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A Comparison of CVM and Point Allocation Approaches to Estimating Nonuse Values for Wilderness Areas

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ABSTRACT

Both point allocation and total and use values for wilderness designation in Utah were compared to examine use and nonuse values. Results indicated that use, option value, existence value, and bequest value statistically have almost identical allocations across groups favoring wilderness in general, the Bureau of Land Management proposal for wilderness, and the Utah Wilderness Coalition proposal. However, when the difference between total and use values calculated from willingness-to-pay measures is compared to the point allocations, there does not appear to be a consistent relationship between use and nonuse values; that is, option value cannot clearly be defined as either use or nonuse.

A COMPARISON OF CVM AND POINT ALLOCATION

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VALUES FOR WILDERNESS AREAS[1]

Introduction

Determination of the nonuse values of public recreational goods has been the subject of several studies and articles. Greenley, Walsh, and Young identified four parts of value (use, option, existence, and bequest) and estimated them using contingent valuation techniques, wherein the respondents were asked to allocate portions of their total willingness to pay (WTP) for hypothetical wilderness areas to actual use, possible future use, satisfaction of knowing the wilderness areas existed, and satisfaction of knowing the areas would be protected for future generations. Following this article, and others concerning option value and existence value (McConnell; Walsh, Loomis, and Gillman; and Smith), there seems to be a general consensus that "... 'option value' does not represent a distinct component of value, and that ... total value ... {is composed of} ... use values (e.g., consumptive, nonconsumptive, and indirect), with what remains being termed existence value or nonuse value" (Larsen).

The Study

As a part of a larger examination of wilderness designation in Utah, a contingent valuation (CV) study to determine Utahn's willingness to pay for wilderness designation or nondesignation was completed. While several proposals for wilderness have been made in Utah, only two have

well-documented specific proposals:[2] the Utah Wilderness Coalition (UWC) recommendation, which was published as *Wilderness at the Edge*, and the U.S. Bureau of Land Management (BLM) recommendation, which was reported in their related *Final Environmental Impact Statement*. The former proposal comprises approximately 5.7 million acres of BLM land; the latter, about 1.9 million acres. Most of this acreage is, quite obviously, in sparsely populated rural Utah, which has depended heavily on a traditional extractive resource economic base.

The contingent valuation portion of the study focused on these two proposals for wilderness designation. A sample of 2,135 Utah households was drawn by Survey Research, Inc. of Arlington, Virginia. Given the distribution of Utah population (over 80 percent of the population resides in the urbanized Wasatch Front), a second sample (600 households) of only the rural population was requested, in the anticipation that some rural counties would not be adequately represented in the general population sample. The samples used in the study included the original general population respondents, the urban respondents (those households residing in counties along the Wasatch Front, plus Cache County), and rural respondents (all other counties).

A computer-based contingent valuation questionnaire was developed for the study. Prior to its implementation, a packet of information was sent to each household in the sample. That packet included a map detailing the existing wilderness areas in Utah and the two proposals for designation along with a brief explanation of the regulations, which have been implemented to constrain the use of recently designated wilderness areas.[3] These regulations include clauses,

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[2]There is at least one other significant alternative proposal, the Hansen-Orten option. However, this alternative had not been sufficiently defined at the time of the study to provide the study respondents with enough detailed information on which to compare the three proposals. In addition, there have been many less well-specified proposals reported in the press and elsewhere.

[3]The map used was taken from *Wilderness at the Edge*.

which specify that no reduction in existing traditional uses will be made unless the "wilderness quality" is threatened, and that the traditional means of extraction will be allowed (for example, trucking and mechanized maintenance for grazing). However, further development of grazing, minerals, or other traditional extractive uses, and the use of mechanized recreational equipment, are prohibited.

In addition to the information regarding the wilderness proposals, a letter explaining the contingent valuation study and information concerning the survey itself was included. This letter indicated that willingness to pay for designation or nondesignation would be collected, along with attitudinal and socioeconomic data. Upon telephone contact with a household, the interviewer asked for the person 18 or older in the household who had most recently had a birthday. This approach was used to help insure a random sample. If the packet had not been received, read, or retained by the respondent, a new packet was sent and the individual recontacted at a later date.

