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Differences between Decision and Experienced Utility: An Investigation using the Choice Experiment method.

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Abstract

Recent work by Kahneman and others has led to a new focus in economics on a wellbeing-based approach to utility. This suggests that 'experienced utility' is an alternative and more appropriate basis for the measurement of economic value compared with 'decision utility'. In this paper, we apply the choice experiment technique to the valuation of changes in upland landscapes in the UK, in order to identify if experience in the moment or in memory impacts on the value associated with changes in ecosystem services under different management regimes. Four treatments are employed to measure decision utility, experienced utility, and remembered utility at two different time intervals. We show that our experienced utility treatment generates very different estimates of preferences than any of the other treatments. Whilst measurement of experienced utility is rife with difficulties, the approach taken allowed the identification of experiential impacts on utility and may have implications for the future use of experienced utility as a basis for the valuation of public goods.

Keywords: experienced utility; cost-benefit analysis; choice experiments; public goods; national parks.

JEL codes: B10, D61,Q51

1. Decision Utility, Experienced Utility and Remembered Utility

In recent years, Kahneman and others have called for the Benthamite (Bentham, 1789) approach to utility to become central to economics again. Kahneman and Sugden (2005) note that early nineteenth century economics employed a concept of hedonic utility based on an absolute measure of pleasure and pain. Bentham argued that utility, which he identified as the amount of pleasure or pain associated with an event, was quantifiable and additive. He related levels of utility to the drivers of probability, intensity, duration and extent. Edgeworth (1879) referred to absolute measures of pleasure and pain from which overall happiness measures should be calculated over some time period. The idea of utility as a momentary measure of hedonic experience has become referred to as *experienced utility.* However, as Kahneman and Sugden (2005) point out, economics retreated from this concept of utility around the beginning of the 20th century. Neo-classical economists argued that utility could only be measured by backward induction from observed behaviour (the notion of revealed preference). Marshall (1920) stated that quantification of desires or their outcomes was impossible (Book 3, Chapter 3, Paragraph 2). Utility became viewed as something which indexed the preferences of individuals and explained how they chose (thus the term *decision utility*) which could be interpreted in a positive manner, in contrast to the normative concept of experienced utility.

Based on insights from behavioural economics and psychology, Kahneman and others have argued, that this (now traditional) Marshallian approach to utility is flawed, and that a return to the ideology of Bentham could solve problems of relying on an idea of decision utility which is not supported by observed behaviour (Kahneman, Sarin and Wakker, 1997) . Examples of literature which make this argument include Bateman et al 2000, Tversky, Sattath and Slovic 2000, Kahneman 2003, Kahneman and Sugden 2005, Loomes 2006 and Beshears et al 2008. Kahneman and others' normative approach to the consideration of utility is that "instant utility" gives an absolute measure of the utility (pleasure or pain) we are experiencing at any moment. A summation of instant utility gives us a measure of 'experienced utility' for a given period

of time. Either concept may be measured in a number of ways, including the experience sampling method (Stone et al, 1999), and the day reconstruction method (Kahneman et al, 2004). A movement back to experienced utility as a basis for economics is called for, so the argument goes,since anomalies in individual behaviour mean that the idea of individual rationality within a decision utility context becomes a shaky foundation on which to build public policy analysis through, for example, the use of stated preference methods (Hanley and Shogren, 2005). Robson and Samuelson (2010) have recently argued that the dichotomy between decision and experienced utility has emerged due to evolutionary pressures in that "..evolution systematically misleads the agent as to the future implications of his choices" (p.2), due to people's inherent inability to correctly choose between rather similar alternatives. Such an analysis takes the distinction between experienced and decision utility as self-evident.

