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The interpretation of contingent values with measures of attitude and motivation: An empirical case study of alternative water quality improvement schemes in a lake with amenity

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MEASURES OF ATTITUDE
AND MOTIVATION: AN EMPIRICAL
CASE STUDY OF ALTERNATIVE
WATER QUALITY IMPROVEMENT
SCHEMES IN A LAKE WITH AMENITY**

by

**Philip Cooper¹,
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and Ian J. Bateman^{1,3}**

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Abstract

The application of the contingent valuation method to environmental resources has been criticised on the grounds that individuals' responses are thought to be motivated by considerations not strictly relevant to economic valuation, thus leading to observed anomalies such as scope insensitivity. This study investigates the validity of contingent values in this context by reference to measures of attitude and of individuals' perceived motivation using a set of nested environmental goods (various levels of water quality improvement). Endorsement of the "new ecological paradigm" is found to be a good predictor of the perceived importance of certain motives for WTP (deriving from existence, anthropocentric intrinsic and bequest values), and of WTP for environmental improvement itself to the extent that these motives are perceived as important. The importance of these motives dominates that of others, such as those linked to private or social use value, and is positively associated with WTP, as is the extent of perceived personal responsibility. Moreover, all these relationships with WTP are reflected in an enhanced sensitivity of WTP to the scope of the good provided. However, WTP values are unaffected by the extent to which the individual feels under some general moral obligation to contribute to "good causes". The findings support the internal validity of the WTP values elicited and suggest that the importance of motives deriving from certain nonuse values are more significant determinants of WTP than others, at least for the resource studied here.

Keywords: Contingent valuation; Motivation; Nonuse value; "New ecological paradigm"; "Warm glow".

1. Introduction

The contingent valuation (CV) method uses survey techniques to obtain from individuals their willingness-to-pay (WTP) for the hypothetical provision of a public good (or willingness-to-accept compensation, WTA, for its hypothetical loss). These monetary values are taken to represent the benefit to the individual of the proposed change and may then be aggregated for use in making public decisions that potentially improve social welfare.

CV is well suited to the valuation of changes in environmental resources given the paucity of markets in which values are revealed and the nonuse value of such resources (i.e. that part of the total value that derives other than from the valuer's own use of the resource).¹ However, its application to environmental resources has been a source of controversy.

Critics of the CV method (e.g. Diamond and Hausman, 1993, and Stevens *et al.*, 1993) claim that the WTP values it yields are not valid measures of benefit. They argue that such values are inconsistent with economic theory, even assuming that they would actually be paid (i.e. the stated value is not simply a product of the hypothetical nature of CV questions), based on their interpretation of empirical studies in terms of individuals' motivations for their stated values.

Responses to this criticism have involved detailed consideration of the methods employed in the empirical studies and of alternative interpretations of the results (e.g. Hanemann, 1994). Moreover, a general defence of CV has been mounted in terms of consumer sovereignty and the consequent irrelevance to the social decision-maker of the individual's motivations in ascribing personal value to a good. We would suggest (as discussed in more detail below) that an intermediate position can be identified such that certain motivations are problematic to the extent that they result in an element of WTP insensitive to the nature and amount of the good provided. However, even if it is accepted that CV yields theoretically correct values, it is arguable that the social decision-maker requires some understanding of the relative importance of various motives in order to ensure that the values are appropriately applied.

There has been limited empirical investigation of the relative importance of different motivations for response to CV questions; studies have tended to concentrate on the importance of single types of motivation relevant to the particular investigation (e.g. Common *et al.*, 1997). The apparent reluctance to

¹ The term "nonuse value" is used here after Randall (1991) although certain authors refer to "passive use value" following Arrow *et al.*, (1993). The terms are treated as synonymous throughout.

consider a spectrum of possible motives might derive from concerns as to the “fallacy of motivational precision”, i.e. the error of assuming that individuals can be sufficiently aware of “what motivates their value judgements” (Mitchell and Carson, 1989, p.287 *et seq.*). As a consequence, some attention has been focussed on measures of attitude towards the environment as an alternative basis for interpreting contingent values, in line with the recommendation of the NOAA Panel (Arrow, 1993).²

The recent study of Kotchen and Reiling (2000) is particularly notable in this context for two reasons. Firstly, they use a standardised measure of attitude towards the environment (endorsement of the “new ecological paradigm” (NEP), measured by the NEP scale), the validity of which is supported by other studies. Secondly, they demonstrate significant relationships of this measure with, respectively, the stated strength of motives related to nonuse values and WTP for preservation of endangered species (substantially with pure nonuse value).

The observed coherence between a measure of attitude and strength of motivation indicates that individual reports of motivation may provide a reliable guide to the structure of values applied in a specific valuation task, contrary to the assumption of the “fallacy of motivational precision”.³ This suggests that Kotchen and Reiling’s technique could be used to elucidate relationships amongst a wider range of potential motives, including those identified by critics of CV, and that measures of motivation may bear some consistent empirical relationship to WTP. To explore these possibilities, this paper builds on and extends the work of Kotchen and Reiling using a case study involving water quality improvements in a lake with consequent effects on the associated ecosystem.

The key elements in the present investigation are as follows. Firstly, the robustness of the relationships of the NEP scale that Kotchen and Reiling describe is investigated in the context of a good with potential use (as well as potential nonuse) value. Furthermore, certain modifications of their CV methodology are introduced: particularly, employing an alternative elicitation method and with face-to-face administration of the instrument. Secondly, alternative

interpretations of the significance of the NEP scale are tested. Thirdly, the analysis is extended to investigate direct relationships among motives and WTP. Section 3 provides a detailed rationale for these elements and describes how the range of motives considered can be expanded, following a review in section 2 of the potential motives for CV responses that have been identified by critics of the CV method.

Section 3 also describes the survey method. Section 4 sets out the results of the survey, which are discussed in section 5 in the context of implications for the application of contingent values in social decision-making.

² For example, Langford *et al.*, (2000) investigate measures of “natural worldview” as predictors of WTP for the reduction of a specific risk while Langford *et al.*, (forthcoming) investigate measures of specific attitude towards an endangered species as predictors of WTP for its preservation. Also, Green and Tunstall (1999) review evidence for relationships among core beliefs, attitudes and WTP.

³ This is not to say that individuals should be able to partition their total WTP among the various benefits that motivate their value, consistent with the views of Mitchell and Carson, and Cummings and Harrison (1995).

2. The Significance of the Individual's Motivation in Response to CV Questions

Motivational criticisms of the validity of contingent values derive from empirical studies that may be broadly classified as supporting what we refer to as a quantitative or an ethical critique, as discussed in sub-sections 2.1 and 2.2. The respective responses to these critiques are also covered but discussion of the general argument as to the relevance of motivation is reserved to sub-section 2.3, which also reviews the possible role for attitudinal measures in the interpretation of elicited values.

2.1 The Quantitative Critique

In this type of study empirical measures of WTP (or WTA) are compared and interpreted as not behaving in compliance with the predictions of economic theory. This is taken as evidence that individuals are not valuing the resource as they would a normal good. Within this category are studies that indicate:

- insensitivity of value to the amount of the good provided or substitutes available (e.g., Diamond *et al.*, 1993, Desvousges *et al.*, 1993), or
- sensitivity of value to the position the good occupies in a series of goods to be valued (Tolley *et al.*, 1983), to whether the good is provided alone or as part of a more inclusive good (Kahneman and Knetsch, 1992) as well as to whether the WTP or WTA measure is used (see, for example, the review by Cummings *et al.*, 1986, p.35).

The more recent explanations for these findings have tended to focus on the concept that individuals obtain a “warm glow” from contribution to a public good. This term originates in the literature on charitable giving where it is defined to represent a hypothetical private benefit the individual might enjoy from donation towards the provision of a public good which would *not* arise from payment of taxation to fund such a good (Andreoni, 1989). However, the concept has been applied to explain responses to CV questions in which the proposed payment vehicle involves an increase in federal taxation (Diamond *et al.*, 1993) or is only described as “higher taxes, prices, or user fees” (Kahneman and Knetsch, 1992).

Applying the “warm glow” interpretation in the absence of a voluntary contribution payment mechanism may simply require the assumption that individuals treat their WTP through taxes etc. in the same way as they would a charitable contribution. Alternatively, the term may be used to refer to other private benefits created by contribution to a public good. When Diamond and Hausman (1993) suggest that “.... standard CV questionnaires do not generate a

description of preferences but, rather, elicit responses that generally express concern...” (p.27) and Diamond *et al.* (1993) suggest that people’s answers in CV could “reflect the desire on the part of people who care about the environment to state their support for environmental issues” (p. 48) they appear to be referring to a “warm glow of expression”, i.e. a benefit of expressing a personal attitude or opinion.⁴ Furthermore, based on the results of verbal protocol analysis, Schkade and Payne (1993) find this type of concern “expressed in terms of civic or social responsibility”. This suggests a “warm glow of compliance” with perceived social duties or perhaps another source of “warm glow of expression” derived from expressing recognition of or compliance with such duties.