The respondent was first asked about his/her past history of visitation to wilderness areas in Utah and participation in various kinds of outdoor recreation activity. He or she was next asked to rank his/her feelings about wilderness in general using a Likert scale of 1 to 10, where 1 signified strong opposition; 5, neutrality or no opinion; and 10, strong support. If the respondent gave a ranking of 5 or above, he or she was classed as "supporting" wilderness in general; a ranking of 4 or less resulted in being classified as "opposing" wilderness in general. Supporters of "wilderness in general" were then asked to allocate 10 points to each of four categories of reasons for his/her support, as follows:

> Now, suppose you have 10 points to allocate among reasons why you favor
> wilderness areas in general. You may allocate all 10 points to one reason, or
> divide them up according to your feelings about the relative importance of each

reason. I will read the reasons, and then ask you to give me your allocation. Remember that the total must add up to 10.

A.   I or members of my family will use these wilderness areas and want them for my continued use.

B.   There is a chance that I or members of my family will use these areas, and I would like to have them available if and when I decide to use them.

C.   I would like to have these areas available for others to use even if I or members of my family never use them.

D.   I would like to have these areas available for future generations to use, even if I or members of my family never use them.

In the event that an individual did not allocate exactly 10 points, he or she was reminded about the limit of points, and the questions were asked again. This allocation question was asked only once, after the initial "support of wilderness in general" question. It was assumed that individual respondents would make those same allocations for any wilderness proposal.

After the allocation questions were completed, a series of CV questions regarding use of the existing wilderness areas was then asked.[4] Next, the same ranking criteria were applied to the BLM proposal, followed by a set of CV questions which addressed both total value (establishment of the wilderness areas proposed by the BLM) and use value (annual WTP for use of the area). Lastly, those criteria were applied to the UWC proposal and the final set of CV questions were asked. After the CV questions were completed, information on the socioeconomic characteristics of the respondent and his or her spouse (if any) were collected, including race, age, education, employment, marital status, and income. The telephone interviews lasted, on average, about 20 minutes.

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[4]CV questions were also asked of opponents to wilderness, in general, as well opponents of the BLM and UWC proposals. See Keith, Fawson, and Johnson for a discussion of those responses.

A closed-ended dichotomous choice approach was used for the CV questions. This approach is generally (although not entirely) accepted as the standard approach for minimizing various kinds of bias in CV studies.[5] The "bid values" were chosen, based on earlier work in Utah by Pope and Jones, on other wilderness studies as reported by Walsh et al. and on a pretest using a nonrandom sample of individuals on the Utah State University campus. Those values ranged between $10 and $2,000, and were selected at random by the computer program used for the survey.

The CV questions for the proposed designations (BLM and UWC) involved two "steps." First, the individual was asked a referendum question about his or her willingness to vote for the designation of the BLM- (or the UWC-) proposed areas, given that designation would result in a specified annual income loss (in perpetuity). The bid represented a measure of total value. Next, the respondent was asked about his or her willingness to pay for an annual permit to use those areas as wilderness, using the same format as used for the use of existing wilderness areas. Those responding that they would vote against designation and/or would not pay any fee were asked to specify their reason for not being willing to pay. These reasons were classified as economically based ("not worth it to me," or "I can't afford it") or protests ("I shouldn't have to pay for wilderness," "I object to the payment (or the question)," etc.).

The willingness-to-pay measure (compensating surplus) was estimated for each question and each group of nonprotest respondents (general wilderness, BLM, and UWC). Two

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[5]There has been considerable discussion of closed-ended, referendum CV questions in the literature. Some authors (Green et al., for example) suggest that this approach causes overestimates due to anchoring effects compared to open-ended questions. Others suggest that the close-ended approach is based on random utility functions, while the open-ended approach has no such underlying consistency.

alternative approaches were used. The first followed Hanemann (1984, 1989), using a logit estimator and the linear form of the indirect utility model. This approach admits negative responses (that is, part of the density function may be found in the negative quadrant, indicating a positive probability of a negative willingness to pay). This "negative response" is frequently found in CV studies; ours was no exception. Given the possibility of negative responses in a case in which there is clearly no expectation of negative responses (such as ours in which opponents were eliminated from the estimation), one can choose to truncate the distribution, which biases the estimated WTP, or to use a log-linear form which is consistent with only positive bids (note that the log-linear form excludes 0 bids), such as the estimations by Bishop and Heberlein. Johansson et al., in their comment on Hanemann's 1984 article, briefly suggest that this form and others, which are local approximations to utility functions, might be used. We estimated WTP using both the truncated linear and the log-linear models.

