ANALYSIS

The structure of motivation for contingent values: a case study of lake water quality improvement

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Abstract

Critics of the contingent valuation (CV) method have argued that individuals apply "noneconomic" motives in responding to CV questions, implying that elicited values are not valid measures of the economic benefit of environmental improvement. This study examines the role of such motives by using measures of attitude and motive strength to interpret willingness-to-pay (WTP) values for a set of nested environmental goods with potential use and nonuse benefits. Motivational structure is found to be more complex than suggested by the simple distinction between valid economic–theoretic and "noneconomic" motives. Social motivations possibly associated with the benefit of contributing to a public good rather than the benefits of the good itself are potentially relevant to the WTP decision but do not give rise to separable values. The strength of perceived personal responsibility for provision of the good is significantly associated with WTP but also with the theoretically desirable property of enhanced scope sensitivity. WTP is not found to be associated with the extent to which the individual feels under some general moral obligation to contribute to "good causes". Motives arising from ethical concerns for the environment and altruism are also potentially relevant to WTP but are closely related to underlying motives associated with existence and personal use values, respectively. It is suggested that the CV debate should be informed by further empirical investigation of the extent to which motives for WTP can be treated as separable.
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Keywords: Contingent valuation; Motivation; New ecological paradigm; Warm glow; Scope sensitivity

1. Introduction

The contingent valuation (CV) method typically uses survey techniques to elicit individuals' willingness-to-pay (WTP) for the hypothetical provision of a public good or willingness-to-accept compensation (WTA) for its hypothetical loss. These monetary

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values are taken to represent the economic–theoretic benefits of the proposed change and therefore may be aggregated for use in conducting benefit–cost analyses of public interventions that potentially improve social welfare. However, the application of the method to the environment has generated considerable controversy.

In principle, CV is well suited to the valuation of a change in the status of the environment. The theoretical basis is that the individual seeks to maximise a utility function, or equivalently minimise an expenditure function subject to a utility constraint, that includes a vector of services dependent on environmental status (see for example, Freeman, 1993, Chapters 3 and 5). Representing the level of these services as elements, g_i, in the vector **G**, the individual's maximum WTP, W, for a project that enhances environmental status is a total value derived from the benefits of changes in distinct services (Δg_i), each such benefit constituting a motive for WTP. For unpriced environmental services, the WTP for a project that improves services from $\mathbf{G}^0$ to $\mathbf{G}^1$ is given in terms of the expenditure function by:

$$W = e(\mathbf{G}^0, \mathbf{P}, u^0) - e(\mathbf{G}^1, \mathbf{P}, u^0) \qquad (1)$$

where u^0 is the initial utility level and **P** is the vector of prices of goods in the private consumption bundle. The most widely recognised services give rise to values described as: use, option, existence, and bequest [Turner (1999) provides a survey]. The use of CV is advantageous in these circumstances because it captures the total value that WTP represents.

Because environmental services are treated as goods, it is expected that in the absence of satiation or budget constraint, the individual's WTP should exhibit scope sensitivity: the greater the increase in services offered by a project, the greater is WTP. Formally, this is represented as:

$$\frac{\Delta W}{\Delta \mathbf{G}^1} \gg 0 \qquad (2)$$

Critics of the CV method argue that elicited values are not valid measures of economic benefit because the individual has "noneconomic" motives in responding to CV questions on environmental goods. A "quantitative critique" derives from what is claimed to be inadequate scope sensitivity in empirical studies (e.g., Kahneman and Knetsch, 1992; Diamond et al., 1993; Desvousges et al., 1993). To account for these observations, some authors have hypothesised that individuals state a positive WTP in order to purchase "moral satisfaction" or obtain a "warm glow" (originally defined by Andreoni (1989) as arising from *voluntary* contribution to a public good). Alternatively, "ethical critiques" generally employ the hypothesis that the individual's response to CV questions is motivated by ethical considerations manifested either through altruism towards other people (Milgrom, 1993; McConnell, 1997) or through the attribution of moral rights to nonhuman entities. In the latter case, the CV principle of trade-off between income and the environment may be rejected or, where preferences are expressed, they represent stated values reflecting what the individual sees as morally right regardless of personal benefit (e.g., Stevens et al., 1991; Opaluch and Grigalunas, 1992; Common et al., 1997). This may be referred to as an intrinsic value, i.e., a human value stemming from a rights-based belief on the part of the holder (Turner, 1999).

While the interpretation of studies underlying the "quantitative critique" has been challenged (Smith, 1992; Harrison, 1992; Hanemann, 1994, 1996; Carson and Flores, 1996) and empirical evidence suggests that only a small minority of CV responses might be influenced by ethical beliefs (Stevens et al., 1991; Spash and Hanley, 1995; Spash, 2000), there has been limited empirical investigation of the relative importance to the individual of the range of possible motives for a given WTP value and how those motives might interact. This may stem from concerns as to the theoretical justification for enquiring into individuals' motives and the feasibility of doing so.

