had more rural backgrounds and lower incomes than their counterparts. The sign of the education variable tended to confirm earlier work suggesting that more educated respondents are less likely to protest.

Despite these differences, the discriminant model produced a very poor fit. This is indicated by the low canonical correlation, which when squared gives an indication of the amount of variation among the two groups accounted for by those independent factors introduced. Less than 10% of the total variation in protest bid behavior was explained in this model. This is also indicated by the poor fit, as suggested by the high Wilks' Lambda and the relatively low χ^2.

Perhaps the best indication of the inability of this model to adequately differentiate protestors from non-protesters is drawn from the classification table (Table 3), which suggests that 70% of the respondents could be sorted into their appropriate groups. While on the surface such a sorting is good, an inspection of the internal components reveals that the discriminant function could correctly classify 90% of the non-protesters and only 28% of the protesters. Thus, the confusion matrix reveals that the model is only moderately better than what could be achieved on the basis of knowledge of the margins alone; that is, if all the respondents were sorted as non-protesters, 98 errors would be made, while the discriminant function resulted in 7 fewer errors (91).

Further analysis of the data set using a logit model supported the results of the discriminant

Table 3. Multivariate Classification of Protest Bidders

Actual Classification	Number of Cases	Predicted Group Membership: Non-Protesters	Predicted Group Membership: Protesters
Non-Protesters	207 (68%)	187 (90%)	20 (10%)
Protesters	98 (32%)	71 (72%)	27 (28%)
Percent of "grouped" cases correctly classified:			70%

Table 4. Logit Analysis of Factors Influencing Protest and Non-Protest Bids

Dependent variable: Protest zero[a] = 1		
Variable	Estimated Coefficient	Asymptotic *t*-ratio
CONSTANT	−0.297	−0.183
TRIPS	0.034	0.194
SEEREAD	0.208	0.841
HUNT	0.350	1.065
MEMB	0.122	0.319
SUBSCRIBE	−0.283	−0.845
REAL$	−0.004	−2.022*
PRESERVE	−0.148	−1.290
MIMPT	−0.083	−0.746
NLIVE	0.150	0.909
NGREW	−0.110	−0.645
AGE	0.015	1.477
GENDER	−0.368	−1.194
OCC	−0.073	−0.798
LABORF	−0.089	−0.155
EDUC	−0.231	−1.269
INCOME	0.192	1.410
WLINDEX	−0.093	−0.487
Chi-Squared: 27.289 with 17 d.f.		
McFadden R^2: .07		
Percentage of right predictions: 69.2		
Degrees of freedom: 287		

[a]These respondents answered either "The bald eagle should be preserved in New England but the money should come from taxes and license fees instead of donations" or "Bald eagle preservation is important to me but I refuse to place a dollar value on it" to the survey question examining reasons for zero bids.

*Significant at .05 level.

Table 5. Actual Behavior of Protesters and Other Respondents

Attitudes	Respondents (Non-Protesters)	All Protesters	Ethical	Vehicle
Actual donation to wildlife management last year (percent)	38	24	36	18
Average dollar amount actually donated to wildlife management last year	34.00	11.61	27.58	5.23
Average "gift" amount donated[a] to wildlife management (dollars)	76	36	24	43

[a]Respondents were asked to assumed that they had received a gift of $1,000.

analysis; that is, the model was unable to differentiate between protest and non-protest bidders using the independent variables chosen (see Table 4).[8] Only one variable (*REAL$*) was significant at the 90% level; the significance and negative sign of this variable indicate that people who actually contribute to environmental organizations are less likely to register protest bids. It is possible that these respondents have less difficulty visualizing the contingent market, since they may already be donating money for preservation of endangered species.

Protest Bidders: Additional Information

Since the discriminant analysis revealed little in the way of differentiating protest bidders from non-protest bidders, additional descriptive information was drawn from the survey results in an effort to shed more light on the issue. The survey contained several questions and statements designed to determine respondents' attitudes about the importance of preserving wildlife, such as:

> How important is it to you that the bald eagle exist in New England? (very important, somewhat important, not very important, not important at all)
>
> Society has much more important problems than preserving wildlife. (strongly agree, moderately agree, moderately disagree, strongly disagree)

Protest zero bidders were slightly less likely (47% vs. 58%) to view the existence of bald eagles in New England as *very* important. Also, protest zero bidders were more likely to feel that society has more important problems than preserving wildlife (45% vs. 30%). Thus, protest zero bidders feel that bald eagle existence is important, but not as important as other respondents seem to consider it. If, as Dillman, and Stephens and Hall maintain, survey nonresponse is motivated by lack of interest in the issue, the responses to this question cast doubt on the practice of treating protest zero bidders as nonrespondents (by dropping them from the sample).

