Testing Kahneman's Attitudinal WTP Hypothesis

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by

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Abstract

A psychological interpretation of willingness to pay (WTP) bids arising from the Contingent Valuation Method (CVM) claims they represent a general contribution towards environmental causes rather than a personal economic valuation. Yet the evidence supporting this contribution model has been criticised for using group mean correlations to draw conclusions about individual motives. This paper avoids this problem by examining motives at an individual level. Evidence reported shows the need to qualify the role of the attitudinal explanation. Some, but not all, positive WTP bids are found to be based on contributory rather than economic motives, while the decision to bid zero or positive appears to represent a general psychological appraisal rather than being purely related to attitudes.

[1] Data used originates from two projects. Study 1 was sponsored by the European Commission DG XII under the project on "Social Processes of Environmental Valuation" co-ordinated by Martin O'Connor, EC contract ENV4-CT96-0226; the final report can be found on-line at http://alba.jrc.it/valse/report.htm. Study 2 was part of the European Community project "Integrated Evaluation for Sustainable River Basin Governance" (ADVISOR), co-ordinated by Paula Antunes, EC Contract EVK1-CT-2000-00074 under the Framework V, Energy, Environment and Sustainable Development RTD Programme.

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I. INTRODUCTION

The CVM is a controversial but commonly applied approach for placing a monetary value on an actual or proposed environmental change. Many economists believe that a well designed and properly administered CVM survey will result in a reliable estimation of the 'true' monetary valuation of an environmental proposal (e.g. Arrow, et al. 1993; Bateman, et al. 2002; Mitchell and Carson 1989; Smith 1994). The contention is that, under the right conditions, if you ask a member of the public "What is the maximum you would be willing to pay for environmental improvement X", participants will readily provide a meaningful response that reflects their personal monetary valuation of the proposal and can be taken as representing the welfare they would gain. This approach assumes that people are not only capable of comparing the utility of the status quo with the utility of a proposed change, but are also able to estimate how much money they would be willing to spend in order to purchase the benefits that they, or their household, would derive from such a proposal. The greater the perceived net benefit of the proposal, the more respondents should be prepared to pay. Thus, a positive WTP bid is taken to represent the exchange of money for positive welfare benefits.

This overall approach has been termed the “purchase model” by Kahneman and colleagues (Kahneman and Ritov 1994; Kahneman, et al. 1993; Kahneman, Ritov and Schkade 1999). These psychologists have then put forward an alternative explanation of the motives underlying WTP responses which they label the “contribution model”. They assert this to be a psychologically more plausible interpretation. The contribution model portrays positive WTP bids as being motivated by a perception that the environmental proposal outlined by a CVM survey is a good cause that needs supporting (Kahneman and Ritov 1994). Respondents are deemed to be fully aware that any monetary amount that they personally offer will be insufficient to realise the type of social projects to which CVM is

applied (Kahneman and Ritov 1994; Kahneman, et al. 1993). The contribution model posits that the spirit of donation, rather than acquisition, is the primary motivation underling a positive WTP response. Instead of assessing the costs and benefits of outcomes, people are regarded as concerned with taking positive action to address a social problem. Respondents may even be willing to give more due to a belief that an action is "right" in comparison with those making a judgement based on consequences (Spash 2000, 2006). The contribution model clearly denies that a positive WTP is representative of the monetary value of the welfare benefits arising from an environmental improvement, and suggests that some people are willing to pay for social goods from which they expect to derive no personal utility.

Kahneman and Ritov (1994, p.7) state that "a favourable attitude to an object is usually correlated with favourable attitudes to actions that will protect that object from harm, or restore it if it has been harmed" and go on to suggest that a positive WTP bid represents a favourable attitude supporting a proposed societal change. The link between WTP and the concept of attitudes is so central to the contribution model that Kahneman and Ritov state their main substantive hypothesis "is that WTP is a measure of attitude on a scale of hypothetical dollars" (p.28). They draw upon Andreoni's (1989) warm glow hypothesis suggesting that "an individual who has a favourable attitude to a cause derives utility from contributing to it" (p.8). The contribution model therefore puts forward an "attitudinal hypothesis", positing that WTP is an attitudinal measure. Kahneman et al. (1999) further clarify this by stating that "attitudes can be expressed on a scale of dollars, as well as on rating scales" (p.207). This attitudinal hypothesis predicts that WTP responses will correlate with a range of attitude measures. The more positive an attitude towards an environmental change, the greater should be the stated WTP, although Kahneman et al. (1999) also argue that the WTP money scale is a psychometrically inefficient measure of attitudes.

This paper aims to test the relevance of the contribution model and the attitudinal hypothesis. In the next section we review the role of attitudes and the evidence for interpreting WTP as an attitudinal measure within a contribution framing. Two CVM study datasets are then presented and analysed.

