ANALYSIS

Fairness in the contingent valuation of environmental public goods: attitude toward paying for environmental improvements at two levels of scope

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Abstract

Respondents to contingent valuation (CV) surveys give a variety of reasons for not wanting to pay money. This variability is likely to reflect people's attitudes toward paying for the public good change, their attitudes toward paying for public goods in general, and a component that is independent of these attitudes but unique to particular beliefs about paying (e.g. 'I can't afford to pay'). Negative attitudes toward paying can contribute to an apparent insensitivity to different levels of the same public good. In a telephone survey, northern Wisconsin property owners were asked about their WTP for four environmental public goods (biodiversity, Indian spearfishing, water quality, and wolves) at two levels of scope (part and whole). For water quality and spearfishing, the part was a chain of lakes that was geographically nested within a larger region of lakes. Similarly, the biodiversity whole represented a region comprising the smaller level of the public good. The scope conditions for wolves were quantitatively nested levels of returning 300 and 800 wolves to northern Wisconsin. Respondents' beliefs about paying for each public good and level of scope were measured in order to test their generality across the different public goods and levels of scope. Negative attitudes toward paying that are general across public goods place restrictions on the use of CV for environmental public goods. However, negative attitudes that are tied to specific environmental public goods suggest that the valuation method might be difficult to implement in these cases only. Moreover, negative attitudes toward paying that are either general or specific may contribute to perfect embedding when they are expressed across different levels of scope for the same public good. Respondents' beliefs about paying for each public good were associated with an attitude toward paying for the respective good and an attitude toward paying for public goods in general at both levels of scope. The general attitude was more explanatory of beliefs about paying for wolf reintroduction and spearfishing than were the specific attitudes. The distribution of beliefs was sensitive to the type of good being valued, but less so to the scope of the public good change. Contingent valuation practitioners should seek improvements in respondents' perceptions of the fairness of the valuation process in order to facilitate citizens'

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involvement in decisions about environmental public goods. Avenues for future research are proposed and discussed. © 2001 Elsevier Science B.V. All rights reserved.

1. Introduction

Contingent valuation (CV) research has identified a proportion of individuals who are not willing to pay to obtain (avoid) an increase (decrease) in some environmental public good (Halstead et al., 1992; Lindsey, 1994; Jorgensen and Syme, 1995; Jorgensen et al., 1999; Soderqvist, 1998). Individuals' opposition to paying can be associated with an information deficit, dissension over the proposed means of bringing about the change in the public good (e.g. the payment vehicle, pollution abatement intervention, etc.), an ethical objection to the idea of placing valued environmental objects in a market context, the belief that paying for environmental quality is the responsibility of government rather than individual citizens, and/or that other social groups should pay (e.g. polluters, users, etc.).

The types of 'protest' responses cited above are sometimes distinguished from other reasons for refusing to pay in CV studies. For example, respondents might feel that they cannot afford to pay and/or that the public good change is not worth anything. These responses appear to be consistent with theoretical expectations (Soderqvist, 1998) although CV practitioners define protest responses in a variety of ways in practice (Lindsey, 1994). Importantly, respondents seem to rarely remark that their refusal for paying was based on a lack of worth for the public good change (Lindsey, 1994; Soderqvist, 1998; Jorgensen et al., 1999).

One conclusion that might be drawn from the literature is that protest beliefs are representative of attitudes toward the valuation process (Jorgensen and Syme, 1995). Some individuals simply disagree with the idea that they (or others) should have to pay for a change in a particular public good. The question of why people will not pay becomes problematic when their responses to the valuation question do not indicate zero consumer surplus for the proposed change in the public good (Halstead et al., 1992; Lindsey, 1994; Soderqvist, 1998). For example, respondents who believe that they already pay enough, that the polluters should pay, that there is too much waste in government, or that existing revenue should be used, may still value a certain public good improvement but not the act of paying more money for it. This situation is problematic because willingness to pay values derived from CV cannot automatically be interpreted as the value of the change in the public good.

2. Problems with censoring protest responses

The validity of aggregate assessments of non-market benefits is questioned when estimates vary according to ad-hoc censorship rules applied by some practitioners and not others. One solution might be to develop general rules for censoring protest responses and apply them to all respondents who refuse to pay (Lindsey, 1994). However, censoring can contribute to sample non-representativeness when the distribution of the protest belief is not independent of the WTP response (Halstead et al., 1992; Jorgensen and Syme, 1995, 2000), the elicitation question format and/or factors external to the survey (Jorgensen et al., 1999).

The validity of CV estimates is also threatened when theoretically inconsistent data are summarily ignored or misinterpreted (Jorgensen and Syme, 1995). This is particularly the case when two or more protest beliefs represent expressions of the same attitude toward paying despite apparent differences in their content. For example, some respondents may state that they cannot afford to pay and that it would be unfair to expect them to pay. Both beliefs may reflect the

same attitude toward paying for the public good. If this underlying commonality is not detected, CV practitioners may censor one type of response and not another despite both being representative of the same attitude toward paying.

Furthermore, omitting responses on the basis of respondents' attitudes toward paying is difficult to defend if the distribution and meaning of the protest responses vary as a function of the public good. To this extent, general rules for censoring responses cannot be a feasible solution to the interpretation of zero dollar amounts.

Is attitude toward paying associated with the public good, independent of the good, or a combination of both? Are those individuals who have a negative attitude toward paying for one public good more likely to have a negative attitude toward paying for other goods? If attitude toward paying depends upon the good, then research might be able to look at the conditions under which particular types of goods are likely to be protested. If the variances of the protest beliefs are largely independent of the public good, then future research might focus on ways to engender perceptions of procedural fairness in economic valuations of environmental public goods.