However, most economic analysis of the past 100 years has made use of the concept of decision utility (Kahneman and Sugden, 2005). For decision utility and experienced utility measures to be equivalent, individuals must be affective forecasters, accurately predicting the consequences of their actions in terms of the consequences for their well-being. A growing body of research would suggest this is not the case (Gilbert and Ebert 2002 and Gilbert et al 2004). For example, Dunn et al (2003) find errors in how much happier students think they will be if they succeed in their preferred choice of university accommodation. Reasons for divergence between predicted well-being and actual well-being (once experienced) include a failure of affective forecasting (the ability of people to correctly anticipate the consequences of events on their well-being in future states), adaptation to changes over time in the absolute level of consumption, and focussing effects.

Kahneman and Sugden (2005) suggest that experienced utility may be a more appropriate measure upon which to base economic policy evaluation than the standard economic concept of decision utility, since the problems of affective forecasting means that peoples' ex ante choices or preferences may be biased

indicators of actual well-being . They, however, accept that the measurement of experienced utility is difficult. Moreover, based on findings reported in Dunn et al (2003), we might expect the relationships between variables thought to determine the satisfaction of certain outcomes and a measure of such satisfaction or well-being to differ according to whether people are making predictions about how a particular choice will impact on their well-being in the future, relative to how a choice actually impacts on their well-being as measured at the moment of consumption. Dunn et al (2003) found that the factors explaining predicted happiness from choice of housing were different to those explaining variations in actual reported happiness after housing had been allocated.

The idea of adaptation of self-assessed well-being to change was first proposed by Helson (1964) and Scitovsky (1976). An alternative view point with similar implications is that of projection bias (Loewenstein et al 2003). In summary the issue is that the overall satisfaction individuals anticipate from a particular outcome or situation tends not to equate to the final satisfaction they report once a change has occurred. For instance, individuals get used to a new situation (such as higher disposable income), and factor this into their measures of well-being. Well-being increases due to rising incomes, for example, are thus temporary. This has been referred to as the Hedonic Treadmill (Brickman and Campbell, 1971). However, not all goods or experiences are susceptible to similar degrees of adaptation. Scitovsky (1967) identified two types of goods, *pleasures and comforts.* Pleasures are goods to which individuals do not adapt, the suggestion being that consumption should concentrate on pleasures (i.e. goods to which one will not adapt) as buying comforts is a waste of money. Of particular relevance to this paper is the observation by Kahneman and Sugden (2005) that it is unlikely that individuals adapt to beautiful landscapes, which may suggest that household expenditure on non market environmental resources is a valuable way to increase utility.

A second issue concerns possible differences between momentary measures of well-being (experienced utility) and remembered levels of well-being. Redelmeier and Kahneman (1996) identified that there was a

benefit associated with extending the length of colonoscopies since a period of lesser discomfort at the end of the treatment increased patients' willingness to undergo additional treatments. This was explained by individuals placing additional emphasis on the last moments of an experience when that experience is remembered, rather than on average or cumulative measures of experience. Work on pleasurable experiences reported in Do et al (2008) suggest that intensity of pleasure is more important than length of experience, and that addition of less positive (but still positive) experience could reduce overall utility even if it increased total worth of the experience. Given these factors, it is likely that experienced utility will vary according to when it is measured – that, for example, willingness to pay for a particular change in a public good will depend on how much time passes between experience of that public good, and statement of willingness to pay.

The above arguments suggest that measures of welfare (in our case, willingness to pay) based on experienced utility should differ from those based on decision utility, and that welfare measures elicited at the "moment of consumption" will differ from those elicited based on the memory of that experience. In this paper, we compare decision utility-based measures of economic value for upland landscapes with a number of measures of value based on experienced utility, including "moment of consumption" and "remembered" measures of willingness to pay. Our interest is in whether decision utility-based measures are equivalent to experienced utility based measures, and also in how these experienced-based measures evolve over time.

2. **Study Area and Experimental Design**

We designed and implemented a stated preference Choice Experiment in the Peak District National Park, England[1]. The Choice Experiment method was chosen since we wished to obtain estimates of willingness to

[1] For detail on the choice experiment method, see Hensher et al, 2005.

pay for prospective changes in a public good – landscape and its associated biodiversity – in three contexts: decision utility, experienced utility, and remembered utility. A stated preference approach was appropriate since we anticipated that willingness to pay for changes in landscape and biodiversity would partly be motivated by non-use values, meaning that a revealed preference approach was inappropriate.