The justification for examining motivation has been disputed under the fundamental principle of consumer sovereignty (e.g., Harrison, 1992; Hanemann, 1994, 1996). However, without disputing this principle, it is arguable that motivation is irrelevant to CV only where it is certain that the individual is valuing precisely the good envisaged by the investigator. If instead a wider set of goods is being valued, then this may influence the interpretation and application of stated values. To illustrate, say that the

individual enjoys some psychic reward, an "indirect private benefit" (IPB), from the act of contributing to a public good.[1] The value of this benefit is then part of the total value represented by WTP, as shown by a modification of Eq. (1):

$$W = e(\mathbf{G}^0, \mathbf{P}, u^0) - e(\mathbf{B}, \mathbf{G}^1, \mathbf{P}, u^0) \qquad (3)$$

where $\mathbf{B}$ represents an IPB from contribution. Within this model, the elements in $\mathbf{B}$ (b_j) could be used to represent private benefits associated with the hypothesised sources of "warm glow": social compliance (the benefit of complying with perceived social norms arising from "civic or social responsibility" or an "obligation to pay a fair share", Schkade and Payne, 1993, 1994) and expression [the benefit of expressing "concern" (Diamond and Hausman, 1993) or "support for environmental issues" (Diamond et al., 1993; Sugden, 1999)].

As regards the feasibility of investigating the range of motives for WTP, several relatively early CV studies sought self-reported estimates of the proportion of WTP attributable to use or various nonuse values (for example, in the context of water quality: Sanders et al., 1990). However, subsequent empirical investigation may have been constrained by concerns as to the "fallacy of motivational precision", the error of assuming individuals can be sufficiently aware of "what motivates their value judgements" (Mitchell and Carson, 1989, p.287 et seq.). Nevertheless, a recent study by Kotchen and Reiling (2000), hereafter K&R, suggests that individuals can reliably distinguish at least the relative importance of their motives in responding to a CV task.[2]

The K&R study involves the measurement of the strength of the individual's proenvironmental attitude by means of the score on the "new ecological paradigm" (NEP) scale (Dunlap et al., 2000). This attitudinal measure is found to be a significant predictor of assent to the offered WTP in a dichot-omous choice format CV of projects to protect certain species. Furthermore, those individuals with a stronger proenvironmental attitude tend to ascribe higher importance to existence-related motives for their responses.

K&R's findings raise the possibility, which we pursue here, that measures of stated motivation and of attitude can be used to investigate a range of motives for WTP, including the "noneconomic" motives suggested by critics of CV. Specifically, we consider relationships between motivation and WTP with a view toward elucidating the role of "noneconomic" motives in the WTP decision and whether this characterisation of such motives is empirically meaningful. The study also supports further investigation of the NEP scale as a means of interpreting individuals' statements about their motives and their WTP.[3]

For these purposes, we employ a case study involving alternative levels of provision of a good with both potential use and nonuse values. We find evidence that the individual's motives are more complex than suggested by the theoretical labels used in the CV debate. Therefore, we argue that the simple "noneconomic" vs. valid economic–theoretic distinctions will be of limited usefulness in advancing this debate.

In Section 2 we develop a framework for characterising "noneconomic" motives and apply an extension of K&R's method to derive empirical expectations. The case study used to test these expectations is described in Section 3. Section 4 sets out the results of this case study, which are discussed in Section 5.

2. The characterisation of "noneconomic" motives for WTP

It is implicit in the motivational critiques that a "noneconomic" motive has relevance to the individual's response to CV questions and is separable from other motives—its meaning to the individual and its effect are distinct from those of other motives.

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[1] The hypothesis of IPB is comparable to that of "warm glow" as used by critics of CV but is used in distinction here because it does not require any idea of voluntary contribution. Thus, it can be clearly distinguished from Andreoni's "warm glow of giving".

[2] This not to say that individuals can reliably partition their total WTP among motivating benefits, consistent with the views of Mitchell and Carson (1989) and Cummings and Harrison (1995).

[3] An implicit issue is also whether the NEP scale is effective in the interpretation of *formal* CV results outside the U.S. As far as we are aware, this has not been tested to date.

K&R's method provides a basis on which these characteristics can be assessed for specific motives. Their findings indicate that the stated importance of motives connected with existence value (Δg_E) and intrinsic value (Δg_I) is consistent with the NEP score:

$$I(\Delta g_E) \propto NEP \tag{4}$$

$$I(\Delta g_I) \propto NEP \tag{5}$$

where *NEP* is the NEP score, $I(\bullet)$ is the importance ascribed to the specified motive, and the proportionality symbol ($\propto$) indicates an empirical association between variables. While K&R's findings deal only with existence-related motives, they suggest that stated importance could be used to directly gauge the individual's perception of the relevance of other motives and thus as a basis for assessing separability.

The NEP score is also found by K&R to be positively associated with WTP:

$$W \propto NEP \tag{6}$$

and taking Eqs. (4) and (5) with Eq. (6), this measure of attitude links motive importance to WTP. Because WTP is a function of the impact of changes in environmental services as per Eq. (3), the measure of motive importance is arguably conveying information about the extent of this impact and thus the contribution to WTP, i.e., for elements in **G**:

$$W \propto -\frac{\Delta e}{\Delta g_i} \propto I(\Delta g_i) \tag{7}$$

and for elements in **B**:

$$W \propto -\frac{\Delta e}{b_j} \propto I(b_j) \tag{8}$$

The relation in Eq. (7) provides a basis for assessing motive relevance in terms of the relationship to WTP, and that in Eq. (8) provides a basis for detecting motivation by an IPB, as discussed further below.