II. THE CONTRIBUTION MODEL AND THE ATTITUDINAL HYPOTHESIS

The contribution model assumes that CVM measures attitudes towards a proposed environmental change. Attitudes are defined as being an evaluative tendency, which can be favourable or unfavourable (Eagly and Chaiken 1993). Psychologists clearly conceptually distinguished attitudes from other psychological variables. The theory of planned behaviour (TPB) identifies attitudes as being only one out of three main influences on behavioural intentions (Ajzen 1991, 2001). Subjective norms and perceived behavioural control are defined as being non-attitudinal psychological variables that are posited to independently influence behavioural intentions above and beyond the influence of attitudes. If these non-attitudinal psychological variables are found to have an independent and significant relationship with responses to WTP surveys, then this would suggest that WTP designs are measuring a broader psychological evaluation of a social proposal than an attitudinal assessment.

One of the strengths of the contribution model is that WTP responses are conceptualised as being mental representations rather than an objective economic assessment. Such a psychological approach makes sense of findings that are anomalies under the orthodox economic interpretations. For example, the psychological literature acknowledges that attitudinal scales can be extremely sensitive to context effects, such as framing and anchoring, while also being insensitive to seemingly vital information such as embedding effects (Fischhoff 1991; Payne, Bettman and Schkade 1999; Schwarz 2007; Schwarz and

Bohner 2001). Attitudes toward richly experienced 'objects', such as family members, one's own nation, and familiar environments, can be particularly vulnerable to context effects (Eagly and Chaiken 2007). This implies that responses to attitudinal scales assessing social projects can be heavily influenced by contextual factors related to the measurement design. Kahneman et al. (1999) argue that the nature of cognitive and evaluative processes make it unavoidable that CVM will be context dependent and this is not a result of defective procedures, nor will it be satisfactorily eliminated by changing survey design.

Evidence supporting the attitudinal hypothesis is primarily based upon three published journal articles that administered the headline method (Kahneman and Knetsch 1992; Kahneman and Ritov 1994; Kahneman, et al. 1993). The headline method asks participants to assess a list of solutions to public problems. While some of the participants assess the public problems on a WTP scale, other participants respond on an attitudinal scale. For each scale the list of solutions to public problems are ranked according to their mean or median scores. A rank correlation assessing the degree of similarity in the ordering of the public problems based on mean/median scores of attitude scale and WTP measure is then reported. As shown in Table 1, the headline method studies have reported some very strong rank correlations between WTP and a number of single item attitudinal scales. Kahneman et al. (1999) also note supporting results from an experimental study by Kahneman, Schade and Sunstein (1998) that employed the headline method to look at punitive damages in a product liability case. Furthermore, Payne et al. (1999) found high rank correlation between attitudinal measures and stated WTP using a similar design.

Kahneman and Ritov (1994) note the importance of investigating the mean scores of a specific proposal because many public decisions are based on aggregated data and average CVM scores are used by economists rather than individual scores. However, the literature presented in Table 1 also claims that the high rank correlations are indicative of a

psychological process operating at an individual level. Based on the rank correlations the authors have concluded that attitudinal scales and WTP are almost interchangeable measures of the same attitude, with the rank correlations being interpreted as representing "an idealised subject" or person (Kahneman et al. 1993).

TABLE 1
Reported Rank Correlations from Three Headline Method Studies

Study and Scale		Correlation with WTP
Kahneman and Knetsch (1992)		
Moral satisfaction (group 1)		0.78
Moral satisfaction (group 2)		0.62
Kahneman et al. (1993)		
Rating of political support for intervention		0.75
Rating of personal satisfaction expected from making a voluntary contribution of time or money to the intervention		0.79
Rating of how upsetting it would be to read the story announce by the headline or to watch the item on television		0.52
Rating of the importance of the problem		0.72
Kahneman and Ritov (1994)		
Rating of political support for intervention		
	WTP	0.84
	% WTP	0.82
	N (WTP)	0.81
Rating of personal satisfaction expected from making a voluntary contribution of time or money to the intervention		
	WTP	0.84
	% WTP	0.80
	N (WTP)	0.88
Rating of the importance of the problem		
	WTP	0.76
	% WTP	0.66
	N (WTP)	0.83

Notes:
%WTP = percentage of positive responses; N (WTP) = WTP response for each individual divided by the mean contribution from that individual

Nickerson (1995) has criticised such an approach, arguing that an intrinsically within-respondent hypothesis cannot be tested by correlation analysis based on means or medians, except in some special and restricted cases. A more appropriate hypothesis test would be to simultaneously collect attitudinal ratings and a WTP value from each respondent. Nickerson (1995) describes the headline study approach as an example of a subtle and insidious methodological problem known as "cross-level inference". This is defined as instances where data are organised or aggregated in one way, but the conclusions drawn from the analysis of those data assumes that the data are organised or aggregated in some other way. A good example of cross-level inference is the following quote by Kahneman et al. (1993): "our main finding was that correlations between the rankings of environmental issues by different response measures were high suggesting that the WTP to make a personal contribution of money, support for political action and a simple rating of the importance of the problem are almost interchangeable measures of the same attitude" (p.314). Nickerson (1995) demonstrates that there is no necessary mathematical relationship between the correlation of the group means and the mean within-respondent correlation.