2.1. Do protest responses depend on the type of good?

It is not known whether the meaning and distribution of protest responses vary according to the public good (Jorgensen and Syme, 1995). Attitude objects (e.g. public goods) and acts differ in the intensity of emotions they engender, their perceived importance, and the range of situations in which people gain experience with them (Petty and Krosnick, 1995). Therefore, individuals might be expected to hold a negative attitude toward paying for some types of goods and not others.

Respondents might also be unwilling to pay for public goods in general. That is, some individuals may value a particular set of environmental programs and yet not be willing to pay for any of them. People may not want to contribute additional amounts of money for public good improvements because (1) it conflicts with their beliefs about the appropriate role of government

in the provision of goods and service, (2) they are opposed to new taxes, (3) they distrust the government, (4) they think the government is inefficient, and/or (5) they think that others are responsible for paying for environmental protection. In short, for reasons unrelated to one's value for specific environmental improvements, respondents who refuse to pay for one public good may by unwilling to pay for other goods also.

2.2. Are protest beliefs independent of attitudes toward paying?

Some respondents may be unable to afford to pay for any environmental program, independent of their attitude toward paying. An inability to pay does not necessarily imply that respondents hold a negative attitude toward paying. In fact, some CV practitioners do not consider an inability to pay to be a protest against the valuation process (Soderqvist, 1998), but rather a consequence of legitimate budget constraints. In this sense, some proportion of the variability in refusals to pay may be independent of attitude toward paying.

Previous research has reported that reasons denoting an inability to pay were stated in conjunction with so-called protest reasons when individuals were given the chance to offer more than one response (Jorgensen et al., 1999). That is, respondents who felt that they could not afford to pay also disliked the valuation question. Therefore, if lack of ability is regarded as an acceptable reason for refusing to pay, then so should other beliefs that are representative of the same attitude toward paying.

2.3. Do protest responses depend on the scope of the good?

Protest beliefs may be more frequently observed when the scope of the public good change exceeds an individual's ideal level of service. That is, respondents may be willing to pay for small increases in a public good if large increases are perceived to be unfeasible or associated with negative consequences. In addition, the distribution of protest beliefs may vary with environmental

changes that have local effects rather than re-gional ones. Individuals may believe, for example, that increased water quality in local lakes is their responsibility while other people are responsible for water quality in other areas.

On the other hand, negative attitudes toward paying might be independent of differences in the scope of the public good. Individuals who are unwilling to pay because they believe that clean water is their right might be expected to protest irrespective of the level of scope. Further, individuals who cannot afford to pay for a relatively small change might be unlikely to offer a positive bid for a larger change.

Protest beliefs can contribute to the absence of scope sensitivity when respondents fail to value the part or the whole, but state WTP bids that reflect their attitude toward paying. On the surface, these zero responses appear to indicate that individuals fail to distinguish between levels of the public good. However, this apparent lack of attention to the content of the scenario may not be entirely due to an inability to appreciate the WTP question (Desvousges et al., 1993; Diamond and Hausman, 1993), the desire for moral satisfaction (Kahneman and Knetsch, 1992) or to survey mis-specification (Mitchell and Cameron, 1995), but to respondents' negative attitudes toward paying. To the extent that individuals have a negative attitude toward paying for a public good change, they may persist in their protest as long as they are asked to make an additional monetary contribution.

There is support in the CV literature for the role of protest beliefs in the absence of sensitivity to scope. One factor that appears to distinguish among studies reporting the magnitude of scope is whether zero bids were removed from the analysis (e.g. Kahneman and Knetsch, 1992; Brown et al., 1995) or not (e.g. Loomis et al., 1993). Harrison (cited in Kahneman and Knetsch, 1992, p. 61, footnote 1) raised concerns for potential biased results arising from the way zero responses are handled. Individuals may offer responses that only appear to ignore differences in levels of a public good (e.g. Goodman et al., 1998). Rather, a proportion of the perfect embedding effect might arise when respondents offer a zero bid,

even though they may well distinguish higher levels of quality or greater amounts of the public good from lower levels presented in the survey.

2.4. Summary

When respondents to WTP questions will not pay because they dislike some aspect of the valuation process, the reason is likely to be invariant over different levels of scope. That is, respondents will refuse to pay irrespective of the level of scope of the public good change. In contrast, individuals might feel that the smaller level of scope is preferred to some larger level because the former is more fair, equitable or affordable. When respondents either reject paying for a good at any level of scope, or prefer less of the good than more of it, WTP responses might appear to demonstrate insensitivity to the scope of the public good change. An alternative interpretation is that such responses might be expressions of negative attitudes toward paying for specific public goods and/or public goods in general.

Protest beliefs associated with elements of a contingent valuation survey that are not liked by respondents can potentially produce zero bids whenever they are perceived to be apparent. In this situation, information regarding the level of the public good might prove to be irrelevant to the individual's response. The fact that willingness to pay questions require respondents who favor environmental improvements to agree to additional monetary contributions may be the most objectionable aspect of contingent valuation surveys for some individuals.