The Peak District National Park lies within an hour's drive of one third of the UK's population, and is the most heavily visited National Park in the UK. A particular focus for this research was the impacts of land management change on landscape and biodiversity values of the area. The land use on which we focussed was livestock farming, a dominant land use in the area (Dallimer et al, 2009). Management intensity changes can impact upon other ecosystem functions, in particular water quality, flood protection and revenues from consumptive recreational use such as grouse hunting. However, these were not included in the experimental design. We focussed on the values of changes in ecosystems to individuals living near, but not within, the National Park itself (for reasons that will become apparent). The choice experiments were applied through a valuation workshop approach (Alvarez-Farizo and Hanley, 2006) with three locations being chosen for sampling as representative of the local area. Valuation workshops were employed due to the need to sample the same individuals at three points in time, the complexity of the public good in question, and the extent of information on the implications of management change for this public good which needed to be conveyed to respondents.

Individuals were chosen who lived relatively close to the workshop locations through mail shots, telephone calls, leaflet drops and advertisements in local shops. The choice of locations was constrained by the need to be close to a site in the National Park which contained landscapes representative of the management intensities being considered. The communities chosen for recruiting participants were Stannington, a large village on the outskirts of Sheffield; Stocksbridge, a former steel and mining town; and Penistone, a market town. The site chosen for the second experimental treatment (experienced utility) was on the Strines Moor

Road, selected as it gave views of all relevant representative land management regimes. Participants were paid £25 for participation in the first workshop and £50 for participation in a second workshop. In total 52 participants took part. Workshops were run in October 2007 and January 2008.

It was necessary to ask participants to complete a large number of choice cards. However, respondent fatigue[2] was identified as a possibility and participants were encouraged throughout to consider carefully every choice they were making. From observations at the time of the experiment it was clear that most if not all of the participants were paying attention to each choice and referencing the additional material provided at regular intervals. As each of the experiments contained 16 choice cards, this gave in the region of 832 choices for each experiment[3].

The choice experiment was developed with colleagues from the Department of Animal and Plant Sciences Sheffield University who provided inputs on the likely impacts of management change on the Peak District National Park. This information was based upon data collected and experience developed through a wider project investigating the likely impacts of changes to agri-environmental schemes on management practices and the resultant impacts on bird diversity. In order to design the experiment a series of focus groups were organised, as well as a pilot study. All policies under consideration were changes to agri-environmental schemes to reduce or increase management intensity, but not to abandon farmland. In relation to biodiversity, impacts respondents were told that less intensive management would lead to a greater variety of habitats and species. It was made clear to participants that more species did not mean a greater number of total birds, or any greater chance of seeing birds.

[2] Risk of invalid response due to excessive demands being placed upon the research participants.

[3] All respondents answered to all choice cards in the first three experiment, and we only missed few observations due to mistakes in filling the survey . In the fourth experiment (remembered utility), held four months later after the first, only the 82% of respondents came back and carried out the experiment (see table 2 for the exact number of observations in each experiment).

2.1 Choice Experiment attributes

The choice experiment design included five attributes: intensity of management in three habitat areas - moorland, moorland fringe and valley bottom farmland; footpath network quality; and annual household tax increases. These attributes were explained to respondents at the start of Treatment 1. Each landscape attribute (moorland, moorland fringe, farmland) was matched with a number of representative bird species to represent likely impacts of management on biodiversity, as detailed below. Photographs of each landscape type were shown to respondents in Treatment 1 (see below).