Study Results

Point allocation results are listed in Tables 1, 2, and 3. The standard deviations for each "reason" are relatively large, although the means are remarkably consistent for all three cases. The correlations between the attitudinal measure (5 to 10 for supporters of wilderness) and the point allocation for nonprotest respondents for both the BLM and UWC proposals are found in Table 4. In both cases, the higher the attitudinal score, the higher the scores in both the use and bequest values, but the lower the scores in option and existence values. Further, use values appear to have a negative correlation with all other categories, and a relatively strong negative correlation (-.50) with bequest values. Simple OLS analysis for both proposals suggests a

Table 1. Point Allocation for Wilderness in General

	Use		Option	Existence		Bequest
All Wilderness Supporters:						
Total	1,509		992	1,182		2,177
Percent	25.75		16.93	20.17		37.15
Std dev	22.88		16.74	17.09		25.08
Sum		42.68			57.32	
Nonprotest Supporters:						
Total	908		590	719		1,383
Percent	25.22		16.39	19.97		38.42
Std dev	22.52		15.57	16.69		25.01
Sum		41.61			58.39	

Table 2. Point Allocation for BLM Wilderness Proposal

	Use		Option	Existence		Bequest
All Supporters:						
Total	1,157		753	916		1,734
Percent	25.37		16.51	20.09		38.03
Std dev	22.36		16.38	17.13		24.72
Sum		41.88			58.12	
Nonprotest Supporters:						
Total	883		503	633		1,231
Percent	27.17		15.48	19.48		37.88
Std dev	23.55		15.32	16.66		24.86
Sum		42.65			57.35	

Table 3. Point Allocation for UWC Wilderness Proposal

	Use	Option	Existence	Bequest
All Supporters:				
Total	959	593	755	1,433
Percent	25.64	15.86	20.19	38.32
Std dev	22.53	16.06	17.45	25.49
Sum	41.50		58.50	
Nonprotest Supporters:				
Total	680	413	532	1,055
Percent	25.37	15.41	19.85	39.37
Std dev	22.55	16.73	18.53	26.32
Sum	40.78		59.22	

Table 4. Correlation Coefficients

	Attitude	Use	Option	Existence	Bequest
BLM Proposal:					
Attitude	1				
Use	0.08887	1			
Option	-0.25337	-0.23342	1		
Existence	-0.09750	-0.38025	0.03534	1	
Bequest	0.13728	-0.54855	-0.41876	-0.33180	1
UWC Proposal:					
Attitude	1				
Use	0.01212	1			
Option	-0.14499	-0.20079	1		
Existence	-0.02942	-0.31449	-0.03952	1	
Bequest	0.10253	-0.50712	-0.43619	-0.40964	1

significant (t ≥ 2.0; .025 level) negative coefficient between the attitude measure and option value and a somewhat less significant (t ≥ 1.75; .05 level) positive coefficient between the attitude measure and bequest value. The coefficients for existence (negative) and use (positive) were not significant except for a slightly significant (t = 1.55; .1 level) positive relationship for BLM use allocations. The distribution of attitudinal values were as expected (Table 5): relatively large numbers of "5" scores, scores between 5 and 9 centered on the median scores (7 and 8), and a relatively large number of "10" values.

The results from the linear logit estimations for nonprotest bids[6] are found in Table 6 along with the number and percentage of each group. These results appear consistent with expected results. It should be noted that the number of nonprotest bids changed the number of observations used in the estimates. In addition, many of the intercepts and coefficients for the

Table 5. Distribution of Attitudinal Score

| | BLM | | UWC | |
	Number	Pct	Number	Pct
5	81	23.9	85	29.9
6	33	9.7	35	12.3
7	53	15.6	40	14.1
8	68	20.1	49	17.3
9	23	6.8	8	2.8
10	81	23.9	67	23.6

[6]When respondents indicated that they would not be willing to pay the bid presented, they were asked to state their reason. Responses such as "costs too much" or "not worth it to me" were deemed nonprotest. Protest responses included such statements as "I shouldn't have to pay," "I object to the question," or other similar statements indicating an unwillingness to give an economically based reply. These responses were recorded by the interviewer.

Table 6. Logistic Results (t statistics in parentheses)

Wild Prop	Establishment			Use			N	Pct
	Int	Bid	Inc	Int	Bid	Inc		
WLD Support	N/A	N/A	N/A	.01898 (.07)	-.00293 (-5.58)	.02010 (.38)	365	90.0
BLM Support	.3405 (1.17)	-.00119 (-5.29)	-.00286 (-.05)	1.7906 (4.74)	-.00898 (-7.21)	-.04682 (-.66)	316	72.3
UWC Support	.3228 (1.06)	-.00209 (-5.54)	.072 (1.11)	1.5724 (4.53)	-.00564 (-6.72)	-.0961 (-1.41)	284	63.6

income variable are not statistically significant at the 10 or even the 20 percent level. All of the coefficients for the "bid" are statistically significant at least at the 10 percent level. For the nonprotest segment of the respondents, the percentage of those supporting wilderness designation declines between the smaller BLM and larger UWC proposals. Table 7 indicates the WTP values, which are obtained from the approach to willingness-to-pay measures suggested by Hanemann (1984, 1989) for the simple linear random utility model using the calculation, which does not admit negative values are used ($y[1 - e^{-\alpha/\beta}]$).