3. Empirical model

Fig. 1 shows a measurement model incorporating four sources of variability in each measured protest belief. Protest beliefs within common public good domains are assumed to reflect an attitude toward paying for that particular good. Second, all beliefs are hypothesized to reflect variability in a general attitude toward paying operating across public good domains. Third, each type of belief is assumed to share variance unique to
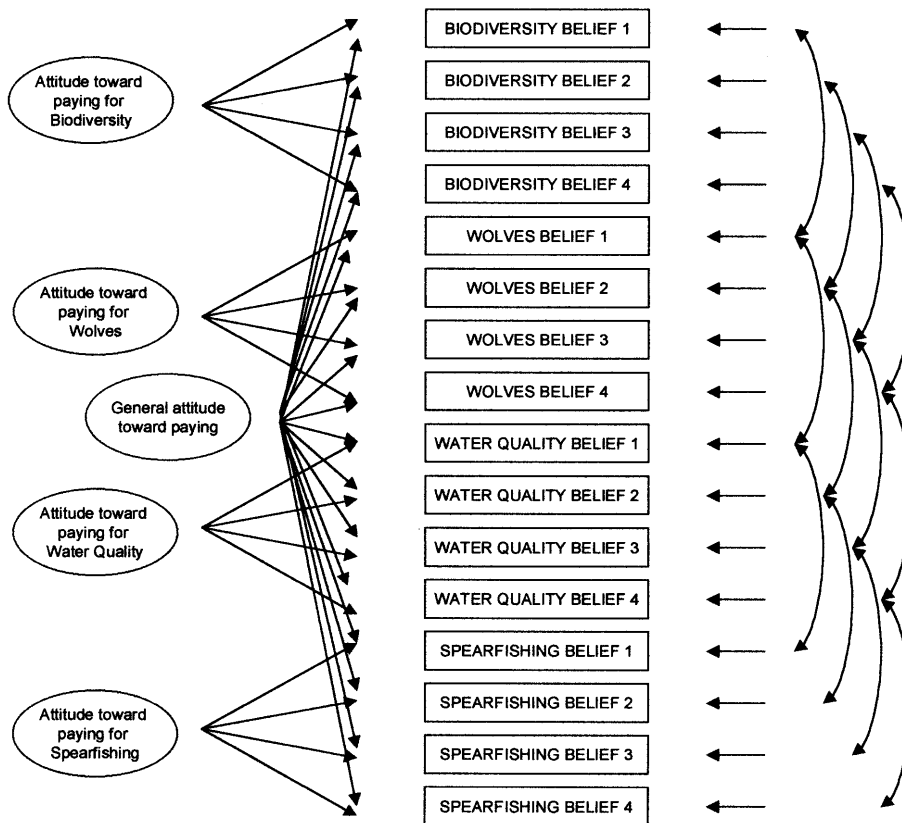
Fig. 1. Empirical model.

other items having the same content (e.g. all the 'BELIEF 1' items) and independent of the attitude variables. For example, to the extent that an inability to pay stands as a reason for not paying which is independent of attitude toward paying (either for a particular good or for goods in general), the residuals of like items will covary across public good domains. Finally, each measured belief is associated with an error component that is uncorrelated with any other variables in the model. This error variance may comprise both random and unique sources of item variability.

The parameters in this latent variable model can be estimated using structural equation modeling software such as LISREL 8.3 (du Toit et al., 1999). Structural equation models have been utilized in a number of social science disciplines including economics (Goldberger, 1972), sociology (Duncan, 1975), and psychology (Joreskog,

1971). However, examples of these types of models in the contingent valuation literature are rare (c.f. Jorgensen et al., 1998, 1999; Jorgensen and Syme, 2000).[1] Nevertheless, this type of modeling can deal with the problem of random and systematic measurement error in social science research that deals with unobservable constructs such as behavioral intentions and values.

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[1] The estimation process for latent variable models begins with fitting the measurement model to a correlation or variance–covariance matrix of observed variables (Anderson and Gerbing, 1988). An estimation procedure (e.g. maximum likelihood, weighted least squares, etc.) is used to derive all of the model's unknown parameters. When the model is over-identified (i.e. there are more known parameters compared with unknown parameters), a variety of goodness-of-fit statistics can be used to assess the statistical adequacy of the model (Bollen, 1989; Browne and Cudeck, 1993).

The attitude factors pertaining to each public good in the model are represented by the shared variance of the same four belief items. The general attitude factor, on the other hand, is represented by all 16 items. When the variability in two or more like items, in different public good domains, share common variability after accounting for the attitude factors, their error variances (or uniquenesses) will covary.

4. Method

A contingent valuation (CV) survey was administered by telephone to a sample of property owners in northern Wisconsin. The structured interview asked respondents about their WTP for four environmental public goods (biodiversity, spearfishing, water quality and wolves) at two levels of scope (part and whole). For water quality and spearfishing, the part was a chain of lakes that was geographically nested within all lakes in Vilas and Oneida counties. Similarly, the biodiversity part referred to Vilas and Oneida counties while the whole comprised biodiversity throughout all of northern Wisconsin. Finally, the scope

Table 1
Description of belief items concerning paying for public goods

Variable	Description of belief statements
CANTPAY	I cannot afford to pay money to protect [Environmental Good] in [Scope Level].
UNFAIR	It is unfair to ask me to pay money to protect [Environmental Good] in [Scope Level].
NOINFO	I need more information before making a decision about paying money to protect [Environmental Good] in [Scope Level].
WORTHY	Protecting [Environmental Good] in [Scope Level] is not worth paying money.
PAYENUF	I already pay enough in taxes and government charges for things like protecting [Environmental Good] in [Scope Level].
EXISTING	The government should use existing revenue to pay for the protection of [Environmental Good] in [Scope Level].
MYRIGHT	It is my right to have [Environmental Good] in [Scope Level] protected.

conditions for wolves were quantitatively nested levels of reintroducing 300 or 800 wolves to northern Wisconsin. The levels of scope and the type of public goods were chosen following a series of preliminary interviews with a small sample of property owners.