Moorland management intensity was set at three possible levels (*More Intensive*, *No change in Intensity, Less Intensive*). The intensity of management on the moorland areas currently varies across the national park. More intensive moorland management was represented by increased numbers of sheep and moorland burning. Burning of moorland encourages young shoots to grow which also leads to increased numbers of grouse for shooting. Less intensive management was depicted as having the opposite impacts. Representative moorland bird species selected to be shown to respondents in the survey materials were: the golden plover (Pluvialis apricaria), merlin (Falco columbarius), dunlin (Calidris alpine) and short eared owl (Asio flammeus).

Moorland Fringe Management Intensity – this also took three levels (*More Intensive, No change in Intensity, Less Intensive*). More intensively managed moorland fringe can become resemblant of farmland, with sufficient fertiliser input producing lush green fields, additionally increased sheep numbers would be present. Less intensive management leads to more scrubby appearance with occasional shrub-like plants. The moorland fringe area is relatively important for biodiversity since it is a transitional zone providing resources to both moorland and farmland species in addition to habitat specific and generalist species. Representative moorland fringe bird species used were: the reed bunting (Emberiza schoeniclus), stone chat (Saxicola torquata), wheatear (Oenanthe oenanthe) and lapwing (Vanellus vanellus).

Valley Bottom Farmland Management Intensity – three levels were again used (*More Intensive, No change in Intensity, Less Intensive*). These valley bottom farmlands in the Peaks are the "traditional" green fields of the English countryside, found in the Peak District at lower altitudes bordered by dry stone walls. More intensive management results in greener fields with more sheep, with less intensive management having the opposite impact. It was made clear that field boundaries and buildings would continue to be maintained whatever the management regime adopted. Representative bird species used were the yellow hammer (Emberiza citrinella), linnet (Carduelis cannabina), redstart (Phoenicurus phoenicurus) and pied flycatcher (Ficedula hypoleuca).

Footpath Network Quality – three levels (*Improved, No change, Degraded*). The quality of the footpath network with a degraded state was represented by an increase in the length of footpaths with more degraded sections (eroded and muddy) and an improvement represented by an increase in the number of paths managed to prevent degradation.

Tax – six levels selected based on average council tax in the areas, shown as additional tax burden to the household per year.

A business as usual baseline based upon likely future landscape change was included in the design. Estimates of the impacts on the park, if no additional money is made available, identify the likelihood of an increased management intensity in all areas and a degradation of the footpath network. As such the baseline (zero cost) option available to participants for every choice set presented was increased management intensity of all landscape areas (moorland, moorland fringe and farmland), a worsened footpath network and zero additional tax cost. The options which this baseline was set against were developed using a fractional factorial orthogonal design, with two alternative choices being presented on each choice card (see Table 1 for a sample choice card). Additional verbal information was given at the start of each workshop detailing the information presented above, and individuals were encouraged to ask questions in order to clarify the information they had received. To enable participants to become familiar

with the process involved in making a choice, a series of practice sample choices were presented and explained prior to undertaking the first choice tasks.

2.2 Treatments used

Four treatments were used in this study. By "treatment", we mean a choice occasion when data is collected from the same set of individuals under different circumstances. Each treatment thus involved respondents in completing a set of choice cards from the same underlying experimental design, all representing the same range of changes in landscape and biodiversity in response to changes in management intensity.

Treatment 1 (decision utility) gives our baseline estimate of willingness to pay for different levels of landscape change in the Peak District National Park. This experiment was run in a local community centre prior to a visit to the national park. This treatment represents the value estimated in most choice experiments (and other stated preference techniques), since it is based on information given to participants through description, visual images and orally. It is not, however, provided at the "point of consumption".