Monin and Oppenheimer (2005) provide a simple example that demonstrates the dangers in mixing-up correlated averages with averaged correlations. Table 2 displays the scores of two judges who each rate four stimuli: a, b, c, d on two separate dimensions A and B. The within-respondent level proposed by Nickerson (1995) correlates the two dimensions for each of the judges and reports a strongly negative correlation ($r = -0.80$). In contrast an approach, analogous to the headline method, which correlates the rankings of mean scores for each of the four stimuli, reports a perfectly positive rank correlation ($r = +1.00$). While Monin and Oppenheimer's example of cross-level inference is extreme, the problem clearly exhibits that the onus of proof lies with Kahneman and colleagues to demonstrate that within-respondent correlations can be extrapolated from their rank correlations of the 'average' or

'idealized' respondent. Kahneman and Ritov (1994) comment that while they are aware that Nickerson considers cross-level inference to be a serious concern they do not. Kahneman et al. (1999) suggest that any major differences between rank correlations and within-respondent correlations will be due to the group scores being dominated by a few individuals. They point out that the headline studies assessed the effects of standardising the data of each individual and concluded that the data set did not contain atypical patterns of responses that would be indicative of individuals behaving inconsistently with the rank correlation conclusions. However, even if there are no worrisome outliers it is still possible that there are fundamental differences between how people respond to WTP scales and attitudinal measures.

TABLE 2
Disjunction between Rank and Within-Respondent Correlations

		Stimulus				
		a	b	c	d	
Judge 1	Dimension A	0	2	4	6	
	Dimension B	6	2	4	0	r = -0.80
Judge 2	Dimension A	6	2	4	0	
	Dimension B	0	2	4	6	r = -0.80
Mean scores	Dimension A	3	2	4	3	Rank = +1.00
	Dimension B	3	2	4	3	Within-respondent = -0.80

Source: Monin and Oppenheimer (2005)

Kahneman and colleagues argue that a WTP money scale is psychometrically a measure of attitudes, and a poor one. The 'headline studies' demonstrate the statistical inefficiency of the open-ended WTP scale by analysing: (i) the variance between the different issues that are presented, (ii) the variance associated with individual differences and (iii) the noise variance. A good scale should be able to differentiate between various issues, but should also have a low variance between individuals and a low noise variance. Kahneman et

al. (1993) and Kahneman and Ritov (1994) found the proportion of problem-related variance to be larger for the attitudinal scales, while the individual differences variance was much larger for the WTP scale. Based on this evidence they propose that attitudinal scales are statistically more efficient than the WTP scale. Kahneman and Ritov (1994) and Kahneman et al. (1999) claim that the poor properties of the WTP scale are due to: (i) a lack of common modulus[3] and (ii) the distribution of WTP responses.

Kahneman et al. (1999) suggests that the money scale does not provide participants with a common modulus leading to large differences between individuals as to how the money scale is interpreted. The modulus that each WTP participant uses are claimed to be arbitrary. Context effects in CVM questionnaire design is argued to lead not only to individual differences in the evaluation, but also to individual differences in the money expression of this evaluation. Attitudinal scales on the other hand are regarded as being bounded, psychologically meaningful, response scales. Kahneman et al. (1999) suggest that most people have an intuitive and common understanding of the meaning of the attitudinal response scales administered by psychologists. For example, most people would have a basic agreement on the difference between "extremely important", "very important", "moderately important", "not very important" and "not important". Survey participants are argued to share a common definition as to what constitutes a certain response range. Kahneman and Ritov (1994) suggest that as a result attitudinal measures should replace WTP questions when the goal is to assess the value of social proposals. They suggest that a money value could be assigned to an attitudinal score based on a reference to a standard scale of attitude scores.