The public good and scope conditions were presented within-subjects. Individuals were randomly assigned to groups that differed according to the order by which the public good scenarios were presented. Random assignment of participants also determined whether the part or the whole was presented first. Respondents who were first asked about their WTP for the part were asked about the whole in a follow-up interview approximately two weeks later. Two interview times were instigated to reduce the cognitive burden on respondents and decrease the chance of dependencies between the WTP responses for the part and whole.

Individuals were asked to participate in the CV survey if they had responded to an earlier mail questionnaire concerning attitudes toward the same public goods included in the telephone survey (see Wilson et al., 1999, for details regarding the attitude survey). This original sample comprised 876 property owners for an overall response rate of 60%. A total of 686 respondents completed the first round of telephone interviews for a response rate of 78%. Sixty-nine respondents declined to participate in the second interview period reducing the follow-up sample size to 617.

Each WTP question was preceded by information about a proposed change in one of the four public goods, the time frame in which the change would take place, and the payment vehicle. All wording in the scenarios was the same across the scope levels of each public good. Open-ended WTP questions involving a one-time payment to a trust fund were used in all public good and scope conditions.

Following the presentation of each WTP question, participants were asked to rate their agreement to a number of belief items that were randomly ordered over individuals (see Table 1). These items dealt with paying for each public good and were rated on five-point Likert scales ranging from 'strongly disagree' to 'strongly

Table 2
WTP bid frequency distribution by environmental good part–whole pair

Part–whole pair	No bid	Zero bid	Non-zero bid
Biodiversity part	5.2	25.8	69.0
Biodiversity whole	5.2	23.3	71.5
Wolves part	3.7	45.1	51.2
Wolves whole	3.7	49.6	46.7
Water quality part	7.0	31.1	61.9
Water quality whole	7.0	20.3	72.8
Spearfishing part	4.2	51.9	43.9
Spearfishing whole	4.2	46.4	49.4

agree'. The statements were developed on the basis of existing literature on protest responses (Lindsey, 1994; Soderqvist, 1998; Jorgensen et al., 1999; Jorgensen and Syme, 2000) and preliminary interviews with property owners in northern Wisconsin. Individuals who were not willing to pay were given an opportunity to state reasons not expressed in the belief statements.

5. Results

5.1. Descriptive analysis of willingness to pay responses

Prior to examining beliefs about paying, statistics describing individuals' willingness to pay were computed for each public good and level of scope (see Table 2). People were more inclined to pay for biodiversity (69%) and water quality (62%) parts than they were for wolves (51%) and Indian spearfishing (44%) parts. A similar pattern was observed where the public good wholes were concerned (biodiversity, 72%; water quality, 73%; wolves, 47%; Indian spearfishing, 49%). The inverse of this pattern can be observed for the zero bids shown in Table 2. In contrast, respondents who either couldn't or wouldn't offer a bid represented between 3 and 7% of the sample for each public good part–whole pair.

Individuals who were willing to pay and those who were not were compared on age, gender, gross annual household income, and level of edu-

cation. The latter group consisted of individuals who stated a zero dollar amount, refused to state a bid, or had no opinion (see Table 3).

In general, differences between willing to pay groups were consistent across levels of scope. However, there was more variability in the relationships across public goods, although age was significantly related to paying in all public good cases. When relationships were significantly different across groups, older individuals, males, lower income households, and individuals with lower levels of education tended to be unwilling to pay.

Of further interest is the pattern of demographic relationships across public goods. While older respondents tended to be unwilling to pay for any of the different types of public goods, there were more discriminating patterns for the other three variables. Females tended to be more likely to want to pay for biodiversity and wolves than for water quality and spearfishing. Respondents having higher household incomes and education levels tended to be more likely to want to pay for biodiversity and water quality, although this pattern tended to be more apparent for the public good wholes than for the parts.

5.2. Analysis of beliefs about paying for public goods

The means and standard deviations for each of the belief statements are presented in Tables 4–7. These statistics show stability across levels, but not between public goods. For example, on average, respondents thought that biodiversity, water quality, and spearfishing were more personal rights issues compared with increased wolf numbers. Further, where spearfishing was concerned, individuals were more inclined to see paying as both unfair and unnecessary given their current contributions. On average, individuals also felt that they already paid enough for wolves and that wolf protection was not as worthy a spending priority compared with the other three public goods.

Non-parametric tests were conducted to assess the independence of the distribution of protest beliefs across public goods and scope conditions. From Table 8 it is evident that all of the distribu-

Table 3
Mean demographic differences between payment and nonpayment groups[a]

Part–whole pair	Payment group	Age[b] ($N = 581$)	Gender[c] ($N = 603$)	Income[d] ($N = 545$)	Education[e] ($N = 608$)
Biodiversity part	Non-pay	4.24*	1.33*	9.28	3.55*
	Pay	3.72*	1.42*	9.78	3.82*
Biodiversity whole	Non-pay	4.21***	1.29**	8.92*	3.47**
	Pay	3.75***	1.43**	9.89*	3.85**
Wolves part	Non-pay	4.10***	1.33**	9.37	3.65
	Pay	3.66***	1.45**	9.87	3.82
Wolves whole	Non-pay	4.05**	1.34**	9.49	3.64
	Pay	3.68**	1.45**	9.80	3.85
Water quality part	Non-pay	4.22***	1.36	9.14*	3.58*
	Pay	3.67***	1.41	9.92*	3.84*
Water quality whole	Non-pay	4.36***	1.33	8.64**	3.41**
	Pay	3.70***	1.41	9.96**	3.86**
Spearfishing part	Non-pay	4.02**	1.40	9.33*	3.78
	Pay	3.70**	1.39	10.00*	3.68
Spearfishing whole	Non-pay	3.99*	1.38	9.56	3.76
	Pay	3.76*	1.40	9.71	3.72

[a] The relevant means are reported in each cell of the table, but the significance levels refer to Mann–Whitney (income, age, education) and Pearson chi-square (gender) tests.