Table 7. Calculated Willingness to Pay by Proposal—Linear Model, Negative WTP Not Admitted (Confidence intervals in parentheses)

Proposal	Establishment	Use
	$	$
WLD Support	N/A	255 (214–292)
BLM Support	729 (568–842)	198 (173–216)
UWC Support	498 (392–556)	254 (202–281)

The percentage of use value of total is 27.16 percent for the BLM case and 51.00 percent for the UWC case. The former value is very close to the use category of the point allocation; however, the latter value is closer to the use category plus the option category. In general, there does not seem to be, at least for the general population, a clear indication of the definition of use (that is, with or without option value). When urban and rural respondents were examined separately, the results stayed essentially the same.

Bishop and Heberlein and Johansson et al. have suggested an estimate truncated at the maximum bid amount to avoid the effects of the "fat" tails of the logistic estimation. This is a particular problem for cases of "yea-saying" with high values of bids. Of course, this truncation underestimates the mean willingness to pay derived from the linear approach. One alternative, which avoids the negative distribution issue, is to specify the utility difference function as linear in the logs and assume that it is a local approximation of a utility function (as suggested by Johansson).

The log-linear (in price) logit estimations are indicated in Table 8. The calculated willingness to pay for the log-linear logit models is found in Table 9. When an upper limit to the integration yielding WTP was $3,000, the results exceeded the maximum bid by substantial amounts. Therefore, we used an upper limit of the maximum bid, $2,000, as suggested by Bishop and Heberlein and Johansson.

A comparison of the linear (using either approach to mean WTP) and the log-linear results suggests some substantial differences and some inconsistencies. Note that log-linear results are generally larger than the linear models for the supporters of wilderness for both establishment and use values, but for opponents (supporters of multiple use) these values are smaller for the

Table 8. Logistic Log-Linear Results for the General Population Sample (t statistics in parentheses)

Wild	Establishment			Use				
Prop	Int	Bid	Inc	Int	Bid	Inc	N	Pct
WLD	N/A	N/A	N/A	3.1022	-.77537	.00806	365	90.0
Support	(5.52)	(-7.31)	(.14)					
BLM	2.2104	-.48334	.00447	7.2382	-1.4536	-.08194	316	72.3
Support	(4.68)	(-6.35)	(.07)	(8.66)	(-9.39)	(-1.10)		
UWC	2.9690	-.70638	.09553	6.2623	-1.214	-.1299	284	61.1
Support	(5.58)	(-7.46)	(1.43)	(8.21)	(-8.70)	(-1.80)		

Table 9. Calculated Willingness to Pay by Proposal—Log-Linear Model (confidence intervals in parentheses)

Proposal	Establishment	Use
	$	$
WLD Support	N/A	1,691 (1,624–1,748)
BLM Support	1,348 (1,292–1,484)	1,762 (1,706–1,786)
UWC Support	1,510 (1,415–1,595)	1,718 (1,631–1,760)

establishment values for opponents and larger for the use values. Furthermore, for both the BLM and UWC cases for supporters and opponents, the use values exceed establishment values. This result is inconsistent, since total value (establishment) should include use and existence values. Note that the linear results (which are consistent with utility theory) exhibit the expected relationship between establishment and use values. These results seem to suggest that the

log-linear local approximation should not be used for dichotomous choice questions, although further examination of our data as well as other tests are needed to confirm our results.

Summary and Conclusions

The study appears to substantiate other researchers' results that the division of use and nonuse values is problematic. Our results may stem from the fact that respondents were not asked to allocate points for each of the alternative proposals, as well as for wilderness in general. However, one would suspect that the larger the proposal, the more likely that existence or bequest values would increase. In any case, the inclusion of option value as a part of use value does not seem warranted by the study's result. Secondly, our results from the log-linear model indicate that choosing a local approximation to a utility function in order to avoid the truncation inherent in Hanemann's linear model may result in inconsistent values. Nonparametric estimations of the distributions of responses may furnish a more robust approach to dichotomous choice contingent valuation estimations.

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