Kahneman et al. (1999) also point out that most open-ended WTP distributions have a large positive skew that degrades the statistical efficiency of the scale. They comment that

[3] A common modulus refers to the scale being formally standardised for all participants. This term is borrowed from the field of psychophysics, which is where Kahneman begun his research career. Psychophysicists are interested in how an individual experiences a sensation (e.g. the intensity of a sound). Common practise in psychophysics experiments is to administer participants with a specific standard stimulus (the modulus) and then asked them to assess other stimuli relative to the standard stimuli.

logarithmic transformations improve the statistical efficiency of the money scale. An explanation as to why open-ended WTP scales are positively skewed is that the coins and notes of monetary systems increase exponentially. For example, the UK has four denominations of exponentially increasing pound notes in circulation: £5, £10, £20, £50. Because people are not accustomed to thinking about many environmental proposals in terms of monetary value, the monetary expressions of value may encourage a WTP response that reflects the standardised currency amounts. Studies have found that such WTP estimates are significantly over-represented amongst valuations elicited from the general population (Whynes, et al. 2007; Whynes, Philips and Frew 2005). This suggests that rather than responding on an arbitrary continuous scale, as proposed by Kahneman et al. (1999), many participants may only consider a WTP valuation that is based upon a handful of numbers. Hertwig, Hoffrage and Martignon (1999) argue people are unable to make valuations based on the full continuum of a money scale and therefore rely on a few numbers. If denominations from the monetary system are over-represented in WTP response distributions, this would suggest a lack of variation in how people interpret the money scale rather than a large arbitrary variation (as suggested by Kahneman and colleagues). However, such a finding would also provide strong evidence, for the primary hypothesis of the contribution model, that positive WTP bids are offered in the spirit of a donation rather than an acquisition.

The headline studies only empirically examine the rank correlation between attitude pertaining to a specific proposal and WTP. If participants are offering WTP based on contributory motives then there should also be a strong positive relationship between WTP and general attitudes towards environmental protection. A strong correlation between WTP measures and environmental protection attitudes would provide additional support to the hypothesis that WTP represent a contribution for a good cause rather than for the specific

costs and benefits associated with the proposal. There are several scales that are able to measure attitudes about environmental protection. For example, the Beliefs about the Benefits of Environmental Protection (BBEP) scale which is a statistically superior interpretation of the awareness of consequence scale (Ryan and Spash 2008) assesses whether the respondent believes that environmental protection is beneficial (e.g. "Environmental protection will provide a better world for me and my children") or whether a lack of action to protect the environment has costs (e.g. "Pollution generated here harms people all over the earth"). An alternative attitudinal measure of environmental protection is the Political Action (PA) scale (Stern, Dietz and Kalof 1993). The PA scale asks participants whether they would partake in political action supporting various environmental causes (demonstrating, signing a petition, refusing a job at a company harming the environment, volunteering to work for nature conservation). If specific attitudes regarding a CVM proposal and environmental protection attitudes are found to positively correlate with WTP, then this would support the hypothesis that positive WTP bids are motivated by general contributory and political motives rather than representing an assessment of the specific economic benefits to be derived from the proposal.

III. RESEARCH DESIGN AND METHOD

The current study investigates the attitudinal hypothesis by means of a within-respondent design, investigating datasets from two different CVM surveys. Participants in each of the CVM studies were administered a WTP question and attitudinal scales. One of the administered scales measured specific attitudes about an environmental change proposal, while the other scale measured attitudes about environmental protection. In each study participants were presented with a single proposal. Therefore, unlike the headline method studies, conclusion are not based upon the hypothesis of process continuity which proposes

errors and biases affecting quick intuitive judgements should also affect more slowly formed judgements (Kahneman and Ritov 1994). Data was collected from representative samples without monetary incentives to participate, unlike some of the headline method studies. Finally, rather than measuring attitudes with a single item, multi-item attitudinal scales were administered. The methodology and sample used are therefore better suited to investigating the attitudinal hypothesis than the headline method studies.

The attitudinal hypothesis is tested by examining whether there is a strong within-respondent relationship between attitudinal scales and WTP. Kahneman and Ritov (1994), noting the findings by McFadden and Leonard (1992), point out that the propensity to make positive contributions and the size of these contributions may be essentially independent characteristics of respondents. We therefore decided to separately investigate whether attitudinal measures are able to predict: (i) the two bid type classifications of zero and positive and (ii) the amount offered by positive bidders.

In addition, we aim to analyse whether the psychologists' definition of attitudes, as an evaluative tendency which can be favourable or unfavourable, is broad enough to be able to adequately define WTP as an attitudinal scale. The contention here is that there is more to WTP responses than purely an attitudinal measure. We therefore employ factors from the TPB, as discussed in Section 2, which represent non-attitudinal psychological variables. Two aspects of the TPB are then added, namely, subjective norms and perceived behavioural control.