Whatever the source of the “warm glow” referred to by these critics of CV, there is consensus amongst them that:

- its existence is evidenced by scope insensitivity, and
- its presence means that the stated values of individuals cannot be treated as “a measure of the economic value of public goods” (Kahneman and Knetsch, 1992, p. 69).⁵

The studies that underlie this critique have met with a robust response from proponents of CV. They identify methodological shortcomings in the surveys or their interpretation (e.g., Smith, 1992; Harrison, 1992; Hanemann, 1994, 1996; Carson and Flores, 1996) and demonstrate how certain of the empirical results can be interpreted to be consistent with standard economic theory (e.g., Hanemann, 1991; Smith, 1992). Furthermore, contrary evidence, particularly from studies showing scope sensitivity for resources with nonuse value, has been obtained (e.g., Loomis and White, 1996; Smith and Osborne, 1996; Carson, 1997; Rollins and Lyke, 1998).

The “warm glow” interpretation of the previous studies, and its implications for the validity of the values obtained in CV, has also been rebutted. Hanemann (1994, at footnote 22) points to the lack of empirical evidence that “warm glow” can arise from voting to raise taxes.⁶

⁴ This form of “warm glow” is congruent with the concept of “expressive value” as noted by Sugden (1999), pp. 142-143.

⁵ The critics of CV do not generally consider other reasons for apparent scope insensitivity such as satiation and budget constraint.

⁶ Indeed, there is at least circumstantial evidence that coercive payment systems *reduce* WTP for a public good compared to WTP for an equivalent private good (Johannesson *et al.*, 1996).

2.2 The ethical critique

The ethical critique stems from the hypothesis that the individual's response to CV questions is motivated by ethical considerations that, critics claim, invalidate the value obtained. Generally, this motivation is dealt with as two separate manifestations: altruism (concern for the welfare of other people) and through the attribution of moral rights to non-human entities (e.g., species, "wildlife" in general, "nature" etc.).

Milgrom (1993) questions the possible effect of altruistic motivation on environmental valuation with the assertion that WTP "that arises on account of altruistic feelings must be excluded from the benefit-cost calculation" (p.420) to avoid multiple counting of benefits and thus erroneous conclusions from cost-benefit analysis.

Following developments in the understanding of altruism in the valuation of other public goods (e.g., Jones-Lee, 1992), McConnell (1997) elucidates the implications of various forms of altruism towards users of an environmental resource. He shows that to the extent that altruism is purely paternalistic (i.e. the altruist is concerned about others' use of the resource) or purely non-paternalistic (i.e. the altruist is concerned with the users' general well being) then the altruist's WTP is a valid measure of benefit for cost-benefit analysis. However, if the altruist values the consumer surplus derived by others from their use of the resource then this can distort the results of the cost benefit analysis. McConnell concludes that, since it is unlikely that all individuals are motivated in the same way, empirical research on the nature and extent of altruism in this context is necessary (a point echoed by Fisher, 1996).

The hypothesis of the attribution of rights suggest that environmental resources should not be dealt with on the same footing as other goods since the individual's decisions with respect to such resources derive from ethical beliefs about the environment rather than utility maximisation. Thus, it is argued, CV confounds two categorically different concepts of "value". CV expects the individual to act *qua* consumer (expressing a monetary value from the trade off between income and the resource) while the individual feels impelled to act *qua* citizen (expressing moral duty) (Sagoff, 1988).

The prescription that follows from this rationale is that individual preferences expressed through CV should not be recognised in social decision making since they represent what the individual sees as morally right regardless of personal benefit (e.g., Opaluch and Grigalunas, 1992). Nevertheless, individual choice in other forms of decision making process is justified (e.g., Sagoff, 1994, 1998).

Empirical evidence in support of this form of analysis has been sought broadly in two ways.

Firstly, a relationship is sought between agreement with statements as to ethical concerns or beliefs about public goods (taken to reflect strength of citizen as opposed to consumer concerns) and the response to CV questions. Where a predictive relationship is established this is claimed to evidence the dominance of citizen considerations in the decision of the individual (e.g., Blamey *et al.*, 1995). However, this is merely an inference and a more direct approach has similar elements but involves asking for the respondent's motivations for their choices. This can show that those with preferences for wildlife preservation over income (in a defined range) are more likely than others to state that they were motivated by ethical considerations (Common *et al.*, 1997).

Secondly, interpretation of "extreme" responses is attempted in terms of the priority of ethical concerns over income. Thus, the responses of individuals who refuse to offer a positive WTP (and state they are offering a zero value as a protest against the principle of trade off) or state very substantial/infinite values for WTA are seen to be driven by concern for the rights of non-human entities. However, it appears that only the responses of a minority of the sample in each case can be explained in this way:

- Stevens *et al.*, (1991) find that a substantial majority in their sample agree with the idea that wildlife has "a right to exist independent of any benefit or harm to people" and some 60% of the sample have a zero WTP. However, only 25% of those with a zero WTP said this was because "wildlife values should not be measured in dollar terms".⁷
- Spash and Hanley (1995) find that 75% of their sample agrees that animals/ecosystems/plants should be protected regardless of cost, but only 23% of the sample offer a zero WTP for preservation of ancient woodland.
- From a survey dealing with the creation of wetlands, Spash (2000) reports that some 40% of the sample agreed that endangered species had a right to life regardless of economic considerations, but only about a quarter of these people made zero bids. Indeed, the evidence is that those who agreed with the statement were *more* likely than expected to bid positively.

Therefore, it appears that individuals may be content to espouse an ethical view but this is not necessarily equivalent to rejecting any capacity for trade off.

⁷ The relatively low response rate to the survey (approximately 30%) may suggest a greater proportion of the population hold similar views but no positive evidence for this interpretation is presented.

Furthermore, individuals can be induced to trade off their ethical stance when the cost implications are brought to their attention. Hanley and Milne (1996) report a sample almost unanimously in agreement with a proposition as to the rights of wildlife and landscape to protection, but with the proportion in agreement declining as cost rises (falling to 19% of the sample where the cost is hypothetically 25% of income).

It might be concluded from these empirical studies that there is some part of the population unwilling to countenance the concept of trade off implicit in CV but this remains uncertain. A feature shared by many of these studies is that they are vague as to the payment vehicle (Common *et al.*, 1997) or utilise voluntary contribution payment vehicles such as trust funds (Stevens *et al.*, 1991; Spash and Hanley, 1995; Spash, 2000). Not only is the use of such vehicles likely to induce the individual to consider the questions in a charitable (and thus ethical) frame but it makes more possible a free-riding response that the individual seeks to excuse by reference to ethical concerns.

2.3 The relevance of the individual's motivation and attitudes

The two critical approaches described above resolve to a similar issue as to what motivates the individual's response to CV questions and the implications this has for the validity of the values elicited. The quantitative critique infers motivations to account for empirical results; the ethical critique hypothesises other motivations and seeks empirical evidence for their operation. In both cases, the conclusion is that these motivations invalidate the elicited values. This is typified by the comment of Stevens *et al.*, (1993) that: "many respondents who gave positive bids were motivated by ethical concerns, altruism, or their desire to do their "fair share" – concerns that indicate they used decision-making processes inconsistent with the neo-classical paradigm".

In response, proponents of CV deny a distinction between "economic" and "non-economic" motives since, under the fundamental concept of consumer sovereignty, what provides utility to the individual is solely a matter for the individual (e.g., Harrison, 1992; Hanemann, 1994, 1996). Consequently, there is no restriction such that the validity of values for economic analysis is dependent on their being motivated by "selfish" interests, and there is no need to enquire as to what motivates the individual's value.

Without disputing the basic principles of this response here, empirical enquiry into the motivations of behaviour in the context of CV can be justified for at least two reasons.

First, the development of the theoretical debate as to the acceptability of estimates derived from CV requires an understanding of the extent to which

individuals are actually motivated in the ways that the critics claim undermines the method. For example, certain forms of altruistic motivation may provide theoretically invalid values but the question remains as to how relevant are the strengths of such motivations.

Second, understanding the individual's motivations can "determine how the resulting value estimates should be interpreted and used in making management decisions" (Stevens *et al.*, 1993) particularly if the individual's specification of the good is not precisely that of the investigator. This point can be illustrated by a closer examination of the types of insensitivity of "warm glow".

To distinguish from the "warm glow of giving" as originally defined in the literature on charitable giving, assume that individuals can obtain an "indirect private benefit" (IPB) from contributing to a public good even where the contribution is not perceived as a voluntary donation.⁸ This IPB represents a psychic reward enjoyed purely by the individual and might derive from, for example, the individual satisfying a demand to express attitude or comply with perceived social responsibility (e.g., a desire to feel that they are "doing their bit" or "paying their fair share" of the cost).

Now, it is possible to identify two extreme forms of IPB, with separate implications for the consumer sovereignty argument, characterised by whether the amount of the IPB obtained is dependent on the nature and amount of the public good provided.