Treatment 2 (experienced utility) aims to identify the impact of the moment of experience of landscape on values, and was conducted on-site where a representative series of landscapes could be seen. Participants were driven by minibus into the Park, and shown the landscape characteristics which they were valuing in the choice experiment. Individuals could identify the impacts of management changes without needing to rely on their own anticipation of landscape changes. Participants were shown landscape features characteristic of each proposed level for each attribute, and were asked to identify those features relevant to the combinations presented in the choice before them. The two adjacent fields to the site involved intensive and extensive moorland fringe management practices whilst areas of intensively and extensively managed moorland backed onto these fields. Below the site was a panorama showing intensive and extensive management of farmland rising across the valley to additional examples of moorland fringe and moorland management

Treatment 3 (Remembered utility 1) was conducted upon return to the community centre on the same day as the site visit. **Treatment 4 (Remembered utility 2)** was administered during a second workshop held in the same community centre four months after the first.

3. Results

Initial analysis of results was conducted using a conditional logit specification (Hensher et al, 2005). Some models, however, failed the Hausman test for IIA, so an alternative specification was sought. It was found that both the nested logit model and error component model provided good model fits. The Error Component model is in essence an evolution of the Nested Logit model and the results of this specification are presented here. The error component model allows flexible patterns of substitution via an induced correlation across utilities, which relaxes the IID assumption of the multinomial logit specification (Scarpa et a, 2005). In the context of this study, we introduce a correlation terms in the utility specification of the two "policy on" options (option A and B in table 1), to gather unobserved common elements of the respondents' choices for these options relative to the status quo option. It is important to note that the results presented below are derived from the same participants responding to the same choices in repeated experiments.

Table 2 shows estimate coefficients for each treatment, Table 3 identifies the coding used and Table 4 shows implicit prices (willingness to pay) calculated for landscape change away from the baseline in each treatment. A range of socioeconomic variables (which include per capita income, the number of children, whether respondent or a household member was a recreational user of the national park, etc.) were initially incorporated in the choice model analysis. Sex, age and whether respondents consider themselves as a local of the national park, however, were the only characteristics significant in at least one treatment. These suggest that women in particular, and to a lesser extent older individuals, are more likely to choose

either option A or B over the status quo. In treatment 1 the stated consideration of feeling as belonging to the national park is also significant, in that people who feel themselves as "locals" were more likely to prefer the current conditions compared to any change to the landscape of the national park.

It should be noted that to directly compare coefficient estimates across different choice models it is necessary to take account of differences in scale. This is because the estimated parameters in each treatment are confounded with an unknown scale parameter which is inversely proportional to the error variability of the respondents' choices in a particular treatment (Colombo et al 2007, p. 137)[4]. To estimate the relative scale parameter across treatments we estimated a pooled model where we fix the scale parameter of the first treatment to one and allow the scale parameters of the other treatments to vary. Estimated coefficients of this pooled model are shown in the last column of table 2. Due to the larger sample size most of the coefficients are significant. It is interesting that for all landscape management respondents show an aversion towards changes in landscape management, no matter whether the changes involves a more intensive or a less intensive management. The only attribute where respondents prefer a change to the status quo is the improvement of the footpath network.

The analysis of the relative scale parameters reveals that experience reduces significantly the scale parameter (the scale of Treatment 2 is almost half of the scale of Treatment 1). Since the scale parameter inversely proportional to the variance of the error terms, it can be concluded that experience increase the variance of the error terms. Respondents thus found it more difficult to make choices when actually experiencing the good. It is interesting to observe that the scale parameter of the choices of Treatment 3 and 4 are not significantly different from the scale parameter of Treatment 1, showing that it is just the moment of experience and not its memory which affects the variance of individual choices. Furthermore, experience affects the parameter estimates of the tax attribute; respondents did not focus on the price associated to the proposed alternatives in Treatment 2, unlike all other treatments. Again, we attribute this fact to the sensation that respondents feel when they are asked to choose their preferred alternative

[4] The estimated parameter (β_e) is linked to the true parameter ((β_t) with the following relation: $\beta_e = (\beta_t * \text{Scale})$. Scale is the scale parameter which is inversely proportional to the error variance.

when they are actually facing the different landscapes. Individual make their choices paying no attention to the price attached to the alternatives at the moment of experience, but focus instead on the landscape characteristics they most prefer.