Now, consider the "quantitative critique". In the terms described in Section 1, this involves the assertion that WTP is predominantly driven by the acquisition of an IPB distinct from the benefit of enhanced environmental services and we identified two possible types of IPB, arising from social compliance and expression.

To represent the IPB of social compliance, we define motives that reflect the terms used by Schkade and Payne (1993; 1994): "Obligation" (a perceived general duty to contribute to public goods, $j=O$) and "Responsibility" (a perceived specific duty as regards a particular public good, arising from personal relevance, $j=R$). If these motives are separable from each other, then we would expect:

H1. $I(b_O) \not\propto I(b_R)$

and if they are separable from other motives, then:

H2. $I(b_O) \not\propto I(\Delta g_i) \forall i$ and $I(b_R) \not\propto I(\Delta g_i) \forall i$

If the motives are relevant, the next issue is whether they can be associated independently (if they are separable) or jointly with an IPB. In the "quantitative critique", the individual obtains some benefit from stating a positive WTP because the project exists rather than what it achieves, i.e., highlighting the relevant elements in Eq. (3):

$$W = e(\mathbf{G}^0, u^0) - e(b_j|_{\Delta \mathbf{G} > 0}, \mathbf{G}^1, u^0) \tag{9}$$

In this case, referred to as that of a "pure IPB", the motive of acquiring the IPB is reflected in WTP but is not associated with the scope sensitivity of WTP. If Obligation or Responsibility give rise to such an IPB, then we would expect:

H3. $W \propto I(b_j)$ and $\dfrac{\Delta W}{\Delta \mathbf{G}^1} \not\propto I(b_j)$

for $j=O$, R, respectively, where the motives are separable.

A complementary approach to detecting a propensity to acquire an IPB from social compliance is to use a measure of attitude more directly related to support for the provision of public goods generally (a prosocial attitude). Clark et al. (2003) report a possible such measure, an "altruism scale", reflecting components of attitude suggested as necessary to altruistic behaviour: awareness of consequences, ascription of responsibility, and personal norms (Schwartz, 1970, 1977). If the individual's WTP is substantially motivated by the

notion of social compliance, then we would expect the score on such a scale (*ALT*) to be associated with WTP, i.e.,

H4. $W \propto ALT$

The approach to identifying an IPB of expression could in theory follow that outlined above for the IPB of social compliance. However, this is not considered realistic in practice because individuals are unlikely to ascribe importance to the motive of expression as this could undermine the credibility of their stated WTP. Instead, indirect evidence can be sought on the basis that any propensity to express concern about the environment through WTP is also likely to be manifested in the NEP score. Thus, the NEP score could be a proxy measure of the propensity to express environmental concern.

If the NEP score is acting as such a proxy, then we would expect several observable consequences in the context of a good with potential use as well as nonuse value. First, a higher NEP score would tend to be associated with a higher importance for *all* motives related to environmental status rather than with the existence-related motives (as per Eqs. (4) and (5))[4]:

H5. $I(\Delta g_i) \propto NEP \forall i$

Second, individuals with a higher NEP score would be seeking to obtain an IPB of expression without attending to specific reasons for deciding on value. Consequently, we would expect that WTP would vary with the NEP score regardless of stated motivation and WTP would be relatively scope-insensitive as the NEP score increases:

H6. $W \propto NEP$ but $\dfrac{\Delta W}{\Delta \mathbf{G}^1} \not\propto NEP$

Certain design features of K&R's study could have introduced biases connected with the propensity to express concern. The use of a mail survey (with a 63.1% return rate) may have biased the sample to those more predisposed to expressing their attitude. Furthermore, the dichotomous choice format could have encouraged respondents to express concern without attending to the cost implications (yea saying). To reduce these possible biases, our study uses face-to-face interviews with an open-ended elicitation format.[5]

Turning to the "ethical critique", insofar as ethical concerns motivate a positive WTP, they can be represented in the model in Eq. (3) by elements in **G** because they stem from the enhancement of environmental status, albeit that the benefit is perceived to accrue to others. We refer to two ethically based motives: intrinsic value (Δg_I) and altruism (Δg_A). The critique entails no specific assertions about the relationship of motive strength to WTP, and the key issues here are therefore the relevance of ethical motives and their separability from other motives. If these motives are separable, then we expect:

H7. $I(\Delta g_A) \not\propto I(\Delta g_i) \forall i \neq A$ and $I(\Delta g_A) \not\propto I(b_j) \forall j$

H8. $I(\Delta g_I) \not\propto I(\Delta g_i) \forall i \neq I$ and $I(\Delta g_I) \not\propto I(b_j) \forall j$

As regards those who reject the concept of trade-off on ethical grounds, K&R find that those with a stronger proenvironmental attitude are not more likely to protest, contrary to certain previous predictions (Spash, 1997). However, it is possible that those who did not respond to their mail survey included silent protests. The use of a face-to-face sample supports detection of

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[4] There is some evidence for this possibility in that the group with the top third of NEP scores in K&R's study tended to be more strongly motivated by option value and altruism (both use-related) although the species are rarely seen.