- i. If the amount of the IPB is to any extent dependent on both the nature and amount of the public good provided then it cannot be distinguished from the value that the individual attaches to the public good *per se*. The hypothesis of the IPB is "meaningless" since "it places no definite restrictions on observable behavior" (Harrison, 1992, p. 250).
- ii. If the amount of the IPB is independent of both the nature and the amount of the public good provided then, hypothetically at least, it is separable from the value of the public good (a pure IPB).⁹

⁸ The benefits are denoted as "indirect" to distinguish them from the direct private benefit that the individual might enjoy from provision of the public good.

⁹ Intermediate cases are also identifiable. For example, the "moral satisfaction" of Kahneman and Knetsch (1992) is hypothesised to depend on the nature of the public good but be insensitive to the amount of the good provided. The "warm glow" of Diamond *et al.*, (1993) is hypothesised to "vary somewhat with the size of the "cause"" (p. 60) but they provide no view on its sensitivity to the nature of the public good.

In the first case, it is clear that the distinction between the IPB and some “true” value of the public good is meaningless and the appeal to consumer sovereignty is attractive: there is simply no justification for seeking to make hypothetical distinctions between the sources of the individual’s utility.

Conversely, in the second case, it is arguable that the value obtained by CV reflects that of the public good *plus* some element for another, jointly supplied good. This latter element represents the psychic reward of contribution that could just as well have been obtained regardless of the amount of the public good provided or, indeed, by contribution to another public good. In these circumstances, it is arguable that the policymaker should ignore the value of the IPB since it is not specific to the public good being valued.¹⁰

The implication is that the individual’s motivations for his WTP should be examined to determine whether they include the desire to obtain a pure IPB.

As described above, the principal empirical approaches to elucidating motivation have involved either directly questioning the relevance of specific motives or inferring motivation from agreement with certain statements which are taken to indicate attitude.¹¹ However, generally, investigators have focussed on a particular form of motivation in each study and used a limited number of highly specific questions to elicit attitudes.

More recently, attention has turned to eliciting response to questions on a broad range of motives and using more generalised measures of attitude. As part of a study of WTP for species preservation, Kotchen and Reiling (2000) measure strength of agreement with a number of statements related to motivation, and endorsement of the “new ecological paradigm” (the NEP scale) developed in the US by Dunlap *et al.*, (2000). This scale aggregates responses to 15 statements so that a higher score is associated with a non-anthropocentric outlook on the environment and a propensity for “pro-environmental” behaviour. It had formerly been applied in the interpretation of informal CV studies (see Kotchen and Reiling’s paper for references to these earlier studies).

¹⁰ A response to this argument could be that the individual is asked to value a hypothetical, marginal project and thus is asked to assume that there will be only a single opportunity to satisfy the demand for IPB’s. Therefore, the value of the IPB’s is as relevant to the public decision-maker as that of the public good in these circumstances.

¹¹ The use of attitudinal measures rather than solely expressed motivation stems from the psychological theory that attitude shapes behaviour (Ajzen and Fishbein, 1980) and thus is implicit in motivation for that behaviour. Arrow *et al.*, (1993) specifically recommend the use of measures of attitude to rationalise response to CV questions, and psychometric measures of perception have also been used in this way in the context of the contingent valuation of risk reductions by McDaniels *et al.*, (1992) and Savage (1993) *inter alia*.

Kotchen and Reiling show that those scoring more highly on the NEP scale are *not* more likely to reject the idea of monetary trade off and, indeed, the score on the NEP scale is positively associated with the probability of assent to the offered WTP in a dichotomous choice format. This is interpreted as contrary to the predictions of those who assert that ethical motivations will tend to diminish WTP (e.g., Spash, 1997), and as validating the values obtained by CV. However, other interpretations of their results are possible.

One such interpretation is that because those with a higher NEP score are more concerned about the natural environment, they are more likely to obtain an IPB from expressing this concern through their stated WTP. In this sense, the NEP score could be an indicator of the extent to which the individual derives “expressive value” from the WTP bid.

Alternatively, the NEP score could be related to the extent of concern for the welfare of others. Thus, a relationship of the NEP score to WTP for provision of a public good would not necessarily establish that WTP reflects the welfare change from improvement of the natural environment. Rather, it could represent the welfare change from the provision of any public good.

Clark *et al.*, (2001) recognise this distinction and seek to develop a measure of attitude to predict support for the provision of public goods generally (i.e. “pro-social” behaviour) analogous to the NEP scale as a predictor of “pro-environmental” behaviour. They develop a nine item “altruism scale” the score from which is found to be a significant predictor of WTP for a “green electricity program”, although it is of only moderate internal reliability.

3. Issues Addressed in the Survey and Method

The study reported here builds on the results of Kotchen and Reiling by addressing a number of issues that arise from their paper and expanding the scope of their analysis. The ultimate objective is to elucidate the relative roles of various motives in the WTP decision, particularly in the context of the criticisms of CV, through the analysis of WTP in terms of the perceived importance attributed to offered motives and measurements of attitude. The specific research issues may be summarised under three main headings:

1. Are the previous findings robust to changes in design and sample?
- i. *Cultural specificity of the NEP scale* - While the NEP scale has been used in many studies outside the US (e.g., Schultz and Zelezny, 1998), as far as we are aware it has not been so used in the interpretation of CV results. Thus, it appears to be an open empirical issue as to whether the scale is culturally specific (to the US) in terms of interpreting the results of CV.
- ii. *Constitution of sample* – Kotchen and Reiling employed a mail survey with a response rate of 63.1%, and it is possible that those who did not respond included many who protested the concept of trade off between natural resources and income. Therefore, it is necessary to confront a sample face-to-face to ensure that such protestors are not ignored in the analysis. Furthermore, to enhance the prospects of positively detecting this type of protest behaviour, a sample can be constructed with individuals who might be considered more likely to reject trade off.
- iii. *Predisposition to “yea-saying”* – That those with a higher NEP score are more likely to assent in a dichotomous choice format could simply mean that such individuals are more likely to agree to an environmental improvement scheme and do not attend to the cost implications (yea-saying). The question, therefore, is whether any relationship between the NEP score and WTP is robust to elicitation format. An open-ended format arguably provides the most stringent test in this respect.¹²

¹² 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) but it is arguable that both formats are flawed in terms of allowing respondents to costlessly “make a point” (Sugden, 1999). In terms of whether respondents find it credible that they will actually have to pay the amounts they bid, the nature of the scenario in the empirical study presented here is considered more appropriate to an open-ended format since the payment vehicle effectively involves a tax on consumption. In these circumstances, a dichotomous choice format might not be considered credible since it would imply knowledge of the respondent’s consumption pattern. In any event, bids that appear implausibly high are excluded from the analysis, as discussed below.

2. Are alternative interpretations of the significance of the NEP scale supported?
- i. *NEP as an indicator of expressive value* – Two forms of test are used to investigate whether NEP score is associated with WTP simply because it indicates that individuals are deriving an IPB from expressing a “pro-environmental” attitude through their WTP.
 - (a) *Total versus nonuse value* – If those with a higher NEP score use WTP simply to express their “pro-environmental” attitude, it would be expected that: they would tend to state a greater strength for all forms of motivation, and their WTP would tend to reflect total value rather than just nonuse value.¹³ In the context of a good with potentially both use and nonuse values, it would be expected therefore that NEP score would be positively associated with the importance of motives deriving from both use and nonuse motivations, and with WTP across the whole sample. By contrast, if WTP is *not* being used to simply express attitude then those with higher NEP scores should be more strongly motivated in terms of nonuse values but not necessarily so for other values. Furthermore, NEP score would only be positively associated with WTP for those whose motivation is dominated by nonuse values.
 - (b) *Scope sensitivity* – By definition, the value of a pure IPB will not vary with the amount of the good provided. Therefore, if NEP score is positively associated with the scope sensitivity of WTP then any expressive value element in the WTP cannot necessarily be treated as separable from the value of the good. Scope sensitivity is tested by eliciting WTP for three alternative levels of good provision.
- ii. *NEP as an indicator of “pro social” behaviour* – To test this possibility, a measure of “pro-social” attitude (the score on an “altruism scale”) is compared to the NEP score in terms of relationship to motivation strength and WTP. The components of this scale are adapted from those originally employed by Clark *et al.*, (2000) and Messer (1999) to measure the components of an individual’s attitude suggested to be necessary to altruistic behaviour: awareness of consequences, ascription of responsibility and personal norms (Schwartz, 1970, 1977). The resulting score seeks to measure the individual’s predisposition to supporting the provision of public goods generally.

¹³ There is some evidence for the former expectation 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 values) although the species are rarely seen.

3. What is the relative importance of motives in deciding WTP?

By the nature of the good in Kotchen and Reiling's study (species preservation), it is difficult to compare the relative strengths of motives deriving from use versus various forms of nonuse value. Employing a good with potentially both use and nonuse values, it is possible to undertake such a comparison. Furthermore, the motives considered are expanded to include two possible sources of pure IPB's: "Obligation" (a perceived general duty to contribute to public goods) and "Responsibility" (a perceived specific duty as regards the public good in question, arising from personal relevance). A partial test of whether these motives constitute pure IPB's (separable from the underlying public good) is also possible by eliciting WTP for various levels of good provision.