Actual behavior between protest zero bidders and respondents offering positive bids also differed (Table 5). Thirty-eight percent of respondents had made actual contributions to environmental causes in the previous year, compared to 24% of the protest zero bidders. On average, positive-bidding respondents donated $34.00, compared to $11.61 for protest zero bidders (this difference was statistically significant at the 5% level). Ethical protesters tended to donate considerably more than vehicle protesters ($27.58 vs. $5.23), which is consistent with the disagreement with the donation preservation vehicle implied in response (b).

When allocating a hypothetical "gift" of $1,000,[9] positive-bidding respondents tended to give more than protest zero bidders ($76 vs. $36). When considering the two subgroups of protesters, those with vehicle concerns tended to offer more than ethical protesters ($43 vs. $24); this contrasts with actual behavior, where ethical protesters gave *more* than vehicle protesters.

While it is difficult to draw firm conclusions from this type of qualitative analysis, it appears that

- Both respondents offering positive bids and protest zero bidders value the resource, but positive bidders tend to value it more;
- Ethical protesters tend to offer less "hypothetical" cash to protect natural resources, but give more in actual dollars than vehicle protesters.

The empirical consequences of eliminating protest zero bids from the data are shown in Table 6. As expected, the average bids and the median bid derived from the dichotomous-choice format both

[8] Other logit formulations were constructed using subsets and combinations of variables; this approach yielded results that showed no substantial improvement over our discriminant analysis or the logit model results in Table 4.

[9] The following question was asked in the survey: "Suppose that you received a $1,000 gift. Considering your existing financial obligations, how much of it, if any, would you contribute toward wildlife management in New England?"

Table 6. Average Bids and Equivalent Surplus Estimates, Dollars per Person per Year

Model	Protest Zero Bids Included		Protest Zero Bids Excluded	
	Mean	Median	Mean	Median
Dichotomous-Choice logit (log specification)[a]	20.43	7.00	15.77	9.00
Dichotomous-Choice logit (linear specification)[b]	7.93		11.66	
Average bid	9.80		14.46	

[a]Natural log of offer amount and income.
[b]Median is negative (see Bowker and Stoll).

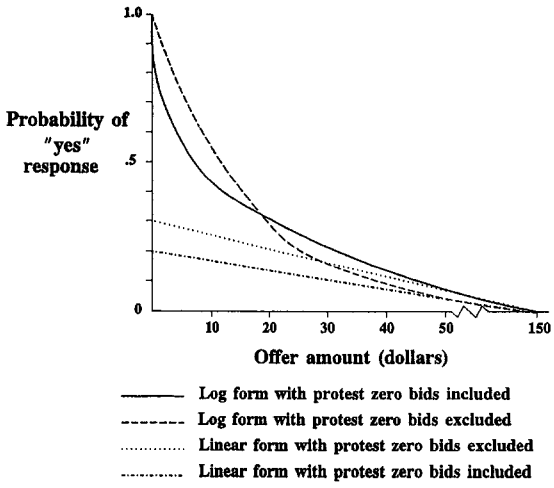

Figure 1. Estimated Willingness to Pay Probability Function

increased (by 49% and 29%, respectively). However, the mean willingness to pay estimate obtained from the logarithmic specification of the dichotomous-choice model *declined* by about 23%, while the mean willingness to pay estimate for the linear specification increased. Elimination of zero protest bids shifted the estimated probability functions, as shown in Figure 1. All models "fit" the data equally well, but the consequences of eliminating protest zero bids in dichotomous choice differ considerably with functional form and whether the mean or median is used to estimate economic value (other authors have noted this problem; a more general discussion of effect of functional form on surplus measures is provided in Boyle).[10] This suggests that particular caution is necessary whenever dichotomous-choice data might contain a significant number of protest zero bids. In any event, the decision to include, modify, or exclude protest zero bids obviously has a very significant impact on aggregate value estimates for the example presented here.