[5] It is claimed that the dichotomous choice format is superior to the open-ended format in terms of incentive compatibility (e.g., Arrow et al., 1993, Carson et al., 2001), but it is arguable that both allow respondents to costlessly "make a point" (Sugden, 1999). Nevertheless, the open-ended format has been widely used in studies where the individual undertakes multiple valuation tasks for nested goods (e.g., Smith and Desvousges, 1986; Mitchell and Carson, 1989; Kahneman and Knetsch, 1992), perhaps because of the practical difficulties of setting multiple bid levels. To increase the bid level as scope increases inevitably provides a cue, while decreasing the bid level as scope increases jeopardises credibility. In any event, bids that appear implausibly high in the current study are excluded from the analysis, as discussed below.

such protest responses. Furthermore, to enhance the prospects of positively detecting this type of behaviour, a sample can be constructed with individuals expected to have a higher-than-average proenvironmental attitude and might therefore be considered more likely to reject trade-off.

3. Case study method

The issues identified above are addressed with data from a CV survey concerning WTP for water quality improvements in a lake (or "broad" in the local dialect) with an area of just under 10 ha located within the grounds of the University of East Anglia (UEA). There is open access to paths around the lake, but the use of the lake itself (e.g., for swimming or boating) is prohibited. A questionnaire was administered in classroom settings to a total sample of 200 UEA students connected with the School of Environmental Sciences. Thus, the sample was composed of individuals who were younger, better educated, and likely to be more environmentally aware than the general population, factors predisposing to a more proenvironmental attitude (Dunlap et al., 2000).

Respondents were provided with a structured, illustrated presentation regarding three nested schemes for improving water quality in the lake:

- Scheme F–Filter runoff water from the UEA campus into the lake.
- Scheme P–Scheme F plus the planting of reed beds around the lake.
- Scheme D–Scheme P plus the dredging of sediment from the lake.

The results of the schemes were described in terms of increasing populations and diversity of species with increasing water quality and the visibility of these effects.[6] For example, Scheme F was described as having effects on "plants and insects *in the water*" (emphasis in the original) with Scheme D having effects both in and around the lake. WTP for each scheme respectively (i.e., on an exclusive basis) was then elicited in an open-ended format.

A coercive payment vehicle was employed wherein improvements would be undertaken by the university authorities and costs recouped from increases over the forthcoming 5 years in rental charges to campus shops, which would in turn be permitted to pass these on in higher prices. Accounting measures were employed to prevent overcharging and respondents were asked to state maximum WTP over the forthcoming year via this payment vehicle. Respondents were also asked to express in their own words the factors influencing their bid.

Subsequently, respondents were asked to indicate on a Likert scale their strength of agreement or disagreement with a series of statements including those used to calculate the NEP score (see Table 1) in

Table 1
Mean score and item–total correlations (r_{i-t}) for the NEP scale statements

Statement[a]	Mean	r_{i-t}
1. We are approaching the limit of the number of people the earth can support.	3.94	0.55
2. Humans have the right to modify the natural environment to suit their needs.	3.99	0.55
3. When humans interfere with nature, it often produces disastrous consequences.	4.10	0.50
4. Human ingenuity will ensure that we do not make the earth uninhabitable.	3.36	0.47
5. Humans are severely abusing the environment.	4.43	0.51
6. The earth has plenty of natural resources if we just learn how to develop them.	2.32	0.35
7. Plants and animals have as much right as humans to exist.	4.46	0.45
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	4.19	0.34
9. Despite our special abilities, humans are still subject to the laws of nature.	4.61	0.44
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.	3.64	0.43
11. The earth is like a spaceship with very limited room and resources.	3.68	0.43
12. Humans were meant to rule over the rest of nature.	3.95	0.46
13. The balance of nature is very delicate and easily upset.	4.06	0.43
14. Humans will eventually learn enough about how nature works to be able to control it.	3.62	0.44
15. If things continue on their present course, we will soon experience a major ecological catastrophe.	3.87	0.52

[a] The numbering of statements is according to Dunlap et al. (2000), as applied by Kotchen and Reiling (2000).

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[6] Full details (including questionnaire wording) are given by Bateman et al. (2001).

a random order and interspersed with six statements designed to elicit the score on an "altruism scale" (see Table 2). These latter statements were closely based on certain of those included in Clark et al.'s (2003) scale.

Respondents were then invited to revise their WTP for any or all of the schemes as they wished. This opportunity is connected with the fact that the sample was split between different treatments in terms of whether all three valuation tasks were disclosed in advance and the order in which they were undertaken (for details, see Bateman et al., 2001). To focus on the issues that are of interest here, the values after the opportunity for revision are employed, recognising in the analysis of WTP that the treatment might have some residual influence on those values.

After the opportunity to revise their bids, respondents were asked to indicate on a Likert scale the importance of various "reasons" for their WTP decisions (as shown in the first column of Table 3). The scores from the responses are used to indicate the strength of motives labelled as shown in Table 3 (but not disclosed to respondents). For the "reasons" with motives labelled as Option, Altruism, Bequest, Existence, and Intrinsic, the wording is adapted from that used by K&R.