Two datasets were collected from two different CVM surveys designed to measure two different environmental proposals which were actually being considered by community planners. In both surveys the data was collected by a market research company employing a stratified random sampling procedure. Market research representatives recruited participants by door-knocking designated locations. Each market research representative verbally

administered consenting participants a face-to-face interview which initially involved the presentation of a case study scenario that outlined an environmental proposal in need of funding. The final versions of the survey were based upon pretesting and stakeholder consultation.

Study 1 overview: 713 UK residents were recruited for Study 1. Participants were asked to consider a proposal regarding the possible purchase by an existing regional charity of a one square mile site in Eastern England currently used for crop farming. The charity was interested in transforming the site into a wetland to provide sanctuary for rare species of birds such as Bewick's swan, the pintail, and gadwall. A request was made for a one-off payment to a charitable trust. The focus on the behaviour of participants willingness to respond to the monetary scale meant 218 participants were excluded because they either chose the 'don't know' option or refused to provide a response to the WTP question. 495 participants were classified as giving a WTP bid (207 positive bids and 288 zero bids). Study 1 also administered two environment protection attitudinal measures which were responded to on a 4-point scale. The two environmental protection attitudinal measures were the PA scale and the BBEP scale (see Appendix). The PA scale reported a Cronbach α of 0.65. The BBEP scale reported a Cronbach's α of 0.83.

Study 2 overview: 1069 Scottish residents were recruited to participate in a CVM survey assessing a proposal for the Tummel catchment region in Scotland. The introduction of a compensation flow regime from the dammed lochs to mimic the natural flow in some of the rivers within the catchment was being considered. The aim of the proposal was to restore the diversity and abundance of species and habitats in the river catchment. Increasing river flows from the hydro-system would potentially reduce electricity generation and increase costs for the hydro-power companies. Such costs would then be transferred to electricity consumers. The payment question asked participants their maximum additional WTP each

quarter on electricity bills over the next year to restore biodiversity in the river Tummel and its surrounding area from 14% to 70%. 336 participants were excluded answering 'don't know' or refusing to respond to the WTP question. 733 participants were classified as WTP bidders (322 positive bidders and 411 zero bidders).

In Study 2, participants were administered two attitude scales. The first was the BBEP scale administered in Study 1. The BBEP scale for Study 2 was answered on a 7-point scale and reported a Cronbach's $\alpha = 0.88$. The second assessed specific attitudes about the benefits arising from paying more for electricity in order to fund the Tummel catchment scheme and the likelihood of such benefits. This scale was designed according to TPB considerations (Ajzen 2006) and asked seven paired items (see Appendix). One of the paired items asked participants to assess whether a proposed outcome for the project is good or bad (e.g. "Enhancing water quality in the Tummel area is [1=extremely bad; 7=extremely good]"). The other paired item asked participants to assess the likelihood of the proposed outcome (e.g. "Paying more for electricity to restore biodiversity will enhance water quality in the Tummel area [1=extremely likely; 7=extremely unlikely]"). The attitude score for each item pair was based on a product score. The TPB attitude scale reported a Cronbach's α of 0.88.

Participants were also asked paired TPB subjective norm items, which were based on assessing beliefs about the expectations of significant others (see appendices for items). One of the paired items asked if the significant other expected them to offer a positive WTP bid (e.g. "My friends would think that I [1=should; 7=should not] pay more for electricity to preserve biodiversity in the Tummel area"). The other paired item asked the degree to which the respondent felt pressured by the significant other (e.g. "Generally speaking, how much do you want to do what your friends think you should do?"). The subjective norm score for each item pair was based on a product score. The TPB subjective norm scale reported a

Cronbach's α of 0.73. A large portion of the study did not have children, a partner or parent who was alive. A decision was made to average out the questions that were answered. If a participant answered only 4 pairs of questions, their total score was divided by 4. If only 3 pairs were answered the total score was divided by 3. Twenty participants who answered only 2 or less pairs of items were treated as missing data. Participants were also asked a perceived behavioural control (PBC) item about their ability to pay ("I can easily afford to pay more for my electricity") on a 7-point scale.

IV. RESULTS

Both surveys administered an open-ended WTP question. As is usually the case, the WTP distributions for Study 1 and Study 2 demonstrated a large positive skew. To improve the normality of the distribution, positive bids were transformed using the log (WTP+1) formula, which resulted in the LNWTP variable. Table 3 displays the summary statistics for the PA scale, the TPB scale, the BBEP scale and WTP responses.