A matter not investigated by Kotchen and Reiling was whether motivational measures might provide a more powerful, and more direct, means of interpreting contingent values. While there is no *a priori* theoretical reason to expect that the strength of any particular type of motive will tend to be more influential on WTP *ceteris paribus*, the empirical possibility remains. For example, say that the NEP score is positively associated with the strength of importance attached to existence value, and both so associated with WTP. The issue then is which is the better predictor of WTP. If, as an empirical matter, WTP is better related to the (self-reported) strength of certain types of motivation than to measures of attitude then such strength of motivation can provide a more direct means of assessing the plausibility of the individual's WTP.

To address the issues identified above, a CV questionnaire was developed concerning WTP for water quality improvements in a lake (or "broad" in the local dialect) with an area of just under 10 hectares 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. The questionnaire was administered in a classroom setting to a total sample of 200 students connected with the School of Environmental Sciences. Thus, the sample is composed of individuals who are younger, better educated and more environmentally aware than the general population, and who are therefore likely to have a more "pro-environmental" attitude (Dunlap *et al.*, 2000).

Respondents were provided with a structured, illustrated presentation regarding three nested schemes for improving water quality in the lake. The schemes may be summarised as follows:

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. 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 via increases over the forthcoming five years in rental charges to campus shops which would in turn be permitted to pass on charges in the form of higher prices to students. Accounting measures were employed to prevent over-charging 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 WTP.

Subsequently, respondents were asked to indicate their strength of agreement or disagreement with a series of statements. These included the standard statements used to derive the NEP score (see Table 2), in a random order and interspersed with statements designed to elicit a measure of the individual's "pro-social" attitude represented by an "altruism scale" (see Table 3).

Respondents were then invited to revise their maximum WTP for any or all of the schemes as they wished (amendments of their originally stated values was not permitted). The significance of this opportunity lies in that the sample was split between different treatments (in terms of whether all three valuation tasks were disclosed in advance and the order of valuation) as part of a separate investigation of design effects reported elsewhere (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 in the current analysis, recognising where necessary that there could be a residual treatment effect on the WTP values.

After the opportunity to revise WTP values, respondents were asked to indicate the importance of various "reasons" for their WTP decisions (as shown in the first column of Table 1).

Table 1: Reasons potentially relevant to WTP decisions

Reason	Implied motive
I presently use the broad and enjoy seeing the plant and animal life there.	Use (value)
I plan to use the broad in the future and will enjoy seeing plant and animal life there.	Option (value)
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 (value)
I like knowing that people will be able to enjoy the broad's plant and animal life in the future.	Bequest (value)
I like knowing the broad's plant and animal life will be closer to its natural state even if <u>no-one</u> sees it.	Existence (value)
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 (value)

The stated level of importance is taken to indicate the perceived strength of a particular form of motivation as shown in the second column of Table 1. These labels are used here to refer to the underlying values or other motivations indicated; they were not available to respondents. The wording of the “reasons” with the associated motivating values labelled: Option, Altruism, Bequest, Existence and Intrinsic, are adapted from those used by Kotchen and Reiling (2000).¹⁴

Finally, socio-demographic information was sought, including the frequency and nature of the individual's use of the lake, and the number of remaining years the individual would be attending the university. The latter indicates the period over which the individual would be making payments for each water quality improvement scheme respectively.

4. Results

In this section, analysis is confined to non-protest respondents except where specified otherwise. Protest respondents are those 18 individuals (9% of the sample) who gave a “protest zero” value in respect of at least one of the schemes. A “protest zero” is a zero WTP for which the reason (or one of the reasons) given is that the individual doubts the credibility of the contingent scheme (e.g., “I’m sceptical that such measures would be effective”), is unable to decide on a WTP (e.g., “insufficient information is given”) and/or rejects responsibility for payment (e.g., “it is unfair for the students to pay”).

4.1 Attitudinal measures

4.1.1 The NEP Scale

The numerical coding of the categorical responses to the NEP statements follows that of Kotchen and Reiling (2000). Thus, the even-numbered statements in Table 2 are coded as: “strongly agree” = 1, “somewhat agree” = 2, “unsure” = 3, “somewhat disagree” = 4, and “strongly disagree” = 5, and with the ordering reversed for odd-numbered statements. The NEP score is the sum of the values so obtained and thus lies in the range 15 to 75 inclusive.

The mean NEP score for the whole sample (including protest respondents) is 58.2 (standard error 0.49) which is significantly greater than the mean values reported by Kotchen and Reiling (2000) at the 1% level but consistent with expectation given the constitution of the sample. However, this results from somewhat higher mean scores for each statement rather than a radically different pattern of responses as shown in Table 2 (indeed, the rank correlation of the mean scores between the studies is 0.95).

The item-total correlation coefficients shown in Table 2 are generally lower than those reported by Kotchen and Reiling (2000) so that the value of Cronbach's coefficient alpha (0.722) is some 0.1 lower than the values that they, and Dunlap *et al.*, (2000), report.¹⁵ Only the deletion of statement 6 would increase the value of alpha, and then only marginally (to 0.724).

¹⁵ Cronbach's coefficient alpha is related to the average inter-correlation 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 (Nunnally and Bernstein, 1994, Kline, 2000). There is no *a priori* standard for the acceptability of a given reliability level but there is some consensus that an alpha value of 0.7 generally represents the minimum acceptable (Nunnally and Bernstein, 1994; British Psychological Society Steering Committee on Test Standards, 1995; Kline, 2000). Dunlap *et al.* (2000) also use this minimum requirement in the context of applications of the NEP scale specifically.

¹⁴ The term “intrinsic” is used in reference to the “anthropocentric intrinsic value” discussed by Turner (1999), i.e. a human value stemming from a rights-based belief on the part of the holder.

Table 2: Mean score, rank of mean score and item-total correlations (r_{it}) for the NEP statements

Facet ^a	Statement ^a	Mean	Rank ^b	r_{it}	Results of Kotchen and Reiling (2000) ^c		
					Mean	Rank ^b	r_{it}
Reality of limits to growth	1. We are approaching the limit of the number of people the earth can support.	3.94	8=	0.55	3.59	7=	0.58
	6. The earth has plenty of natural resources if we just learn how to develop them.	2.32	15	0.35	2.24	15	0.40
	11. The earth is like a spaceship with very limited room and resources.	3.68	11	0.43	3.50	9=	0.56
Anti-anthropocentrism	2. Humans have the right to modify the natural environment to suit their needs.	3.99	7	0.55	3.42	11=	0.56
	7. Plants and animals have as much right as humans to exist.	4.46	2	0.45	4.23	2	0.47
	12. Humans were meant to rule over the rest of nature.	3.95	8=	0.46	3.61	7=	0.59
Fragility of nature's balance	3. When humans interfere with nature it often produces disastrous consequences.	4.10	5=	0.50	4.09	3=	0.50
	8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	4.19	4	0.34	3.87	6	0.67
	13. The balance of nature is very delicate and easily upset.	4.06	5=	0.43	4.01	5	0.59
Rejection of exemptionalism	4. Human ingenuity will ensure that we do not make the earth uninhabitable.	3.36	14	0.47	2.98	14	0.45
	9. Despite our special abilities, humans are still subject to the laws of nature.	4.61	1	0.44	4.38	1	0.38
	14. Humans will eventually learn enough about how nature works to be able to control it.	3.62	12=	0.44	3.32	13	0.41
Possibility of an eco-crisis	5. Humans are severely abusing the environment.	4.43	3	0.51	4.08	3=	0.59
	10. The so-called "ecological crisis" facing human-kind has been greatly exaggerated.	3.64	12=	0.43	3.40	11=	0.71
	15. If things continue on their present course, we will soon experience a major ecological catastrophe.	3.87	8=	0.52	3.51	9=	0.67

^a The numbering of statements and their grouping to represent "hypothesised facets of an ecological worldview" are according to Dunlap *et al.* (2000).

^b Rank of the statements according to the mean score from 1 = highest mean score to 15 = lowest mean score.

^c The mean is calculated from the distribution of categorical responses in Kotchen and Reiling's (2000) Table 1 using their numerical coding system as adopted here. Their table directly provides the item-total correlation.

Dunlap *et al.*, (2000) suggest another test of internal consistency in terms of the loadings on the first unrotated factor in principal components analysis: relatively high loadings on a factor that explains a substantial proportion of the variance indicating scale reliability. The loadings on the first unrotated factor lie in the range 0.25 to 0.59 and this factor accounts for 21.5% of the variance (eigenvalue 3.2) while the second factor explains only 10.9% of the variance (eigenvalue 1.6). By comparison, Dunlap *et al.*, find loadings in the range 0.40 to 0.73 on the first factor which explains 31.3% of variance (eigenvalue 4.7); the next factor explaining only 10% (eigenvalue 1.5).