Table 2
Mean score and item–total correlations (r_{i-t}) for the ALT scale statements

Statement (Type[a])	Mean	r_{i-t}
1. My personal actions can greatly improve the well-being of people I don't know. (AR)	3.97	0.57
2. My responsibility is to take care *only* of my family and myself. (AR)	4.38	0.66
3. It is my duty to help other people when they are unable to help themselves. (PN)	4.07	0.64
4. The individual alone is responsible for his or her own well-being in life. (PN)	3.09	0.69
5. Many of society's problems result from selfish behaviour. (AC)	4.47	0.42
6. Contributions to community organisations *rarely* improve the lives of others. (AC)	3.85	0.48

[a] AR = Ascription of Responsibility; PN = Personal Norms; AC = Awareness of Consequences.

Table 3
Reasons potentially relevant to WTP decisions

Reason	Implied motive
I presently use the broad and enjoy seeing the plant and animal life there.	Use
I plan to use the broad in the future and will enjoy seeing plant and animal life there.	Option
I should pay my fair share towards any good cause when I am asked to.	Obligation
I like knowing that other people use the broad and enjoy seeing plant and animal life there.	Altruism
I like knowing that people will be able to enjoy the broad's plant and animal life in the future.	Bequest
I like knowing that the broad's plant and animal life will be closer to its natural state even if *no one* sees it.	Existence
Schemes like this are not really my responsibility, the general public should pay, not just people connected with UEA.	Responsibility
Ecosystems like that in the broad have a right to exist that should be supported by humans.	Intrinsic

Finally, socio-demographic and other personal information were sought, including the frequency and nature of the individual's use of the area around the lake and the number of remaining years of attendance at the university (indicating the period over which the individual would be hypothetically paying for any water quality improvement scheme).

4. Analysis and results

Analysis is confined to nonprotest respondents, except in Subsection 4.1 which deals solely with the attitudinal measures. Protest respondents are those 18 individuals (9% of the sample) who gave a "protest zero" value for at least one of the schemes. A "protest zero" is a zero bid for which the respondent cited as an influential factor doubts as to the credibility of the contingent scheme (e.g., "I'm skeptical that such measures would be effective"), inability to decide on a WTP (e.g., "insufficient information is given"), and/or rejection of responsibility for payment (e.g., "it is unfair for the students to pay").

The majority of protest respondents cited this last reason.

We commence with consideration of the attitudinal measures used in subsequent analysis.

4.1. Attitudinal measures

The scoring of the categorical responses to the NEP and ALT statements shown in Tables 1 and 2, respectively, is as follows: the even-numbered statements are scored as: "strongly agree" = 1, "somewhat agree" = 2, "unsure" = 3, "somewhat disagree" = 4, and "strongly disagree" = 5, with the ordering reversed for odd-numbered statements. The NEP and ALT scores are the sums of the respective statement scores and thus represent the strength of the individual's proenvironmental and prosocial attitudes, respectively.

The mean NEP score is 58.2 (standard error 0.49), which is significantly greater than the mean values reported by K&R, consistent with expectation given the constitution of the sample. The greater mean results from somewhat higher mean item scores for each statement rather than a radically different pattern of responses (indeed, the rank correlation of the mean item scores between the studies is 0.95).

The item–total correlation coefficients (r_{i-t} in Table 1) are generally lower than those reported by K&R. Accordingly, the value of Cronbach's alpha (0.72) is some 0.1 lower than the values that K&R and Dunlap et al. (2000), report.[7] Loadings on the first unrotated factor in principal components analysis [a further test of scale reliability reported by Dunlap et al. (2000)] also suggest that the scores obtained here are less consistent with the measurement of a single underlying attribute. However, factor analysis does not provide firm evidence of distinct underlying variables, and it is concluded that the scale reliability is adequate.

The mean ALT score is 23.8 (standard error 0.23), and on the basis of tests described above, the scale is of weak internal reliability. Notably, Cronbach's alpha is 0.61, compared to a value of 0.70 for a similar scale employed by Clark et al. (2003), and the interpretation of subsequent results is subject to this observation.

The NEP and ALT scores appear to substantially measure different attitudinal attributes. The scores are relatively weakly correlated (Pearson correlation coefficient 0.167, $p = 0.024$) and the coefficient alpha of the combined item scores is less than that of the NEP scale alone. Furthermore, principal components analysis of the combined NEP and ALT statement scores reveals that the ALT scale items tend to load on a separate factor.

4.2. Analysis of motive strengths and WTP

The categorical responses to the offered "reasons" for WTP (as shown in Table 3) are scored as follows: "very important" = 4, "important" = 3, "slightly important" = 2, and "not important" = 1, except that the order is reversed in the case of the Responsibility motive. Thus, a higher Responsibility score is associated with the view that the schemes are within the respondent's personal responsibility rather than that of the general public.

The mean scores are grouped around a value of 3 (i.e., "important"), but within-subject nonparametric tests indicate a clear differentiation among groups of motives (Column I, Table 4). The strengths of the existence-related motives tend to be significantly greater than those of use-related motives.[8]

The differentiation between groups of motives is also apparent from the correlations among scores, which are represented in the loadings derived from factor analysis of the motive scores (Columns II and III, Table 4). This analysis involved the extraction of components with an eigenvalue of at least 1.0 and so as to recognise at least 50% of the variance for each

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[7] Cronbach's alpha is related to the average intercorrelation among scores in a multi-item measure and is regarded as a key index of reliability, i.e., the consistency of those scores as measures of a single trait or attribute (e.g., Nunnally and Bernstein, 1994). There is some consensus that an alpha value of 0.70 generally represents the minimum acceptable (Nunnally and Bernstein, 1994; British Psychological Society Steering Committee on Test Standards, 1995; Kline, 2000), and Dunlap et al. (2000) adopt this standard in the context of the NEP scale specifically.