TABLE 3
Summary Statistics

	N	Mean	Standard Deviation	Min	Max	Skewness Statistic	Skewness Standard Deviation
Study 1							
PA scale	441	2.79	0.49	1.0	4.0	0.13	0.12
BBEP scale	450	3.25	0.40	1.6	4.0	-0.18	0.12
Positive LNWTP	207	2.36	0.89	0.7	5.3	0.51	0.18
Bid decision (+ve=1)	495	0.42	0.49	0.0	1.0		
Study 2							
BBEP scale	730	5.69	0.99	2.2	7.0	-0.44	0.10
TPB Attitude scale	719	24.35	10.39	3.0	49.0	0.42	0.09
TPB Norm scale	713	40.60	13.58	1.0	49.0	0.46	0.09
TPB PBC item	731	4.21	1.78	1.0	7.0	-0.02	0.09
Positive LNWTP	322	2.35	0.88	14.0	5.7	0.34	0.14
Bid decision (+ve=1)	733	0.44	0.50	0.0	1.0		

Table 4 displays the correlations between the psychological scales and the three indicators of WTP. Notably, the correlation between positive LNWTP and the attitude scales were not found to be high. Two of these correlations were significant at a .05 level only, while the other two correlations were not significant. For the non-attitudinal scales, positive LNWTP had a significant relationship with ability to pay at a .05 level only, and did not have a significant relationship with perceived norms. At the same time, the results present in Table 4 clearly indicate that attitudinal scales had a strong relationship with the dichotomous "zero or positive bid" variable, while also demonstrating that the "zero or positive bid" variable had a highly significant correlation with ability to pay and perceived norms.

TABLE 4
Correlations between Indicators of WTP and Psychological Scales

	WTP Zero/Positive[1]	Positive LNWTP
Study 1		
BBEP Scale	0.34** (N= 450)	0.01 (N=198)
PA Scale	0.39** (N=441)	0.15* (N=188)
Study 2		
BBEP Scale	0.44** (N= 730)	0.12* (N=321)
TPB Attitude Scale	0.54** (N=719)	0.09* (N=314)
TPB Norm Scale	0.34** (N= 713)	-0.01 (N=310)
TPB PBC Scale	0.36** (N=731)	0.12* (N=321)

Notes:
[1] Point biserial correlation
* Significant at the 0.05 level (2-tailed)
** Significant at the 0.01 level (2-tailed)

A logistic regression was run to test the influence of psychological variables in predicting WTP bid type (positive or zero). Table 5 displays the results of the logistic

regression for Study 1 and 2. In both cases, all of the psychological scales (attitudinal and non-attitudinal) were found to have a highly significant and independent contribution to predicting whether participants offer a positive or a zero bid. The Nagelkerke R^2 and χ^2 suggests a good model fit for a logistic regression based on only attitudinal measures (Study 1), and an even better model fit for a logistic regression based on combined psychological variables, which included attitudinal and non-attitudinal measures.

TABLE 5
Logistic Regression of WTP Bid Type on Psychological Scales

	B	SE B	e^B
Study 1[1]			
Constant	-8.05**	1.07	0.00
BBEP Scale	1.22**	0.34	3.38
PA Scale	1.37**	0.30	3.92
Study 2[2]			
Constant	-8.14**	0.70	0.00
BBEP Scale	0.73**	0.15	2.01
TPB Attitude Scale	0.09**	0.01	1.10
TPB Norm Scale	0.08**	0.02	1.08
TPB PBC Item	0.36**	0.06	1.43

Notes:
** Significant at the 0.01 level (2-tailed)
[1] N = 410; χ^2 (2) = 79.67; Nagelkerke R^2 = 0.24
[2] N = 701; χ^2 (2) = 324.68; Nagelkerke R^2 = 0.50

An Ordinary Least Squares (OLS) regression was run to analyse the influence of attitudes to LNWTP for the positive bids, as shown in Table 6. The overall model for Study 1 was not found to be significant, F (2,180) = 2.43, $p > 0.05$. The overall model for Study 2 was significant at a 0.05 level, F (2,299) = 3.24, $p < 0.05$, but not at a 0.01 level. The Adjusted R^2 for both models is extremely low, suggesting that attitudinal scales cannot be used to explain a significant portion of variance in the amount offered by positive bidders.

TABLE 6
OLS Regression of Positive LNWTP on Psychological Scales

	B	SE B	t-Ratio
Study 1[1]			
Constant	1.95**	0.61	3.17
BBEP Scale	-0.20	0.20	-0.97
PA Scale	0.37	0.17	2.20
Study 2[2]			
Constant	1.12**	0.41	2.75
BBEP Scale	0.22*	0.09	2.39
TPB Attitude Scale	0.01	0.01	0.20
TPB Norm Scale	-0.01	0.01	-1.04
TPB PBC Item	0.06	0.03	1.98

Notes:
** Significant at the 0.01 level (2-tailed)
[1] N = 182; R = 0.16; R^2 = 0.03; Adjusted R^2 = 0.01
[2] N = 303; R = 0.20; R^2 = 0.04; Adjusted R^2 = 0.03