Therefore, both in terms of coefficient alpha and principal components analysis, the NEP score is not as consistent with the measure of a single scale variable as in precedent studies.¹⁶ Nevertheless, it is considered that the value of alpha of itself and the consistency of the ranking of mean scores for individual NEP statements with previous studies are sufficient to warrant use of the NEP score as a measure of “pro-environmental” attitude in the current study.¹⁷ The evidence certainly does not support the idea that the NEP scale is culturally specific to US individuals.

Sorting subjects into one of three groups depending on their NEP score is undertaken in the same way as described by Kotchen and Reiling (2000). To achieve an approximately even distribution of the sample across the groups, they are defined as follows:

NEP Group	NEP Score, s	Number of subjects	
		Full sample	Excluding protests
Weak	s≤55	65	59
Moderate	55<s≤60	66	62
Strong	s>60	69	61
Total		200	182

The values of the cut-points (55 and 60) are somewhat higher than those employed by Kotchen and Reiling, consistent with the upward shift in the distribution of NEP scores.

¹⁶ This lower consistency is somewhat surprising given the homogeneity of the sample in terms of age and education. However, there appears to be no reason to believe that students *per se* are exceptional in their response to the NEP scale. Indeed, Dunlap *et al.*, (2000) used a sample of college students for pre-testing their questionnaire.

¹⁷ Factor analysis with varimax rotation was undertaken to investigate the possible existence of distinct underlying variables within the NEP score. As was found by Dunlap *et al.*, (2000), certain items do tend to group according to the facets which they reflect (Table 2). However, otherwise, the factors identified are not readily interpretable.

4.1.2 The “Altruism Scale”

The numerical coding of the categorical responses to the altruism statements shown in Table 3 is as described above for the NEP statements. Thus, the even-numbered statements are coded from “strongly agree” = 1 to “strongly disagree” = 5, and with the ordering reversed for odd-numbered statements. The altruism statements are grouped according to whether they are general statements of attitude or whether they are project specific (in that they relate to environmental matters or the water quality improvement schemes in particular).

While there is a relatively high level of agreement with the project specific statements, their scores do not correlate strongly with the total score for all the statements. As shown in Table 3, their exclusion increases the reliability of the scale as measured by Cronbach’s coefficient alpha from 0.586 to 0.606. Consequently, for the purposes of subsequent analysis the “altruism scale” (measured by the ALT score) will be comprised of the scores for only the general statements (thus the ALT score lies in the range 6 to 30 inclusive). Attitudes indicated by the scores for the remaining statements will be dealt with separately.

Even on this basis, the reliability of the ALT score as a measure of a single variable is substantially less than that of the NEP score (and none of the statements could be deleted to increase the value of alpha). While there is some agreement that the minimum acceptable level of reliability is 0.7, Loewenthal (1996, p. 48) states that a reliability level of 0.6 can be acceptable under certain conditions. However, since these conditions include that “there is good evidence for validity”, there must be some doubt as to the internal reliability of the ALT score. The interpretation of subsequent results is subject to this consideration.

The mean ALT score for the whole sample is 23.8 (standard error 0.23). Sorting subjects into three groups according to their ALT score yields the following distribution (applying the same principles as described above in the case of the NEP score):

ALT Group	ALT Score, a	Number of subjects	
		Full sample	Excluding protests
Weak	a≤22	63	57
Moderate	22<a≤25	71	67
Strong	a>25	66	58
Total		200	182

Table 3: Mean score, rank of mean score and item-total correlations (r_{it}) for the “altruism” statements

Statement Relevance	Statement Type ^a	Statement	Mean	r_{it}	
				All statements	General statements only
General	AR	1. My personal actions can greatly improve the well-being of people I don't know.	3.97	.51	.57
		2. My responsibility is to take care <u>only</u> of my family and myself.	4.38	.62	.66
	PN	3. It is my duty to help other people when they are unable to help themselves.	4.07	.58	.64
		4. The individual alone is responsible for his or her own well-being in life.	3.09	.62	.69
	AC	5. Many of society's problems result from selfish behaviour.	4.47	.39	.42
		6. Contributions to community organisations <u>rarely</u> improve the lives of others.	3.85	.46	.48
Project specific	AR	7. All students should contribute towards improving environmental quality around the UEA campus.	3.86	.35	
	PN	8. I worry only about natural resources that I see or use.	4.11	.44	
	AC	9. Reducing current pollution levels will improve water quality for future users of the UEA Broad.	4.34	.38	
Cronbach's α				.586	.606

^a AR = Ascription of Responsibility, PN = Personal Norms, AC = Awareness of Consequences.

As was found with the distribution of the NEP scores, a substantial proportion of the subjects has ALT scores close to the mean value and the “moderate” group covers a relatively limited range of scores.

The ALT and NEP scores appear to substantially measure different attitudinal attributes since they are relatively weakly correlated (Pearson correlation coefficient 0.167). As regards the respective categorical variables representing the ALT and NEP groups, their cross-tabulation indicates some positive association ($\chi^2=13.15$, $p=0.011$) but the rank correlation coefficient is only 0.151.

4.2 Motivations for WTP

Table 4 shows the mean scores for the importance to respondents of the offered reasons when deciding their WTP's. Responses to the motivation questions are coded as: “very important” = 4, “important” = 3, “slightly important” = 2 and “not important” = 1, except in the case of the Responsibility motive which is coded in the reverse order. Thus, a higher Responsibility motive score is associated with the view that the schemes are within the respondent's personal responsibility rather than simply that of the general public.

The mean scores for importance, are grouped around the motives being considered “important” (scored as 3). However, within-subject non-parametric tests for equality of means indicate that individuals strongly differentiate among certain of the motives. As shown in Table 4, the levels of importance attached to the Intrinsic, Existence, Responsibility and Bequest motives tend not to be significantly distinguished from each other but they tend to be so distinguished from the other motives.

The relatively low mean score for the Obligation motive suggests a widespread perception that this motive is of substantially less importance than the other motives. The importance attached to the Altruism and (personal) Use motives is also relatively low.¹⁸ It is possible that respondents did not distinguish between their own use and that of other people. However, the substantial correlation of the importance of Altruism with that of the Bequest motive (Table 5) suggests that respondents considered use by “other people” (currently or in the future) in a similar way, but with much more importance attaching to future use.

¹⁸ The relatively low importance attached to the Use motive appears to reflect a perceived lack of change in amenity 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 score of motive importance and Z statistic for the Wilcoxon Signed Ranks Test of difference between scores

	Intrinsic	Existence	Respons- ibility	Bequest	Option	Altruism	Use	Obligation
Mean score	3.13	3.04	2.99	2.98	2.83	2.69	2.69	2.47
Intrinsic	-	1.207	1.383	1.845*	3.346***	4.990***	4.707***	7.043***
Existence		-	.540	0.758	2.528**	3.965***	3.854***	5.946***
Respons.			-	0.040	1.533	3.042***	2.832***	4.786***
Bequest				-	2.139**	5.937***	3.769***	6.327***
Option					-	1.830*	2.478**	3.952***
Altruism						-	0.026	2.878***
Use							-	2.498**
Obligation								-

Z statistic: * Significant at the 10% level; **Significant at the 5% level; ***Significant at the 1% level.

Table 5: Rank correlation of scores for motive importance and attitudinal measures

	Intrinsic	Existence	Respons- ibility	Bequest	Option	Altruism	Use	Obligation
Intrinsic	-	0.485***	0.038	0.345***	0.222***	0.161**	0.241***	0.248***
Existence		-	0.080	0.326***	0.193***	0.234***	0.201***	0.200***
Respons.			-	-0.001	-0.076	0.049	-0.017	0.016
Bequest				-	0.380***	0.744***	0.361***	0.319***
Option					-	0.393***	0.680***	0.173**
Altruism						-	0.386***	0.311***
Use							-	0.209***
Obligation								-
NEP Score	0.270***	0.416***	0.095	0.162**	0.082	0.019	0.087	0.126*
ALT Score	0.160**	0.303***	0.139*	0.240***	0.219***	0.221***	0.201***	0.177**

Correlation coefficient: * Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

The consistency with which the sample ordered the importance of the motives is also apparent from the correlations among scores (Table 5). The scores are significantly positively correlated with the exception of the Responsibility motive, which is apparently not seen as congruent with the other motives offered in the survey.