In spite of the difference in relative scale, it is possible to compare Willingness to Pay (WTP) measures across treatments, since the scale parameter cancels out of the implicit price calculations (Scarpa et al. 2008). It is interesting to note that estimates for all WTP amounts (those that are significantly different from zero) are negative, not positive. The analysis calculates WTP for a shift away from the current management system (no change in management intensity). The results thus suggest that, independently from the conditions in which they were asked to make their choices, individuals are willing to pay in order to avoid a future level of management which is more intensive in character, although for moorland fringe the 95% confidence interval for WTP spans zero. Additionally individuals are willing to pay (in general) to avoid a less intensive management regime in the habitats, although again this is not significant in some Treatments. The implication is that there appears to be a significant status quo preference, since individuals would be willing to pay in order to maintain current levels of management intensity. We now provide more detailed comments on each of the four treatments.

Treatment 1 - Decision Utility

The pseudo R2 for this mode is 0.25. Individuals have the highest WTP to avoid more intensive management in the moorland areas and value bottom farmland habitats. This is perhaps unsurprising as whilst valley bottom farmland makes up a relatively small proportion of the park (as opposed to moorland habitats) most roads in the park run through valley bottoms and this landscape is seen from representative images presented of the National Park on tourism websites to be archetypal of the Peak District National Park. They are also WTP to avoid a reduction of the management intensity in the moorland fringe and valley bottom farmland. Locals living close to the national park also prefer an improvement of the footpath network.

Treatment 2 - Experienced Utility

This is the poorest fitting model of the four treatments, with a pseudo R^2 of 0.19. The most striking impact of experience is on the parameter estimate for the tax attribute, which is not significant in this treatment. Due to the insignificance of the parameter on the tax attribute, it is not possible to calculate marginal WTP in this treatment. Relative to the coefficients of treatment 1, experience impacts significantly on the preferences for less intensive management of the moorland which becomes significant with a large coefficient (-0.765[5]). Along the same line, experience modifies the preferences for the moorland fringe landscape and less intensive farmland management. The improvement of the footpath network is no longer considered important by respondents.

Treatment 3 and 4 – Remembered Utility

The fit of this model is very similar to treatment 1, although there are changes in parameter values for the choice attributes. With the exception of improving the footpath network, all mean WTP estimates decrease in absolute terms for maintaining current management levels in the third treatment, although they do not differ statistically from the estimates of treatment 1. Recall that this third treatment was administered as soon as respondents returned from their field trip. By the fourth treatment, administered 4 months later, mean WTP estimates for changes in farmland continue this trend relative to treatment 1, showing that respondents are less WTP for maintaining the current landscape management. The parameter estimate on the tax attribute changes substantially compared with treatments 3 and 1.

Due to a relatively low sample size and the size of standard errors in statistical terms we cannot conclude whether the change in WTP estimates across treatments are significant. There are trends in estimated coefficients between the treatments: willingness to pay is typically higher (in absolute terms) in treatment

[5] Note that to compare the value of the coefficient it is necessary to take into account the value of the scale parameter. The value –0.765 results from dividing the estimated coefficient (-0.417) by the estimated scale parameter (0.545).

1, and falls in treatment 3 and 4. The most striking effect, however, is for experienced utility. Respondents, when directly experiencing the good over which they were being asked to make choices, did not focus on the price associated with the different alternatives, meaning that WTP measures in this treatment cannot be derived.

Conclusions

The proposition of the New Benthamites such as Kahneman is that the moment of experience impacts on the utility associated with consumption. They suggest that individuals are inefficient in determining utility maximising consumption behaviour ex ante, as they are poor at forecasting the change in utility that will be experienced from a decision. They propose that an analysis of experienced utility gives a better measure of happiness than one based on decision utility. Experienced utility may thus be a preferable basis for assessing the public values of changes in environmental goods. Researchers should at least develop some idea of what differences exist between decision- and experienced-utility measures of welfare change for public goods, if cost-benefit analysis is to retain its claimed ability to identify welfare-enhancing resource allocations.