[b] Age categories were: 1 (under 30); 2 (31–40); 3 (41–50); 4 (51–60); 5 (61–70); 6 (71–80); 7 (80 and over).

[c] Gender was coded 1 (male) and 2 (female).

[d] Income categories were: 1 (less than US$10 000); 2 (US$10 000–14 999); 3 (US$15 000–19 999); 4 (US$20 000–24 999); 5 (US$25 000–29 999); 6 (US$30 000–34 999); 7 (US$35 000–39 999); 8 (US$40 000–44 999); 9 (US$45 000–49 999); 10 (US$50 000–59 999); 11 (US$60 000–69 999); 12 (US$70 000–79 999); 13 (US$80 000–89 999); 14 (US$90 000–99 999); 15 (over US$100 000).

[e] Education categories were: 1 (less than highschool); 2 (highschool); 3 (some college); 4 (2 years of college or technical degree); 5 (BA or BSc); 6 (advanced degree).

* $P < 0.05$.

** $P < 0.01$.

*** $P < 0.001$.

tions were associated with the type of good. For example, respondents rated increases in the wolf population as less of a personal rights issue, and less worth paying for, than protected water quality. Further, paying to reduce spearfishing was regarded as less fair than paying for increased biodiversity.

The distribution of protest responses was independent of the scope of the good in most cases (see Table 9) according to Wilcoxin Signed-Rank tests. Some exceptions were observed for water quality where respondents felt that it was less fair and worthy to pay for the part compared with the whole. Respondents also considered the water quality and wolves parts to be less of a personal right compared with the whole goods. Further, respondents were more inclined to feel that they already paid enough money for biodiversity in

Table 4
Descriptive statistics for the biodiversity belief statements

Belief statement	Part–whole	Mean	S.D.
CANTPAY	Part	2.67	1.09
	Whole	2.70	1.10
UNFAIR	Part	2.76	1.16
	Whole	2.78	1.14
NOINFO	Part	3.44	1.13
	Whole	3.43	1.17
WORTHY	Part	2.17	0.95
	Whole	2.20	0.95
PAYENUF	Part	3.45	1.09
	Whole	3.33	1.14
EXIST	Part	3.78	0.90
	Whole	3.77	0.90
MYRIGHT	Part	3.86	0.90
	Whole	3.73	0.96

Table 5
Descriptive statistics for the spearfishing belief statements

Belief statement	Part–whole	Mean	S.D.
CANTPAY	Part	2.97	1.22
	Whole	2.96	1.22
UNFAIR	Part	3.62	1.18
	Whole	3.55	1.22
NOINFO	Part	3.03	1.32
	Whole	3.02	1.32
WORTHY	Part	2.88	1.29
	Whole	2.73	1.30
PAYENUF	Part	3.72	1.07
	Whole	3.71	1.09
EXIST	Part	3.49	1.21
	Whole	3.45	1.25
MYRIGHT	Part	3.67	1.22
	Whole	3.70	1.25

Table 6
Descriptive statistics for the water quality belief statements

Belief statement	Part–whole	Mean	S.D.
CANTPAY	Part	2.72	1.11
	Whole	2.66	1.10
UNFAIR	Part	2.96	1.19
	Whole	2.65	1.13
NOINFO	Part	3.30	1.18
	Whole	3.40	1.16
WORTHY	Part	2.05	0.89
	Whole	1.88	0.79
PAYENUF	Part	3.50	1.10
	Whole	3.44	1.11
EXIST	Part	3.80	0.95
	Whole	3.86	0.86
MYRIGHT	Part	3.89	0.88
	Whole	4.04	0.84

Vilas and Oneida county than for biodiversity throughout all of northern Wisconsin.

Polychoric correlation matrices were computed for each level of scope and type of public good.[2] The inclusion of the asymptotic variances–covariances allowed the model parameters to be esti-

[2] Where ordinal measures are used, product moment correlations can underestimate linear relations among normally distributed latent variables. The polychoric correlation is an estimate based on a rescaling of the responses assuming an underlying bivariate normal distribution (Rigdon and Ferguson, 1991).

mated without an assumption of multivariate normality using the weighted least squares estimator (Browne, 1984).

Each set of seven belief items were factor analyzed according to the type of public good and level of scope to ascertain their unidimensionality.[3] On the basis of these results the UNFAIR, CANTPAY, PAYENUF, and WORTHY items were retained for further analysis.

This revised attitude toward paying model was estimated for the 8 groups of items. The chi-square (df) statistic for the public good parts ranged from 2.22 (2) to 18.21 (2) for wolves and spearfishing. For the public good wholes, the chi-square statistic was lowest for biodiversity (1.04) and highest for wolves (10.27). These statistics were generally not significant at the 1% level or better and suggested satisfactory degrees of fit in each case. However, significant differences were

Table 7
Descriptive statistics for the wolves belief statements

Belief statement	Part–whole	Mean	S.D.
CANTPAY	Part	2.96	1.18
	Whole	3.00	1.20
UNFAIR	Part	3.25	1.21
	Whole	3.41	1.23
NOINFO	Part	3.18	1.23
	Whole	3.16	1.33
WORTHY	Part	3.13	1.22
	Whole	3.29	1.26
PAYENUF	Part	3.62	1.07
	Whole	3.70	1.02
EXIST	Part	3.21	1.18
	Whole	3.08	1.23
MYRIGHT	Part	2.83	1.16
	Whole	2.61	1.14

[3] The chi-square (df) value for the public good parts ranged from 50.30 (14) to 164.57 (14) for water quality and spearfishing, respectively. For the public good wholes, the chi-square (df) value ranged from 18.04 (14) to 106.59 (14) for water quality and spearfishing, respectively. In all cases, the NOINFO, EXISTING and MYRIGHT items demonstrated the lowest degrees of association with the attitude toward paying factor for each level of each public good. These items were removed from the model on the basis that they were not strong indicators of the same attitude dimension measured by the other beliefs.