The strength of the correlations suggests that the motive scores might be measuring a single underlying variable (such as “motive strength”). Indeed, if the motive scores (other than for Responsibility) are aggregated the alpha coefficient is 0.771. However, factor analysis reveals clearly separable underlying variables. An analysis of all the motive scores excluding that for Responsibility and extracting components with an eigenvalue exceeding unity yields two components that account for just over 60% of the overall variance but only 26.6% of the variance in the Obligation motive score. Additionally excluding the Obligation motive yields two factors accounting for just over 67% of the overall variance in scores with the loadings for the varimax rotated matrix as shown in Table 6.¹⁹

Table 6: Factor analysis of motive scores: loadings on factors

Motive	Factor 1	Factor 2
Use	.806	.060
Option	.825	.043
Altruism	.753	.210
Bequest	.695	.417
Existence	.116	.836
Intrinsic	.144	.833
% of variance	47.74	19.44

Although the Bequest motive loads relatively significantly on both factors in Table 6, factor 1 can be identified with “human value” derived from water quality improvement, i.e. direct benefits to humans, and factor 2 with “natural value”. Thus, the theoretical distinction between (personal) use and nonuse value may not reflect the distinctions that individuals make in their thinking about the types of value associated with environmental improvement. Indeed,

¹⁹ If the restriction on the extraction of components is relaxed from eigenvalues of at least 1.0 to 0.95, then inclusion of the Obligation motive with those shown in Table 6 yields three factors accounting for just under 74% of the total variance. The “natural value” factor identified above is retained but the “human value” factor splits between “social value” (Altruism and Bequest motives) and “private value” (Use and Option motives). The Obligation motive loads clearly with the “social value” factor.

this value structure is highly consistent with that depicted by Turner (1999, p.35) where nonuse value encompasses existence value, (anthropocentric) intrinsic value and some element of bequest value.

The need for separate treatment of the Responsibility and Obligation motives is consistent with these motives not referring to the benefits of the proposed schemes for water quality improvement *per se*.

The analysis reported below uses respondent's factor scores as measures of underlying motive strengths for the motives included in Table 6 and, for comparability, the standardised values of their Responsibility and Obligation motive scores (so that the respective distributions have a mean of zero and unit standard deviation).

4.3 Relationships among the Attitudinal measures and motivation

Table 7 shows the mean scores of motive importance for each NEP group with a comparison to the results of Kotchen and Reiling where possible (Use, Responsibility and Obligation motives were not measured in their study). Consistently between the studies, there is evidence of a positive association between mean motive importance and the NEP group for only the Intrinsic, Existence and Bequest motives.²⁰

NEP group membership also has a bearing on the extent to which the individual distinguishes among the motives. The variation in the mean motive score is much less for the weak NEP group than the other NEP groups: a range of mean scores of 0.44 compared to a range of over 0.80 in the other groups. This lack of distinction is also apparent in the number of statistically significant differences between the means. For example, on the basis of a paired sample test, the mean Use and Existence motive scores are not significantly different for the weak NEP group but are significantly different at better than the 1% level for both of the other groups.

These relationships among NEP score and the strength of importance attached to the various motives are reflected in the correlation coefficients at the foot of Table 5, which also reports on the association with the ALT score. This is relatively substantial but is not confined to certain motives as in the case of the NEP score. Rather, a higher ALT score is associated with a generally higher scoring of importance for each motive.

²⁰ Contingency tables of category of importance versus NEP group have χ^2 statistics significant at the 5% level or better only in respect of the Intrinsic, Existence and Bequest motives.

Table 7: Comparison of Motive Importance between Groups

Motive	NEP Group	Mean Score	Rank ^a	Z ^b	Results of Kotchen and Reiling (2000)	
					Mean Score ^c	Rank ^a
Intrinsic	Weak	2.83	3	1.822*	3.24	1
	Moderate	3.13	1	1.892*	3.55	1
	Strong	3.41	2	3.560***	3.83	1
	Total	3.13	1		-	1
Existence	Weak	2.68	6	1.937*	2.70	4
	Moderate	2.95	2=	3.542***	2.96	3
	Strong	3.48	1	5.123***	3.32	3
	Total	3.04	2		-	3
Respons- ibility	Weak	2.88	1	.807	N/A	N/A
	Moderate	2.94	4	1.164		
	Strong	3.16	3	1.385		
	Total	2.99	3			
Bequest	Weak	2.85	2	.888	2.90	2
	Moderate	2.95	2=	1.413	3.03	2
	Strong	3.15	4	1.977**	3.50	2
	Total	2.98	4		-	2
Option	Weak	2.81	4	.401	2.56	5
	Moderate	2.73	5	1.459	2.50	5
	Strong	2.95	5	1.177	2.79	5
	Total	2.83	5		-	5
Altruism	Weak	2.71	5	.608	2.75	3
	Moderate	2.63	6	.724	2.70	4
	Strong	2.74	7	.198	3.00	4
	Total	2.69	6=		-	4
Use	Weak	2.68	7	.686	N/A	N/A
	Moderate	2.55	7	1.675*		
	Strong	2.85	6	.946		
	Total	2.69	6=			
Obligation	Weak	2.44	8	.632	N/A	N/A
	Moderate	2.32	8	2.043**		
	Strong	2.66	8	1.612		
	Total	2.47	8			

^a Ranks are assessed for each NEP Group and between motives with 1 = most important motive etc.

^b Absolute value of Z statistic for the Mann-Whitney Test between NEP Groups in the order for comparison Weak/Moderate, Moderate/Strong and Weak/Strong.

^c Calculated using the scoring system described for the current study (section 4.2).

* Significant at the 10% level; * Significant at the 5% level; * **Significant at the 1% level.

Table 8: Mean (standard error) of factor and standardised motive scores by NEP and ALT groups

	Factor 1 (“human value”)			Factor 2 (“natural value”)			Obligation motive			Responsibility motive		
	A	b	c	a	b	c	a	b	c	A	b	c
NEP group												
Weak	.044 (.120)	-		-.436 (.129)	**		-.037 (.115)	-		-.110 (.137)	-	
Moderate	-.122 (.130)		-	-.018 (.121)		***	-.172 (.131)		-	-.058 (.130)		-
Strong	.081 (.135)	-		.440 (.111)	***		.210 (.134)	**		.165 (.116)	-	
ALT group												
Weak	-.335 (.134)	*		-.271 (.137)	*		-.240 (.154)	*		-.251 (.149)	**	
Moderate	.008 (.112)		***	.052 (.109)		**	.126 (.110)		*	.151 (.106)		-
Strong	.321 (.129)	*		.206 (.137)	-		.091 (.120)	-		.072 (.129)	-	

a: Mean (standard error)

b: Significance of t test of equality with mean of the Moderate group

c: Significance of t test of equality between means of the Weak and Strong groups

* Significant at the 10% level; * *Significant at the 5% level; * * *Significant at the 1% level.

All these findings are summarised in the relationship between NEP and ALT group membership respectively and motive strength in Table 8. The mean “natural value” factor score clearly rises with NEP group, but there is no relationship with the mean “human value” factor score. However, for the ALT group classification there is some tendency for mean factor scores to rise with the ALT group for both factors. Indeed, within subject t tests of scores for the two factors show no significant differences for any of the ALT groups. In contrast, the differences in factor scores for the weak and strong NEP groups are significant at the 5% level.

The relationship only between NEP score and the “natural value” factor strongly supports the validity of the stated importance of the motives underlying this factor. To a lesser extent the ALT score supports the validity of the importance attached to the motives underlying the “human value” factor score. However, the ALT score may reflect some measure of “strength of feeling” about all the motives reflected in the factor scores since the scores by group are not significantly different between the factors. Certainly, the NEP score appears to be a more discriminating measure of attitude; it is associated with only certain motives.

As regards the Responsibility and Obligation motives, the correlation coefficients in Table 5 suggest some positive association with the NEP and ALT scores. However, from Table 8, there is no clear evidence that the mean importance of these motives varies with NEP or ALT group membership. This suggests that the strength of importance attached to these motives derives from attitudes other than those measured by these scales. Some relationship might be expected between the importance of the Obligation motive and the ALT score but this may not be apparent because of the relatively weak reliability of the ALT scale.

4.4 Relationships with CV Response and WTP Values

For each of the three schemes respectively, the distribution of responses to the contingent valuation question across NEP groups is shown in Table 9.

None of the differences between NEP groups are significant according to χ^2 tests and there is no evidence that a strong “pro-environmental” attitude (as measured by the NEP score) is associated with any of the three forms of response: protest zero, genuine zero or positive WTP. Thus, the finding of Kotchen and Reiling (2000), that those with a strong “pro-environmental” attitude are no more likely to protest than others, is confirmed for a sample obliged to respond and comprised of individuals who might be considered more likely to protest at the principle of monetary trade off.

Table 9: Frequencies of type of CV response

NEP Group→	Weak	Moderate	Strong	Total
Scheme F				
Protest zero	5	2	7	14
Zero WTP	5	4	4	13
Positive WTP	54	60	59	173
Total	64	66	70	200
Scheme P				
Protest zero	4	2	5	11
Zero WTP	4	1	4	9
Positive WTP	56	63	61	180
Total	64	66	70	200
Scheme D				
Protest zero	5	2	5	12
Zero WTP	2	2	1	5
Positive WTP	57	62	64	183
Total	64	66	70	200

The classification of CV responses against ALT groups has a similar pattern to that shown in Table 9 and again there are no significant differences in frequency of response type among the groups.

The relationship of WTP to the attitudinal and motivational measures is examined using tobit regressions and linear (OLS) regressions for that of the change in WTP between schemes.²¹ The regressions include the variables of interest here and those found in preliminary investigations to be of some significance, notably whether the respondent would remain at the university and thus be making payments under the contingent scheme for one year or longer. Other socio-demographic variables (including the nature and extent of usage of the lake, and income) were not found to be significant determinants of WTP.²²

Respondents are pooled regardless of the experimental treatment under which the questionnaire was administered. However, to reflect the possible influence

²¹ The relevance of the tobit regression model lies in the idea that the WTP distribution is effectively censored from below at zero, and thus OLS estimates of coefficients are inconsistent and biased towards zero (see, for example, Greene, 2000).