This paper aims to identify if the moment of experience impacts on individual's preferences for environmental goods, such that environmental values , as measured by Willingness to Pay, differ according to which concept of utility is used: ex ante decision utility, or "moment of consumption" experienced utility. Additionally, we examine the effects of memory on willingness to pay. It was not possible to make definitive statements about the changes in preferences between treatments due to a relatively small sample size and relatively high standard errors. However, a striking result is the lack of significance of the tax attribute in the experienced utility treatment, despite its strong significance in all other treatments. When people are experiencing the good in question (landscape), their choices are no longer affected by the

cost involved in achieving the desired outcome. Preference estimates for the other attributes of the landscape are affected by experience and memory, but not in a systematic way. Another result which emerges is that experience and memory affect our estimate of the marginal utility of money, and as such the welfare estimates obtained from the experiment. Memory leads to a slight reduction in mean willingness to pay in the short term and a further reduction in the longer term for several of the landscape attributes. It is interesting to note that people again pay attention to the tax attribute once people are remembering their experience, and plays a bigger role in choices in Treatment 4 than either Treatments 1 or 3.

We noted above the finding by Dunn et al (2003) that the relationships between possible determinants of well-being and a measure of such satisfaction or well-being are likely to differ according to whether people are making predictions about how a particular choice will impact on their well-being, or whether their well-being is measured at the moment of consumption. This would suggest that the estimated parameters relating choices to landscape attribute levels should vary systemically across treatments 1 and 2. However, we find relatively little evidence to support this finding, based on the results reported in table 2

Finally, we note that we have not controlled for changes in information which individuals hold between treatments 3 and 4: individuals may have been exposed to many more environmental "good causes" or learnt more about the Peak District in the period between the sessions, which caused them to revise their preferences or attitudes. Both additional information and "time to think" have been shown to change WTP in other workshop approaches to environmental valuation (MacMillan et al, 2003; MacMillan, Hanley and Lienhoop, 2006).

One question which is raised from the research is whether the fourth (remembered utility) and first (decision utility) treatments have relatively similar outcomes in terms of preference parameters because

treatment 1 responses are based upon remembered experience prior to the workshop. This raises the issue of whether the impact of experience on willingness to pay is negated over time, so that an individual's preferences return to the same level as before. We also note that whilst the values obtained in Treatment 2 are at the "point of consumption" in terms of the levels of each attribute in the choice experiment, they do not relate to real outcomes where individuals have actually paid a higher tax, and then waited for different environmental qualities to emerge. In this sense, our measures based on experienced utility are not really equivalent to what Kahneman advocates in his experience sampling or day reconstruction approaches, since we are still dealing with hypothetical choices, even if the context is real. Behavioural psychologists might thus find problems with our approach.

In terms of policy implications, Loomes (2006) and Kahneman and Sugden (2005) note that experienced utility does not necessarily give results consistent with the dynamics of the decision making process. Assuming that the government aims to provide socially optimal levels of public goods, then individual preferences should inform policy. An argument could be made that these preferences should be those that find expression at the moment of consumption, since this is our most direct measure of well-being. But the measure of utility which is most relevant in terms of winning votes is decision utility, since this will be the value in an individual's mind at the time of voting.

References

Alvarez-Farizo B and Hanley N (2006) "Improving the process of valuing non-market benefits: combining citizens' juries with choice modelling". *Land Economics*, 82 (3), 465-478.

Bateman, I., Munro, A., Rhodes, B., Starmer, C. and Sugden, R. (2000) A Test of the Theory of Reference-Dependent Preferences. *In Choices, Values and Frames, Kahneman D and Tversky A eds*. Cambridge: Cambridge University Press.

Bentham, J. (1789) *An Introduction to the Principles of Morals and Legislation (http://www.econlib.org/library/Bentham/bnthPML2.htm)*

Beshears, J., Choi, J.J., Laibson, D., Madrian, B.C. (2008) How are preferences revealed?, *Journal of Public Economics*, 92, 1787-1794.