Table 8
Comparison of protest belief distributions across public goods for each level of scope[a]

Protest belief	Public good				Friedman $\chi^2(3)$
	Biodiversity	Spearfishing	Water quality	Wolves	
Part					
CANTPAY	2.34	2.65	2.40	2.61	46.136***
UNFAIR	2.17	2.94	2.28	2.61	174.671***
NOINFO	2.69	2.27	2.59	2.45	54.524***
WORTHY	2.18	2.73	2.03	3.06	298.374***
PAYENUF	2.37	2.63	2.44	2.57	23.217***
EXISTING	2.66	2.46	2.69	2.19	79.397***
MYRIGHT	2.75	2.67	2.79	1.80	268.938***
Whole					
CANTPAY	2.36	2.63	2.34	2.67	61.018***
UNFAIR	2.17	2.94	2.09	2.80	266.938***
NOINFO	2.64	2.31	2.60	2.45	35.937***
WORTHY	2.25	2.66	1.93	3.16	347.310***
PAYENUF	2.28	2.66	2.39	2.66	55.607***
EXISTING	2.66	2.47	2.74	2.13	109.246***
MYRIGHT	2.61	2.76	2.96	1.67	388.612***

[a] Numbers in the cells are mean ranks.
*** $P < 0.001$.

Table 9
Comparison of protest belief distributions across levels of scope for each public good[a]

Protest belief	Public good			
	Biodiversity	Spearfishing	Water quality	Wolves
CANTPAY	−0.599	−0.111	−1.514	−0.960
UNFAIR	−0.888	−1.213	−5.793***	−1.978*
NOINFO	−0.101	−0.508	−0.462	−0.369
WORTHY	−0.364	−2.190*	−3.820***	−1.839
PAYENUF	−2.863**	−0.207	−1.952	−1.107
EXISTING	−0.545	−0.610	−1.314	−1.828
MYRIGHT	−2.080*	−1.116	−3.171**	−3.049**

[a] Numbers in cells are z-scores.
* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$.

found between the sample and model-implied correlation matrices for the spearfishing part, the biodiversity part, and the larger scope condition for wolves. In these latter cases, there was evidence of correlations among the error variances of the CANTPAY and UNFAIR items, suggesting that some respondents felt that they could not afford to pay despite believing the CV process to be fair. Nevertheless, these correlations were not large in magnitude, and were equal to −0.37 ($t = −2.84$, $P < 0.01$) the spearfishing part; −0.23 ($t = −3.18$, $P < 0.001$) for the water quality

Table 10
Goodness-of-fit statistics for the model in each scope condition

Scope	$SB\chi^2$ (df)	RMSEA (90% CI)	RMSR	CFI	ECVI (90% CI)
Part	46.69 (64)	0.00 (0.00, 0.00)	0.07	1.00	0.57 (0.57,0.57)
Whole	53.23 (64)	0.00 (0.00, 0.02)	0.07	1.00	0.58 (0.58, 0.61)

Table 11
Confirmatory factor analysis solution for the public good parts

Item	Attitudes toward paying factor loadings[a1]				
	Biodiversity	Spearfishing	Water	Wolves	General
CANTPAY	−0.12 (0.08)				0.81[***1] (0.04)
UNFAIR	0.12 (0.09)				0.93[***1] (0.03)
WORTHY	0.50[*1] (0.24)				0.77[***1] (0.04)
PAYENUF	−0.18 (0.15)				0.68[***1] (0.14)
CANTPAY		0.51[***1] (0.07)			0.56[***1] (0.05)
UNFAIR		0.61[***1] (0.10)			0.44[***1] (0.09)
WORTHY		0.60[***1] (0.08)			0.43[***1] (0.06)
PAYENUF		0.36[***1] (0.08)			0.42[***1] (0.08)
CANTPAY			0.56[***1] (0.10)		0.70[***1] (0.05)
UNFAIR			0.38[***1] (0.08)		0.75[***1] (0.04)
WORTHY			0.35[***1] (0.09)		0.60[***1] (0.05)
PAYENUF			0.27[***1] (0.08)		0.68[***1] (0.05)
CANTPAY				0.33[***1] (0.07)	0.58[***1] (0.06)
UNFAIR				0.67[***1] (0.09)	0.66[***1] (0.06)
WORTHY				0.71[***1] (0.08)	0.57[***1] (0.05)
PAYENUF				0.56[***1] (0.11)	0.47[***1] (0.10)

[a] Standard errors in parentheses.
* $P < 0.05$.
*** $P < 0.001$.

part; and, −0.09 ($t = 2.16$, $P < 0.05$) for the wolves whole. With these parameters added, the chi-square value for each measurement model was not significantly different to zero at the 5% level.