The weak correlations between attitudinal measures and WTP for positive bidders supports the hypothesis that the monetary scale is a psychometrically poor measure. The next question is: how sensitive are people to the monetary scale? Table 7 displays the percentage of responses that correspond with a currency value. 84% of the positive bidding participants in Study 1 offered a contribution that had a corresponding currency value. A χ^2 test found that significantly more participants presented numbers that corresponded to a currency than expected by chance, χ^2 (1)=96.04, $\underline{p}$<0.001. Furthermore, 64% provided a £5 or £10 estimate. A χ^2 test found that significantly more participants offered a £5 or £10 than any other numerical option on the continuous money scale, χ^2 (1)=14.61, $\underline{p}$<0.001.

In Study 2 a total of 67% of the positive bidding sample offered a currency based WTP estimate. A χ^2 test found that significantly more participants used currency based numbers compared to any other numerical option, χ^2 (1)=38.96, $\underline{p}$<0.001. In this case 48% offered either a £5 or a £10 WTP bid. However, a χ^2 test found that there was no significant

difference in the number of participants providing a £5 or £10 than any other positive bid number, $\chi^2(1)=0.45$, $p>0.05$.

TABLE 7
Responses Relative to Currency Denominations

	Bid Category (£)										
	<1	**1**	>1<5	**5**	>5<10	**10**	>10<20	**20**	>20<50	**50**	>50
Study 1 (%)	0	**4**	5	**34**	1	**30**	1	**10**	4	**6**	4
Study 2[1] (%)	1	**3**	13	**18**	2	**30**	6	**13**	8	**3**	4

Notes:
[1] Adds to 101 due to rounding error

V. DISCUSSION AND CONCLUSIONS

We believe that the methodological designs of the studies reported here are more appropriate to examining the attitudinal hypothesis than the headline method. Standard CVM design was employed in these studies which were applied to positive environmental change scenarios. The surveys investigated two different topics (converting farmland to a wetland and increasing in-stream flows from hydro dam regulation) and had two different payment mechanisms (a single individual contribution and an increase in electricity bills). These studies were also administered to different populations. That consistent patterns were found across two very different studies also adds to the robustness of the results.

The results partially support the attitudinal hypothesis. Notably there was a strong relationship between attitude scales and the type of bid offered (positive or zero bid). However non-attitudinal variables from the TPB were also administered. The significant of these non-attitudinal variables suggests that the choice between offering a zero or positive bid represents a more general psychological evaluation than being just an expression of attitude. Kahneman and colleagues have noted that a benefit of the attitudinal hypothesis is the

reliance upon a concept, namely attitudes, which has a considerably broader range of application than the standard concept of economic preferences. However, conceptualising WTP as an attitudinal measure appears an inadequate explanation. Other non-attitudinal psychological variables appear to enhance prediction of whether a zero or positive WTP is offered. As all general psychological evaluations are presumed to be constructed, this would still suggest that respondents' choice of WTP bid will be heavily influenced by contextual effects which are not the result of defective methodological procedures.

The weak or insignificant relationship between attitudinal scales and the amount offered by positive bidders suggests that the money scale is not a sensitive measure of attitudes, supporting the argument by Kahneman and colleagues that this is a psychometrically inferior measure. Although the money scale is technically a continuous variable bounded by a zero, the majority of positive bidding participants in both CVM studies offered a standard currency amount, which suggests they were treating the open-ended money scale as a categorical scale rather than a continuous scale. The finding that a large portion of participants offered either £5 or £10 is incompatible with the suggestion that the absence of a guiding modulus, attached to the money scale, leads to large arbitrary individualistic interpretations. If responses to the monetary scale are insensitive then economists should question the ability of respondents to be able to perform an economic trade-off to the point of indifference. The large portion of standardised bids suggests that the money scale is too blunt a measure to account for variance in the welfare benefits of an environmental proposal. This finding does, however, provide strong support for the main substantive hypothesis of Kahneman and colleagues that WTP respondents are offering a standardised bid compatible with a general contribution.

While the majority of positive bidders demonstrated an extreme lack of sensitivity, a minority of positive bidders (18% in Study 1 and 33% in Study 2) provided bids that were

more sensitive as they did not reflect a standard currency amount. These participants may be offering WTP bids based on economic rather than contributory motives. That is, the contribution model may validly describe the behaviour of some CVM participants, while the economic purchase model may validly describe the behaviour of other participants. This suggests fundamental individual differences in how participants respond to the money scale.