Conclusions

This article attempted to differentiate between protest and non-protest bidders in a CVM study of wildlife based on respondents' sociodemographic characteristics. Discriminant analysis was not able to conclusively distinguish between these two groups. Effectively, therefore, we could not reject the hypothesis that protest and non-protest bidders are the same sociodemographically. Using more qualitative data from the survey, it appeared that protest bidders did indeed value the resource—that is, they were not registering "legitimate" zero bids—but at a lower value than actual (non-zero-bidding) respondents.

Our principal concern is that protest bidders may not be very different from other survey respondents, *except* in terms of their willingness to pay. Consider, for example, the respondents who protested the CVM described in this study: 24% of the protesters had actually donated money for wildlife preservation during the previous year. This implies that many (if not most) of the zero bids did not represent actual zero valuations. It also suggests that the behavior of protest bidders with regard to monetary commitment may differ from that of other respondents, even though there may be little, if any, sociodemographic differences between protesters and non-protesters. Better information about why individuals refuse to pay is obviously needed.

In practice, protest bids are often excluded during analysis of CVM data. We suggest, however, that this procedure might introduce significant bias, that the direction of bias cannot be determined a priori, and that the bias also depends on estimation techniques and functional form. The question then is, how should the partial information contained in responses by those who protest be used? As previously noted, there are three primary methods of addressing the protest bid problem. The potential effect on resource valuation of each method, given our tentative findings, is as follows:

Method 1: Identify the protest bids and discard them from the sample. This effectively treats protesters as having mean WTP values;

[10] Results of the logit models used to derive Figure 1 are available on request from the authors.

our results suggest that protesters may value the resource *less* than positive bidders, so that aggregate valuation estimates would be biased *upwards*.

Method 2: Include the protest zero bids as true zero bids. Since few, if any, of our protest bids represent true zero valuation of the resource (only 6% of zero bidders said that the wildlife species examined in the study were worth nothing to them), this would bias value estimates *downwards*.

Method 3: Treat protest zeros as "missing variables" and adjust using econometric techniques to obtain WTP estimates. Since the R^2 for this model (and models from similar studies) is very low, and discriminant analysis was unable to identify differences between positive bidders and protesters using the independent variables chosen, this method would probably generate WTP estimates close to the positive bid respondents' mean, thus duplicating the bias of method 1 above. This method could hold promise if more could be learned about protest bidders' motivation; however, to date, little is known about the theoretical relationship between individual sociodemographic characteristics and WTP.

We therefore recommend that, in general, CVM researchers should generally not automatically jettison protest responses. Under conditions of either a high overall survey response rate or a low protest rate (or both), the practice of eliminating protest zeros may not, however, introduce "unacceptable" bias. Perhaps, in the absence of more complete knowledge of protest bidders' true WTP, the researcher's best alternative is to present a range of WTP estimates. A lower-bound estimate would be generated by treating the protest bids as legitimate zeros. To derive an upper bound, protest bidders could be assigned the sample mean, or new WTP estimates for the zero bidders could be generated by using method 3.

The results presented here are for one case study, using one particular valuation technique. While one case study cannot be used as an argument to reshape thinking on CVM, it does indicate that further research on the issue of protest bidders is needed. In particular, the hypothesis that the characteristics which personify protest bidders will vary by the type of valuation problem being studied—that is, whether one is measuring existence, option, or consumptive-use value, and in what setting (e.g., wildlife, open space valuation)—could be examined. One weakness of the present study was that it was not initially designed to examine protest behavior; future studies should be conducted with protest behavior as their primary aim, with questions specifically targeted at identifying these respondents and their motivation. Finally, the typically low R^2 values obtained in econometric models indicate that many factors influencing WTP are not being captured by survey data; it is quite possible that the personal "differences" that motivate protest bidders were simply not included in our analysis.

Contingent valuation (and other) researchers have exhaustively examined the issues of interviewer bias, starting-point bias, vehicle bias, hypothetical bias, and various other problems in survey work. Perhaps it is time to devote more attention to the protest bid problem.

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