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[8] The relatively low mean for the Use motive appears to reflect the perception of the extent of change in amenity from water quality improvement rather than a lack of use of the lake. About one third of the sample visits the lake at least once a week and a further third at least once a month, predominantly (80% of visits) to walk or jog around it.

Table 4
Mean motive scores, factor analysis, and correlation with attitudinal measures

Column	I	II	III	IV	V
Motive/Factor	Mean score (s.e.)[a]	Factor loadings[b]		Correlation with attitudinal measures[c]	
		(1) "Human value"	(2) "Natural value"	NEP score	ALT score
Intrinsic	3.13 (.06)[α]	0.144	**0.833**	0.270**	0.160*
Existence	3.04 (.07)[α]	0.116	**0.836**	0.416**	0.303**
Responsibility	2.99 (.08)[α,β]	–	–	0.095	0.139
Bequest	2.98 (.06)[α]	**0.695**	0.417	0.162*	0.240**
Option	2.83 (.07)[β,δ]	**0.825**	0.043	0.082	0.219**
Use	2.69 (.07)[γ]	**0.806**	0.060	0.087	0.201**
Altruism	2.69 (.06)[γ,δ]	**0.753**	0.210	0.019	0.221**
Obligation	2.47 (.06)[ε]	–	–	0.126	0.177*
"Human value"				0.023	0.229**
"Natural value"				0.392**	0.221**

[a] Superscript symbols indicate means not significantly different at the 5% level according to the Wilcoxon Signed Ranks Test.
[b] Loadings on the varimax rotated matrix. Emboldened figures indicate the factor with which the motive is more closely associated. The variance in scores accounted for by the factors is 47.74% (Factor 1) and 19.44% (Factor 2).
[c] Spearman's rank correlation coefficient.
* $p < 0.05$.
** $p < 0.01$.

score. On this basis, the Obligation and Responsibility motives are excluded from the factor analysis and they are dealt with as independent motives (their correlation coefficient is 0.015, $p = 0.419$). Although the Bequest motive loads relatively significantly on both factors, the underlying factors may be readily identified with "human value" derived from water quality improvement, i.e., benefits from human use, and "natural value" linked to the continued existence of the ecosystem.

In the following analyses, the factor scores are used as measures of underlying motive strength together with standardised Obligation and Responsibility motive scores for comparability.[9] Furthermore, those in the upper half of the distribution of the "natural value" factor score (having a nonnegative score) are designated as the "higher 'natural value' group".

The relationship of WTP to other variables is examined by regression of random effects panel Tobit models (see for example, Greene, 2000) and that of difference in WTP between schemes (a measure of scope sensitivity) using OLS regressions. The regression models include the key variables of interest here and those found to be significant in exploratory investigations.[10] Dummy variables are included to recognise whether the respondent would hypothetically be paying for more than one year ("Years"), whether they were informed in advance of the three valuation tasks ("Disclosure"), and the order of the tasks ("Order"). Furthermore, the panel models also include dummy variables to recognise shifts in the WTP distribution between the schemes. In summary, the general functional form is:

WTP or Change in WTP

$$= f\ (\mathbf{Z},\ \text{Years},\ \text{Disclosure},\ \text{Order},\ \mathbf{S})$$

where $\mathbf{Z}$ represents either the attitudinal measures (NEP score, ALT score) or the motivational measures ("human value" factor score, "natural value" factor score, Responsibility motive score, Obligation motive score) and $\mathbf{S}$ represents the dummy variables for

[9] However, it is noted that differences between the response categories used to derive motive scores may not be perceived as equal.

[10] The exclusion of income on this basis probably results from students' relatively low income and a lack of variability: the median value of reported income was £4,000 p.a. with just under 55% of the sample having incomes in the range £3,000–5,000 p.a.

Table 5
Results of regressions against attitudinal measures: coefficients (with standard error)

	WTP		Difference in WTP	
	Sample	Higher "natural value" group	D–F	D–P
Constant	− 3.37 (17.66)	− 27.99 (22.29)	− 34.90 (22.38)	− 27.46 (13.48)*
NEP score	0.35 (0.24)	0.91 (0.32)**	0.79 (0.31)*	0.59 (0.19)**
ALT score	0.45 (0.56)	0.06 (0.57)	1.12 (0.65)	0.59 (0.39)
Years[a]	− 11.81 (3.98)**	− 6.96 (4.46)	− 19.56 (5.46)**	− 12.00 (3.28)**
Disclosure[b]	− 2.42 (3.51)	− 4.72 (5.89)	3.74 (4.29)	0.92 (2.58)
Order[c]	− 2.35 (3.52)	− 8.12 (4.21)	1.51 (4.19)	2.52 (2.52)
Scheme P[d]	12.20 (1.72)**	13.92 (2.49)**		
Scheme D[d]	24.91 (1.71)**	29.28 (2.49)**		
σ_u[e]	27.34 (1.60)**	28.96 (3.60)**		
σ_e[e]	16.00 (0.60)**	17.06 (0.94)**		
Wald statistic (sig.)	229.51 (0.000)	153.98 (0.000)		
F (sig.)			4.560 (0.001)	5.210 (0.000)
R^2			0.117	0.132
Adjusted R^2			0.091	0.106
Sample size	179	97	178	178

[a] More than one year = 1, one year or less = 0.