The model given in Fig. 1 was estimated in each of the scope conditions. The factor correlations for the good-specific attitudes were fixed to equal zero in the initial model. These constraints implied that the specific attitudes toward paying were independent after accounting for the general and item-unique sources of variation. The goodness-of-fit statistics indicated that both models offered an adequate fit to the data (see Table 10).[4]

In each model the factor correlations were relaxed in order to assess the extent to which attitudes toward paying for specific public goods

[4] Given first in the table is the minimum fit function chi-square (χ^2) which provides a test of the degree to which the model-based correlation matrix is consistent with the sample matrix. The comparative fit index (CFI; Bentler, 1990) indicates the extent to which the model fits better than a baseline independence model. Next, the RMSR is the average fitted residual and indicates the average discrepancy between the sample correlation matrix and the fitted matrix. Another different type of fit measure — the root mean square error of approximation (RMSEA; Steiger, 1990) — takes into account the error of approximation in the population as well as the model degrees of freedom. The last fit index given in Table 10 — the expected cross validation index (ECVI; Browne and Cudeck, 1993) — takes into account differences in parsimony (i.e. number of parameters) (Williams and Holahan, 1994).

were correlated after accounting for the effect of the general factor. For the smaller scope goods, only the correlation between paying for spearfishing and paying for biodiversity was significantly different to zero ($\phi = -0.39$, $t = -2.19$). The addition of this correlation resulted in a significant improvement in the model chi-square for one degree of freedom ($\chi_\Delta^2 = 8.67$, $P < 0.01$). For the public good wholes, only the correlation between paying for biodiversity and wolves was significantly different to zero ($\phi = 0.49$, $t = 4.20$). Following the addition of this covariance, the model chi-square was significantly smaller ($\chi_\Delta^2 = 10.18$, $P < 0.01$).

The factor loadings for the two models are presented in Tables 11 and 12. The results indicated that, in most instances, the attitudes toward paying for each public good were represented by beliefs about the fairness of the behavior, ability to pay, the worthiness of paying for the change, and paying adequate amounts already for the proposed environmental changes to occur. An excep-

tion occurred for attitude toward paying for the biodiversity part that was not defined well by the four items. Moreover, variability in the biodiversity and water quality beliefs was more a function of the general attitude than the specific attitude factor. For the other two public goods, variability was split more evenly between general and specific sources. Notwithstanding, all belief items had moderate to high loadings on the general factor in both scope conditions, and the pattern of loadings was qualitatively similar across both levels of scope.

Examination of the correlated error variances among the CANTPAY items showed that nearly all were significantly different to zero (see Tables 13 and 14). The only exceptions occurred for the correlation between the errors of the water quality and spearfishing items for the public good whole. There was no significant covariation between fairness beliefs after accounting for the specific and general attitudes toward paying.

Table 12
Confirmatory factor analysis solution for the public good wholes

Item	Attitudes toward paying factor loadings[a1]				
	Biodiversity	Spearfishing	Water	Wolves	General
CANTPAY	0.24[*1] (0.11)				0.81[***1] (0.06)
UNFAIR	0.33[**1] (0.10)				0.90[***1] (0.05)
WORTHY	0.34[**1] (0.11)				0.72[***1] (0.05)
PAYENUF	0.55[***1] (0.10)				0.62[***1] (0.06)
CANTPAY		0.36[***1] (0.07)			0.65[***1] (0.06)
UNFAIR		0.66[***1] (0.08)			0.47[***1] (0.06)
WORTHY		0.58[***1] (0.08)			0.38[***1] (0.07)
PAYENUF		0.61[***1] (0.13)			0.45[***1] (0.09)
CANTPAY			0.31[*1] (0.13)		0.80[***1] (0.06)
UNFAIR			0.45[***1] (0.13)		0.76[***1] (0.06)
WORTHY			0.45[**1] (0.14)		0.52[***1] (0.07)
PAYENUF			0.07 (0.13)		0.74[***1] (0.06)
CANTPAY				0.46[***1] (0.07)	0.58[***1] (0.06)
UNFAIR				0.76[***1] (0.05)	0.51[***1] (0.06)
WORTHY				0.71[***1] (0.05)	0.48[***1] (0.06)
PAYENUF				0.39[***1] (0.11)	0.52[***1] (0.07)

[a] Standard errors in parentheses.
* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$.

Table 13
Error correlations of belief items for the public good parts

Public good	Biodiversity	Spearfishing	Water quality	Wolves
CANTPAY				
Biodiversity	1.00			
Spearfishing	0.19[***1]	1.00		
Water quality	0.17[***1]	0.17[**1]	1.00	
Wolves	0.23[***1]	0.18[**1]	0.18[**1]	1.00
UNFAIR				
Biodiversity	1.00			
Spearfishing	0.02	1.00		
Water quality	−0.02	0.01	1.00	
Wolves	0.02	0.03	0.00	1.00
WORTHY				
Biodiversity	1.00			
Spearfishing	0.03	1.00		
Water quality	0.10	0.02	1.00	
Wolves	0.07[*1]	0.00	0.09[*1]	1.00
PAYENUF				
Biodiversity	1.00			
Spearfishing	0.23[*1]	1.00		
Water quality	0.13	0.25[**1]	1.00	
Wolves	0.16	0.11	0.11	1.00

* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$.

6. Discussion

The results suggest that developing general rules to censor protest beliefs may be difficult when they are not independent of one another, but representative of the same attitudes toward paying. Even beliefs about one's ability to pay, which might be retained by some CV practitioners, were associated with beliefs about the fairness of paying, the worth of the act of paying money for public good changes, and the amount of money already paid by individuals for environmental management. Beliefs about using existing funds to pay for the public good changes, rights to those changes, and information constraints were less representative of the attitude expressed in the other beliefs.