Understanding more about the strengths and limitations of WTP scales can help guide decision makers in how to assess community perceptions regarding social proposals. There are a number of practical implications of the current study. First, the findings are consistent with many people struggling to convert their environmental values into a monetary amount. Thus money appears to be a poor scale for summarising environmental values. Second, as the choice of a WTP bid is based on a general psychological appraisal, rather than just an attitudinal assessment, using a procedure to obtain a monetary value from attitudinal scales, as proposed by Kahneman and colleagues, seems inappropriate. Such an approach ignores non-attitudinal factors. Converting attitude scores to a money amount based on a standardised procedure would be as blunt an approach to economic valuation as the current CVM approach. Understanding how people perceive social and environmental changes involves more than can be obtained from an attitude scale or a CVM money scale. Thus, interdisciplinary research on economics and psychology reveals that neither discipline alone has the ability to offer a full picture of human behaviour in the context of environmental valuation. This suggests looking to methodologies able to provide a broader context and meaning to environmental values (e.g., non-aggregated social multi-criteria analysis or forms of deliberative monetary valuation). The approaches needed must supply a more descriptively rich summary of how a community perceives an environmental proposal than the approaches so far on offer which rely upon aggregating attitudinal scores or intentions to pay money.

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APPENDICES

PA Scale

Item 1: I would participate in a demonstration against companies that are harming the environment
Item 3: I would sign a petition in support of tougher environmental laws
Item 4: I would take a job with a company I knew was harming the environment
Item 5: I would never do voluntary work for nature conservation
Item 6: Environmental activists are a public nuisance whom I would never support

BBEP Scale

Item 1: Environmental protection will provide a better world for me and my children
Item 2: Environmental protection is beneficial to my health
Item 3: A clean environment provides me with better opportunities for recreation
Item 4: Environmental protection benefits everyone
Item 5: Environmental protection will help people have a better quality of life
Item 6: Tropical rain forests are essential to maintain a healthy planet earth
Item 7: The effect of pollution on public health are worse than we realise
Item 8: Pollution generated here harms people all over the earth
Item 9: Over the next several decades, thousands of species will become extinct

TPB Attitude scale

1a. Paying more for electricity to restore biodiversity will increase the diversity and abundance of plant and animal species in the Tummel area (1 = extremely likely; 7 = extremely unlikely).
1b. Increasing the diversity and abundance of plant and animal species in the Tummel area is (1 = extremely bad; 7 = extremely good).
2a. Paying more for electricity to restore biodiversity will increase genetic diversity in the Tummel area (1 = extremely likely; 7 = extremely unlikely).
2b. Restoring genetic diversity in the Tummel area is (1 = extremely bad; 7 = extremely good).
3a. Paying more for electricity to restore biodiversity will increase river flows in the Tummel area (1 = extremely likely; 7 = extremely unlikely).
3b. Increasing river flows in the Tummel area is (1 = extremely bad; 7 = extremely good).
4a. Paying more for electricity to restore biodiversity will help restore the web of life in the Tummel area (1 = extremely likely; 7 = extremely unlikely).
4b. Restoring the web of life in the Tummel area is (1 = extremely bad; 7 = extremely good).
5a. Paying more for electricity to restore biodiversity will enhance water quality in the Tummel area (1 = extremely likely; 7 = extremely unlikely).
5b. Enhancing water quality in the Tummel area is (1 = extremely bad; 7 = extremely good).
6a. Paying more for electricity to restore biodiversity will teach people to think more about the environmental impacts of industry (1 = extremely likely; 7 = extremely unlikely).
6b. Teaching people to think more about the environmental impact of industry is (1 = extremely bad; 7 = extremely good).
7a. Paying more for electricity to preserve biodiversity will restore the Tummel area to its natural state (1 = extremely likely; 7 = extremely unlikely).
7b. Restoring the Tummel area to its natural state is (1 = extremely bad; 7 = extremely good).

TPB Subjective Norm Scale

1a. My spouse/partner would think that I (1 = should; 7 = should not) pay more for electricity to preserve biodiversity in the Tummel area.
1b Generally speaking, how much do you want to do what your spouse/partner thinks you should do?
2a. My work colleagues would think that I (1 = should; 7 = should not) pay more for electricity to preserve biodiversity in the Tummel area.
2b Generally speaking, how much do you want to do what your work colleagues think you should do?
3a My children would think that I (1 = should; 7 = should not) pay more for electricity to preserve biodiversity in the Tummel area.
3b Generally speaking, how much do you want to do what your children think you should do?
4a My parents would think that I (1 = should; 7 = should not) pay more for electricity to preserve biodiversity in the Tummel area.
4b Generally speaking, how much do you want to do what your parents think you should do?
5a My friends would think that I (1 = should; 7 = should not) pay more for electricity to preserve biodiversity in the Tummel area.
5b Generally speaking, how much do you want to do what your friends think you should do?