[b] Advance disclosure = 1, stepwise disclosure = 0.

[c] Scheme D first = 1, Scheme F first = 0.

[d] WTP for Scheme F is treated as the base case for comparison.

[e] σ_u and σ_e relate to random parameters of the model, where u is the random disturbance characterising each individual and e is the conventional error term.

* $p < 0.05$.

** $p < 0.01$.

schemes. Results of the regressions are given in Tables 5 and 6.[11]

In the regressions, the signs of the significant coefficients accord with expectation and the general lack of significance for the treatment variables indicates that by using the postrevision WTP values, the effects of treatment are substantially eliminated. It is also noteworthy that those hypothetically contributing for more than 1 year have a significantly lower WTP, although they will be able to enjoy the benefits of use over a longer period. This is consistent with the predominant motive for payment being existence-

related. The apparent lack of a relationship between the "human value" factor and the scope sensitivity of WTP (Table 6) indicates that the successively larger schemes are seen as imparting similar increments to benefits from use compared to the status quo.

4.3. Results—hypothesis tests

For reference, Table 7 summarises the hypotheses established in Section 2.

On the basis of the mean motive strengths and the factor analysis, the Responsibility and Obligation motives appear to be independent of each other and of the other motives so that they can be treated as separable motives (H1 and H2 cannot be rejected). However, neither motive can be treated as giving rise to a pure IPB: while the strength of the Obligation motive is unrelated to WTP (Table 6), that of the Responsibility motive is a significant covariate of WTP but also of the difference in WTP between schemes. Consequently, H3 cannot be accepted in respect of either motive. The Responsibility motive

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[11] The regressions exclude from the sample three individuals whose bids were the highest for scheme D (being at least £340 and thus more than three standard deviations from the mean) and were at the top of the range for at least one other scheme. The resulting standardised residuals for these bids were in excess of a value of two (a level suggested by Belsley et al., 1980, as indicating an outlying value) and six for the scheme D bids. On the same basis, a further individual, who bid substantially *less* for Scheme D than the other schemes, is excluded from the regressions of difference in WTP between schemes.

Table 6
Results of regressions against motivational measures: coefficients (with standard error)

	WTP	Difference in WTP	
		D−F	D−P
Constant	31.93 (4.27)**	34.58 (5.67)**	18.75 (3.43)**
"Human value" factor	4.15 (1.59)**	1.87 (2.12)	0.98 (1.28)
"Natural value" factor	6.42 (1.63)**	5.33 (2.13)*	2.86 (1.29)*
Responsibility motive	4.24 (1.57)**	6.56 (2.10)**	4.41 (1.27)**
Obligation motive	− 0.93 (1.67)	2.40 (2.19)	1.76 (1.32)
Years[a]	− 12.92 (3.90)**	− 17.70 (5.36)**	− 10.58 (3.24)**
Disclosure[b]	− 4.38 (3.24)	5.05 (4.29)	1.69 (2.59)
Order[c]	6.56 (3.25)*	2.99 (4.15)	3.51 (2.51)
Scheme P[d]	12.20 (1.69)**		
Scheme D[d]	24.91 (1.69)**		
σ_u[e]	25.79 (1.37)**		
σ_e[e]	15.76 (0.60)**		
Wald statistic (sig.)	271.07 (0.000)		
F (sig.)		4.921 (0.000)	5.139 (0.000)
R^2		0.168	0.175
Adjusted R^2		0.134	0.141
Sample size	179	178	178

For footnotes a–e, see respective notes to Table 5.
 * $p < 0.05$.
 ** $p < 0.01$.

may give rise to an IPB of social compliance, but the evidence is that the value of this benefit is sensitive to the scope of the underlying project so that in contrast to Eq. (9):

$$W = e(\mathbf{G}^0, u^0) - e(b_j(\mathbf{G}^1), \mathbf{G}^1, u^0) \qquad (10)$$

In this case, there would be no meaningful distinction between the value of the IPB and that of the public good per se: both values behave in accordance with the standard assumption of scope sensitivity.

The strength of prosocial attitude does not provide evidence of a propensity to acquire an IPB of social compliance, the ALT score is not a significant covariate of WTP (Table 5). Consequently, H4 cannot be

accepted. However, the altruism scale as used here appears to be of limited usefulness. It was found to be of weak internal reliability and does not exhibit any differential behaviour in its relationships with motive strengths (Column V, Table 4).