The distribution of protest beliefs was sensitive to the type of public good being valued, but were less responsive to the scope of the public good change. While the frequency of a few beliefs showed variability over scope conditions, these differences were not consistent. Water quality showed the greatest scope variability with respect to perceptions of the worthiness of paying, the unfairness of having to pay more money, and the right to clean water. In contrast, protest beliefs associated with spearfishing showed the least scope variability. Only the belief that reduced spearfishing was not worth paying money for varied across scope. However, the perception of one's right to each of the public good changes was the most variable protest belief. The distribution of this belief varied across scope when stated in response to biodiversity, water quality, and wolves. Individuals claimed rights more strongly for the biodiversity part, water quality whole, and wolves part when compared across scope levels.

Factor analysis supported the presence of a general attitude toward paying for public goods. The general factor explained variability in protest beliefs associated with different public goods.

Furthermore, this factor had associations with the protest beliefs that were of a magnitude comparable to, or greater than, those involving the specific attitudes in most cases. The general factor was reflected more in the beliefs about paying for biodiversity and water quality than in beliefs about spearfishing and wolves. Therefore, individuals tended to give greater weight to how they felt about paying for environmental goods in general when considering biodiversity and water quality. This might reflect a perception among a proportion of respondents that biodiversity and water quality were more appropriate priorities for additional household contributions than were spearfishing and wolves. This interpretation seems consistent with the smaller proportion of positive bids observed for spearfishing and wolves.

The relationships between the protest beliefs and the attitude factors appeared to be relatively independent of the scope of the public good except where the biodiversity and water quality

goods were concerned. Beliefs about paying for these goods tended to show different relationships with specific and general attitudes across levels of scope. Nevertheless, the difference between factor solutions was not statistically compared so that strong conclusions in this respect should be avoided.

The results of this study have implications for issues of scope sensitivity in contingent valuation. Based on the analysis of individuals' beliefs about paying, some expectations can be formed with respect to sensitivity to the scope of environmental public goods. Given that respondents believed that paying for the water quality part was less fair and worthy than was paying for the whole, they might be expected to demonstrate sensitivity to scope by paying more for the whole than for the part. Alternatively, beliefs that support paying for the part rather than the whole may lead to scope sensitivity in the opposite direction to that normally expected in embedding research. Further,

Table 14
Error correlations of belief items for the public good wholes

Public good	Biodiversity	Spearfishing	Water quality	Wolves
CANTPAY				
Biodiversity	1.00			
Spearfishing	0.15[*1]	1.00		
Water quality	0.13[*1]	0.11	1.00	
Wolves	0.18[**1]	0.24[***1]	0.16[**1]	1.00
UNFAIR				
Biodiversity	1.00			
Spearfishing	0.04	1.00		
Water quality	0.01	0.03	1.00	
Wolves	0.05	−0.01	0.04	1.00
WORTHY				
Biodiversity	1.00			
Spearfishing	0.00	1.00		
Water quality	0.15[**1]	0.15[**1]	1.00	
Wolves	−0.01	0.01	−0.08	1.00
PAYENUF				
Biodiversity	1.00			
Spearfishing	0.18[**1]	1.00		
Water quality	0.35[***1]	0.10	1.00	
Wolves	0.20[***1]	0.05	0.25[**1]	1.00

* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$.

nonsignificant differences between beliefs about paying for different levels of scope might contribute to WTP insensitivity. Refusing to pay for each level of scope is associated with insensitivity to the extent that a zero WTP is offered in response to any change in the public good.

Of course, these types of hypotheses are only reasonable to the extent that protest beliefs are salient in the WTP decision. Research by Jorgensen and Syme (2000) has indicated that protest beliefs were associated with WTP for stormwater pollution abatement. Unlike explanations that propose respondent ignorance to changes in the level of scope of a public good due to factors such as moral satisfaction (Kahneman and Knetsch, 1992), an inability to appreciate the WTP question (Desvousges et al., 1993; Diamond and Hausman, 1993), or misspecification errors in the questionnaire design (Mitchell and Carson, 1989), respondents may be unwilling to pay despite fully appreciating the scope of the public good change. In short, respondents may not accept that they should pay more for any change in the public good, independent of the desirability of that change.

Future research should examine the extent to which variations in WTP over different levels of scope can be explained by variability in attitudes toward paying. This research should contrast different elicitation techniques since research indicates that this aspect of survey design is associated with the distribution of protest beliefs (Jorgensen et al., 1999). In this respect, conclusions regarding the generality of attitudes toward paying should not be extended to CV question formats other than the open-ended technique employed here.

Future research might also investigate the multidimensionality of attitude toward paying given the significant correlations involving the error variances of the beliefs pertaining to one's ability to pay and perceived adequacy of existing contributions. These residuals may be indicative of unmodelled common factors that are orthogonal to the specific and general attitudes included in the model. Given that the correlated errors were more apparent among beliefs about ability to pay and the existing funding arrangements, the correlations may represent an appreciation of budget constraints that is independent of evaluations of the act of paying.

In conclusion, beliefs about the fairness of paying for environmental public goods may be prevalent in CV studies (Jorgensen et al., 1999), salient in the WTP decision (Jorgensen and Syme, 2000), robust to variations in scope, and partly independent of the type of public good. The fact that a significant component of the variability in protest beliefs is related to a general attitude toward paying suggests that they may be expected to occur in CV surveys whenever additional household payments are the only means by which individuals can express value for environmental public good improvements. In order to facilitate citizens' involvement in public decision-making, improvements in perceptions of procedural fairness would seem desirable. This may require changes in the way that CV surveys are conducted, how the data is analyzed, and the conclusions that are drawn by the practitioner.

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