²² The lack of a significant positive relationship with income contrasts with expectations from standard theory but probably results from the sample being comprised of students. Their incomes are relatively low and lack variability: for the 183 subjects reporting their income, the median value was £4,000 p.a. with just under 55% of the sample having incomes in the range £3,000-5,000 p.a..

of this treatment, two dummy variables are included in the analyses. Their values depend on whether or not the respondent was informed in advance that there would be *three* valuation tasks (advance versus stepwise disclosure) and the order in which the valuation tasks were undertaken (“top down” starting with scheme D or “bottom up” starting with scheme F”).

In summary, therefore, the general functional form adopted for the regressions reported here is:

$$\text{WTP or } \Delta\text{WTP} = f(X, \text{Years of payment, Version: disclosure, Version: order})$$

where X depends on whether the regression is against attitudinal or motivational measures, as follows:

$$\begin{array}{ll} \text{Attitudinal measures} & X = \text{NEP score, ALT score} \\ \text{Motivational measures} & X = \text{Factor 1 score, Factor 2 score, Responsibility} \\ & \quad \text{motive strength, Obligation motive strength} \end{array}$$

Regressions involving both sets of measures simultaneously are not reported given the collinearity between the NEP scores and the “natural value” (factor 2) score.

The analysis in this section deals with the sample excluding protest zero respondents and, for each scheme respectively, outlying values that have a disproportionate impact on representative statistics. These outliers were identified by reference to the values of studentised residuals from preliminary OLS regressions – a method suggested by Belsley *et al.*, (1980). However, a cut-off value of 3 rather than 2 (as suggested by Belsley *et al.*,) was used to ensure that the outliers precisely coincided with those at the extreme upper end of the WTP distribution for each scheme respectively (i.e. more than 3 standard deviations from the mean).²³ Thus, the same sample could be used regardless of the assumed functional form (attitudinal versus motivational measures); the use of a cut off value of 2 would have excluded different further cases for each scheme depending on the assumed functional form. In any event, the qualitative conclusions reported here would not have been substantially altered by the exclusion of the additional cases if a cut off value of 2 had been employed.

The results of regressions of WTP against the attitudinal measures are summarised in Table 10 for the sample as a whole and for a sub-sample referred to as the “higher “natural value” group”. This sub-sample is constituted by those

²³ This results in the exclusion of cases with WTP greater than or equal to the following amounts (with the number of relevant cases): scheme F £100 (4); P £150 (5); D £340 (3).

subjects with a nonnegative factor scores for the “natural value” factor (i.e. their values lie in the upper part of that distribution).

Table 10: Tobit regression of WTP's: Coefficients (with standard error)

Variable	Sample			Higher “natural value” group		
	WTP for Scheme			WTP for Scheme		
	F	P	D	F	P	D
Constant	18.90 (13.48)	11.00 (20.52)	-14.25 (30.98)	17.69 (21.14)	-1.26 (30.69)	-26.77 (47.33)
NEP score	0.08 (0.19)	0.29 (0.28)	0.78 (0.43)*	0.28 (0.29)	0.73 (0.43)*	1.49 (0.66)**
ALT score	0.03 (0.39)	0.62 (0.60)	1.38 (0.90)	-0.11 (.54)	0.28 (.78)	1.13 (1.22)
Years of payment ^(a)	-1.78 (3.22)	-10.54 (4.95)**	-22.10 (7.48)***	-4.04 (5.40)	-6.70 (7.86)	-19.01 (12.20)
Version: disclosure ^(b)	-5.40 (2.56)**	-2.14 (3.91)	-3.23 (5.88)	-8.87 (3.71)**	-9.56 (5.40)*	-13.94 (8.33)*
Version: order ^(c)	-7.35 (2.49)***	-10.12 (3.81)***	-4.33 (5.74)	-9.91 (3.71)***	-15.30 (5.37)***	-11.75 (8.32)
σ	16.43	25.07	38.03	17.69	25.83	40.12
Log likelihood (LU)	-712.55	-796.39	-884.78	-392.65	-434.17	-483.13
LR Test (sig.) ^(d)	14.07 (0.015)	15.31 (0.009)	15.89 (0.007)	13.87 (0.016)	15.23 (0.009)	14.24 (0.014)
Sample size	178	177	179	96	96	97

^(a) More than one year = 1, One year or less = 0

^(b) Advance disclosure = 1, Stepwise disclosure = 0

^(c) Top down order =1, Bottom up order = 0

^(d) LR Test, the likelihood ratio test statistic, is computed as: $2 \times (\text{LU} - \text{LR})$, where LR is the log likelihood for the restricted model in which the coefficients on all parameters, except the constant and sigma, are set equal to zero. The significance of this test statistic is determined by the χ^2 distribution at 5 degrees of freedom (the number of imposed restrictions). The χ^2 value with a 1% level of significance is 15.09.

Significance of t test that coefficient value is zero: * Significant at the 10% level; ** significant at the 5% level; *** Significant at the 1% level.

Table 11: OLS regression of difference in WTP between schemes: Coefficients (with standard error)

Variable	Sample			Higher “natural value” group		
	Difference in WTP between Schemes			Difference in WTP between Schemes		
	D-F	D-P	P-F	D-F	D-P	P-F
Constant	-33.77 (23.22)	-25.62 (14.39)*	-11.11 (11.68)	-58.16 (37.81)	-39.84 (24.63)	-25.83 (16.70)
NEP score	.75 (.32)**	.56 (.20)***	.20 (.16)	1.18 (.52)**	.78 (.34)**	.48 (.23)**
ALT score	1.16 (.68)*	.59 (.42)	.65 (.34)*	1.24 (.97)	.78 (.63)	.57 (.43)
Years of payment ^(a)	-20.20 (5.64)***	-12.46 (3.51)***	-8.31 (2.84)***	-16.63 (9.78)*	-13.65 (6.39)**	-3.88 (4.31)
Version: disclosure ^(b)	3.17 (4.45)	.09 (2.77)	4.36 (2.25)*	-2.22 (6.70)	-1.11 (4.38)	.83 (2.97)
Version: order ^(c)	2.92 (4.34)	3.68 (2.70)	-1.73 (2.19)	.99 (6.69)	2.50 (4.36)	-2.95 (2.95)
F (sig.)	4.28 (.001)	4.66 (.001)	3.54 (.005)	2.18 (.064)	2.48 (.037)	1.92 (.098)
R ²	11.1%	12.0%	9.4%	10.8%	12.1%	9.7%
Adjusted R ²	8.5%	9.4%	6.8%	5.8%	7.2%	4.7%
Sample size	177	177	176	96	96	95

^(a) More than one year = 1, One year or less = 0

^(b) Advance disclosure = 1, Stepwise disclosure = 0

^(c) Top down order = 1, Bottom up order = 0

Significance of t test that coefficient value is zero: * Significant at the 10% level; ** significant at the 5% level; *** Significant at the 1% level.

The coefficients on the NEP score are positive throughout but achieve some significance only for those subjects in the higher “natural value” group, i.e. those attaching more importance to existence and intrinsic values; exceptionally this is not the case for Scheme F. Thus, it appears that NEP score is not simply an indicator for expressive value, those with a higher NEP score have an increased WTP only where they attach more importance to the motives represented by the “natural value” factor.

Table 11 reports on regressions of the change in WTP between schemes against attitudinal measures. It is notable that increasing NEP score is generally associated with an increasing sensitivity of WTP to the scope of the good provided. Furthermore, this is apparent for the sample as a whole (not just the higher “natural value” group) which indicates the strength of the relationship between NEP score and scope sensitivity. Therefore, for the reasons discussed previously, if NEP is associated with some expressive element in WTP, this element cannot be treated as a pure IPB; those with a higher NEP score have an enhanced sensitivity to the nature of the good provided.

The wider implications of the results in Tables 10 and 11 are that the use of the NEP scale in the interpretation of contingent values can be robust to variation in the country where the study is undertaken (the previously identified relationship does not appear to be a “cultural artefact”) and to elicitation format.

The results of regressions using motivational rather than attitudinal measures are summarised in Tables 12 and 13. For each scheme and for the changes between them, the strength of each type of motivation is positively related to WTP but with varying degrees of significance. The “natural value” factor score is clearly more material to WTP than the “human value” factor score, and is also associated with enhanced sensitivity to scope.

The two possible sources of IPB’s examined here are clearly distinguished. A need to contribute to any “good cause” (Obligation motive) is consistently treated as the least important of the presented motives. Moreover, the importance it is accorded appears to have no significant bearing on the individual’s WTP. On the other hand, a need to contribute to a specific scheme because of its perceived personal relevance (Responsibility motive) is regarded as highly important, and is associated with an enhanced WTP. However, this motive cannot be seen as giving rise to a pure IPB since its importance is positively associated with the sensitivity of WTP to the scope of the good provided.