In contrast to the ALT score, the NEP score is significantly correlated with the strengths of the Intrinsic, Existence, and Bequest motives and thus the underlying "natural value" factor but not that of the other motives (Column IV, Table 4), so that H5 cannot be accepted. Similarly, H6 cannot be accepted, the NEP score is not a significant covariate of WTP for the sample as a whole but is positively associated with the scope sensitivity of WTP (Table 5). Thus, we find no evidence that the NEP score is acting as a

Table 7
Summary of hypotheses

H1:	$I(b_O) \not\propto I(b_R)$	Separability of Obligation and Responsibility motives
H2:	$I(b_O) \not\propto I(\Delta g_i) \forall i$ and $I(b_R) \not\propto I(\Delta g_i) \forall i$	
H3:	$W \propto I(b_j)$ and $\frac{\Delta W}{\Delta G^1} \not\propto I(b_j)$ for $j = O, R$	Connection of Obligation and Responsibility motives with a pure IPB
H4:	$W \propto ALT$	Motivation by social compliance
H5:	$I(\Delta g_i) \propto NEP \ \forall i$	NEP score as proxy measure for propensity to express concern
H6:	$W \not\propto NEP$ but $\frac{\Delta W}{\Delta G^1} \not\propto NEP$	
H7:	$I(\Delta g_A) \not\propto I(\Delta g_i) \forall i \neq A$ and $I(\Delta g_A) \not\propto I(b_j) \forall j$	Separability of Altruism motive
H8:	$I(\Delta g_I) \not\propto I(\Delta g_i) \forall i \neq I$ and $I(\Delta g_I) \not\propto I(b_j) \forall j$	Separability of Intrinsic motive

proxy measure of the propensity to obtain an IPB of expression. Instead, the association of NEP score with only certain motives is consistent with it being a measure of environmental attitude, consistent with previous evidence.

The lack of a significant positive relationship between NEP score and WTP appears inconsistent with K&R's findings, perhaps reflecting the fact that the goods in this case have potential use value. While those with a higher NEP score tend to ascribe higher importance to existence-related motives, such motives are not the sole determinants of value. Consequently, a direct relationship between NEP and WTP may only be apparent for those more strongly motivated by existence-related motives. This is consistent with the evidence that NEP score is strongly associated with WTP for the subsample of those in the higher "natural value" group (Table 5).

The ethically based motives are regarded as of substantially different importance, with intrinsic value amongst the most important and altruism amongst the least important motives (Column I, Table 4). However, in each case, the motive is closely associated with others. The means of the Intrinsic and Existence motives are not significantly different and both correlate highly with the underlying "natural value" factor. On the other hand, Altruism has a similar relationship with the Use motive and the underlying "human value" factor. Thus, H7 and H8 cannot be accepted.

Finally, applying the same test as K&R (for details, see Cooper et al., 2002), the distribution of the three forms of bid response (protest zero, zero, or positive WTP) is not related to NEP score for any of the schemes. Therefore, those with a stronger proenvironmental attitude are no more likely to protest than others, even in a sample obliged to respond and comprised of individuals who might be considered more likely to protest at the principle of monetary trade-off.

5. Discussion and conclusions

Critics of the CV method have argued that the existence of certain "noneconomic" motives for WTP means that elicited values should not be applied in economic analysis and policymaking. The empirical work reported here provides evidence that these suggested motives can indeed be relevant to the individual's WTP decision but that the theoretical distinction between valid economic–theoretic and "noneconomic" motives is overly simplistic.

As suggested by the "quantitative critique", social compliance is taken into account in responding to CV questions but is not the sole determinant of value. The concept of an obligation to contribute to public projects is not dismissed by individuals but appears to be of no relevance to the WTP decision. By contrast, perceived personal responsibility as regards the specific good in question is highly relevant. This does not mean that WTP reflects only the value to the individual of exercising this responsibility. Rather, where a sense of responsibility is perceived as important to the WTP decision, this is associated with an enhanced sensitivity of WTP to the scope of the good being provided. Consequently, there seems to be no justification for attempting to separate the effects of this motive from those of motives considered valid.

Similarly, motives deriving from ethical concerns do not appear to invalidate the response to CV because they are closely associated with other motives considered valid. The notion of intrinsic value as distinct from existence value may indeed lack meaning for individuals if it is difficult to see how the values can exist independently—if one believes that nature has rights, then there must be a value for the individual in existence; if one has an existence value for nature, then this is supported by according "rights" to nature. Furthermore, at least in the present case study, the individual may not be able to rationalise the idea that others' use of a good is more or less important than his or her own, so that any altruistic value is equivalent to the individual's own use value. The associations among motives found here also suggest that investigations of any particular motive should be conducted in context. For example, the individual may have a rights-based value for the environment but not distinguish this from the concept of existence value.

There may be limitations in the usefulness of the NEP scale in interpreting WTP for goods with use value. However, even in such a case, it adds plausibility to measures of existence-related motivation and that of the underlying motivational structure identified here, in which motives can be broadly categorised as

relating to "natural" and "human" values. Indeed, the constituents of "natural value" found here are consistent with those in a broad conception of "nonuse value" depicted by Turner (1999), i.e., existence, intrinsic and some element of bequest value.

While these results tend to support the use of contingent values as valid measures of benefit, they also point to the need for a better understanding of the relationships among motivations if this aspect of the CV debate is to be advanced. In particular, future studies should investigate the extent to which motivational structure is sensitive to the nature of the environmental good and composition of the sample. For example, does the importance of intrinsic value vary proportionately with that of existence value as the environmental good varies? It would also be of interest to determine whether a more reliable measure of prosocial attitude could provide insights to motivation akin to those achieved with the NEP scale.

Acknowledgements

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