It remains to be seen whether the stated strength of the Responsibility motive would vary among public goods of different types and with WTP for their

provision. However, on the evidence available here neither the Responsibility nor Obligation values can be said to motivate WTP in a scope insensitive manner. Consequently, they cannot be seen as giving rise to “non-economic” values.

Regardless of functional form, those who envision being at the university, and thus contributing to any implemented scheme, for more than one year have a significantly lower WTP over the “forthcoming year” for Schemes P and D. The reason for this observation is uncertain, but could arise from individuals treating the benefit of water quality improvement as having some fixed, rather than annual, value. Thus, those with longer to pay perceive that they can reduce their annual payment.²⁴

The treatment version also appears to have some residual effect. Although form of disclosure is insignificant (presumably because the WTP values used here are those after the opportunity for revision), there is an ordering effect. Those who valued Scheme D first tend to have significantly lower values for Schemes P and F regardless of their motivational strength and attitudes. A possible explanation is that those who firstly consider the largest good (Scheme D) use this as some form of baseline and subsequently excessively devalue lower levels of provision compared to those who start with the lowest level of provision as baseline. Since this discrepancy is not eliminated on the opportunity for revision of value, it is possible that the individual is not conscious of this “baseline effect”. However, these possible explanations must remain conjectural given the evidence available.

The regression analyses involving attitudinal measures were also conducted with the addition of the variables representing the responses to the project specific statements in Table 6, as well as with these variables replacing the NEP and ALT scores. These variables did not add substantially to the explanatory power of the models and only the strength of agreement with the seventh statement in Table 6 was found to have a significant relationship with WTP (except in the case of Scheme F). This is not surprising given that this statement is related to the ascription of responsibility which has some apparent significance in the WTP decision (in the form of the Responsibility motive) as noted above.

²⁴ A fixed value for the benefit is consistent with nonuse values that stem from the existence of the good; an annual value (which would give rise to a *positive* relationship between WTP and years of payment) would suggest a basis in use value.

Table 12: Tobit regression of WTP’s for sample: Coefficients (with standard error)

Variable	WTP for Scheme		
	F	P	D
Constant	24.39 (3.32)***	40.44 (5.03)***	58.89 (7.59)***
Factor 1 (“human value”)	.68 (1.28)	3.42 (1.94)*	4.66 (2.85)*
Factor 2 (“natural value”)	3.87 (1.25)***	5.25 (1.90)***	8.91 (2.86)***
Responsibility motive	.31 (1.25)	5.20 (1.90)***	9.72 (2.82)***
Obligation motive	.72 (1.33)	.52 (2.00)	.22 (2.96)
Years of payment ^(a)	-2.25 (3.14)	-10.26 (4.74)**	-20.87 (7.16)***
Version: disclosure ^(b)	-4.94 (2.53)*	-.42 (3.82)	-.28 (5.72)
Version: order ^(c)	-7.31(2.45)***	-8.55 (3.68)**	-1.91 (5.53)
σ	15.87	23.87	36.11
Log likelihood	-706.71	-787.52	-875.36
LRT (sig.) ^(d)	25.76 (.001)	33.06 (.000)	34.73 (.000)
Sample size	178	177	179

^(a) More than one year = 1, One year or less = 0
^(b) Advance disclosure = 1, Stepwise disclosure = 0
^(c) Top down order =1, Bottom up order = 0
^(d) LR Test, the likelihood ratio test statistic, is computed as: 2 x (LU-LR), where LR is the log likelihood for the restricted model in which the coefficients on all parameters, except the constant and sigma, are set equal to zero. The significance of this test statistic is determined by the χ^2 distribution at 7 degrees of freedom (the number of imposed restrictions). The χ^2 value with a 1% level of significance is 18.48.

Significance of t test that coefficient value is zero: * Significant at the 10% level; ** significant at the 5% level; *** Significant at the 1% level.

Table 13: OLS regression of difference in WTP between schemes: Coefficients (with standard error)

Variable	Difference in WTP between Schemes		
	D-F	D-P	P-F
Constant	33.97 (5.88)***	18.32 (3.67)***	14.76 (2.95)***
Factor 1 (“human value”)	1.98 (2.22)	.91 (1.40)	2.06 (1.12)*
Factor 2 (“natural value”)	4.62 (2.20)**	2.27 (1.38)*	1.52 (1.11)
Responsibility motive	7.43 (2.18)***	5.02 (1.38)***	3.63 (1.11)***
Obligation motive	1.96 (2.30)	1.52 (1.43)	.51 (1.15)
Years of payment ^(a)	-18.03 (5.55)***	-10.90 (3.46)***	-7.59 (2.78)***
Version: disclosure ^(b)	4.59 (4.45)	1.18 (2.79)	5.00 (2.24)**
Version: order ^(c)	4.68 (4.30)	4.88 (2.68)*	-.70 (2.16)
F (sig.)	4.69 (.000)	4.73 (.000)	4.35 (.000)
R ²	16.3%	16.4%	15.3%
Adjusted R ²	12.8%	12.9%	11.8%
Sample size	177	177	176

^(a) More than one year = 1, One year or less = 0
^(b) Advance disclosure = 1, Stepwise disclosure = 0
^(c) Top down order =1, Bottom up order = 0

Significance of t test that coefficient value is zero: * Significant at the 10% level; ** significant at the 5% level; *** Significant at the 1% level

5. Discussion and Conclusions

Despite changes in the location and design of the survey, many of Kotchen and Reiling's findings were reproduced in this study. Notably, the NEP score could be associated with the strengths of the Intrinsic, Existence and (to some extent) Bequest motives, and with the WTP of those who felt such motives more strongly.²⁵ Furthermore, the latter finding and the positive association of NEP score with the scope sensitivity of WTP suggest that the NEP score does not simply reflect a propensity to express a "pro-environmental" attitude through WTP. Neither does the NEP score indicate the extent of a "pro-social" attitude (as measured by the ALT score), which was not generally material to the WTP.²⁶

Overall, therefore, the evidence indicates that the NEP score is a practical means of gauging the internal validity of WTP values to the extent that these derive from the Intrinsic, Existence and Bequest motives as described here. However, some note of caution is necessary as regards the attitudinal measures employed in this study.

- The response to the NEP questions was found to be similar to that of US individuals from a more widely drawn sample but the resulting NEP scale had only a moderate internal reliability (as a measure of a single attitude) compared to previous studies. Further testing of reliability with larger and more diversely constituted samples is justified.
- In common with previous studies, the ALT scale was of weak internal reliability. Therefore, there is scope for further development of an attitudinal measure that better gauges the individual's underlying attitude to public goods provision with direct human benefits.

While the significance of the importance ascribed to the offered motivating reasons can be questioned (e.g., two individuals with identical perceptions might use alternative descriptions of them, say "important" v. "very important"), the relationship with attitudinal measures provides some evidence of internal consistency. Furthermore, variation in the importance of the motives underlying the "natural value" factor but not the "human value" factor was a

²⁵ Thus, the usefulness of the NEP score lies in its relationship with what is referred to here as "natural value" rather than with all nonuse values. The latter would include values encompassed by the Option and Altruism motives, which do not appear to have any significant relationship with NEP score.

²⁶ It is also apparent that for a significant proportion of the sample the ALT score is strongly positively associated with WTP for schemes P and D. For example, regressions excluding the 14 individuals who did not disclose their income have positive coefficients on the ALT score significant at the 1% level.

significant covariate with WTP. Indeed, variation in the "natural value" factor contributed significantly to the model of WTP for Scheme F, which the NEP score did not.

These results suggest that scores of motive importance could provide a more direct means of assessing the plausibility of WTP values (and using fewer questions than were needed to construct the NEP score). As noted above, there is no *a priori* reason to expect that the strength of some motives is likely to be more influential on WTP than others. However, purely as an empirical matter, the evidence here suggests that such relationships can exist across a sample.

As regards the Responsibility and Obligation motives, only the strength of the former appears to have a significant relationship with WTP. However, since it is also positively associated with scope sensitivity, it cannot be treated as giving rise to some element in WTP distinguishable from the value of the public good provided.

Finally, further evidence has been obtained that higher rights-based values are not necessarily associated with protest behaviour. Despite using a face-to-face survey method with a sample that might be more disposed to protest the concept of monetary trade off, those with a higher NEP score were not found more likely to protest. Indeed, the "natural value" factor score, which reflects the strength of the Intrinsic motive, was strongly, positively associated with WTP.²⁷

In conclusion, the evidence presented here undermines the motivational critiques of CV and suggests that the method yields values appropriate to economic analysis. However, this work constitutes only a case study, and further valuation exercises, avoiding the complexities of the administration experiment included in this study while involving a variety of goods and a more diverse sample, are justified.

²⁷ A matter for further investigation is whether there is any meaningful distinction between the Intrinsic and Existence motives. The relatively close relationship between the importance attached to them suggests that many individuals do not distinguish between them in their decision-making.

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