Brickman and Campbell 1971 Hedonic Relativism and Planning the Good Society. *Adaptation Level Theory: A Symposium,* M.H. Apley, ed., New York: Academic Press, 1971, pp 287–302.

Dallimer, Martin, Dugald Tinch, Szvetlana Acs, Nick Hanley, Humphrey R. Southall, Kevin J. Gaston, Paul R. Armsworth (2009**)** **"**100 years of change: examining agricultural trends, habitat change and stakeholder perceptions through the 20th century" *Journal of Applied Ecology*, 46, 2, 334-343.

Do, A.M., Rupert, A.V. and Wolford, G. (2008). Evaluation of pleasurable experiences: The peak – end rule. *Psychonomic Bulletin and Review* 15 (1)

Dunn E., Gilbert D., Wilson T. (2003) "Location, location, location: the misprediction of satisfaction in housing lotteries" *Personality and Social Psychology Bulletin*, 29 (11): 1421-1432.

Edgewoth, F.Y. (1879) "The Hedonical Calculus", *Mind,* 4 (15) 394-408.

Gilbert, D. T., & Ebert, J. E. J. (2002). Decisions and revisions: The affective forecasting of changeable outcomes. *Journal of Personality and Social Psychology*, 82, 503-514.

Gilbert, D. T., Lieberman, M. D., Morewedge, C. K., & Wilson, T. D. (2004). The peculiar longevity of things not so bad. *Psychological Science*, 15, 14-19.

Hanley N and Shogren J (2005) "Is cost-benefit analysis anomaly-proof?" *Environmental and Resource Economics*, 32 (1), 13-34.

Helson, H (1964) *Adaptation-Level Theory: An Experimental and Systematic Approach to Behaviour,* Harper & Row, New York

Hensher D., Rose J. and Greene W. (2005) *Applied Choice Analysis: a primer.* Cambridge: Cambridge University Press.

Kahneman D., Wakker P. and Sarin R. (1997), Back to Bentham? Explorations of experienced utility. *Quarterly Journal of Economics* 112; 375-405.

Kahneman, D. (2003) Maps of Bounded Rationality: Psychology for Behavioural Economics. *The American Economic Review*. 1449 – 1475

Kahneman, D., A. Kreuger, D. Schkade, N. Schwarz and A. Stone (2004), 'A Survey Method for Characterizing Daily Life Experience: The Day Reconstruction Method', *Science* 306, 1776–1780.

Kahneman, D. and Sugden, R. (2005) Experienced utility as a standard of policy design. *Environmental and Resource Economics*, 32, 161-181

Kahneman, D and Tversky, A (2000) Choices, values and frames. *In Choices, Values and Frames,* Kahneman D and Tversky A eds. Cambridge: Cambridge University Press.

Loewenstein, G., O'Donoghue, T. and Rabin, M. (2003) Projection Bias in Predicting Future Utility. *The Quarterly Journal of Economics* 118 (4): 1209-1248.

Loomes, G. (2006) (How) Can we value health, safety and the environment? *Journal of Economic Psychology* 27: 713-736.

MacMillan D, Philip L, Hanley N and Alvarez-Farizo B (2003) "Valuing non-market benefits of wild goose conservation: a comparison of interview and group-based approaches" *Ecological Economics*, 43, 49-59.

MacMillan D, Hanley N and Lienhoop N (2006) "Contingent valuation: environmental polling or preference engine?" *Ecological Economics,* 60 (1), 299-307.

Marshall, A. (1920) Principles of Economics. 8th Edition London: Macmillan and Co., Ltd. http://www.econlib.org/library/Marshall/marP11.htm

Redelmeier, D.A. and Kahneman, D. (1996) Patients' memories of painful medical treatments: Real-time and retrospective evaluations of two minimally invasive procedures. *Pain*, 66, 3-8.

Robson, A. and Samuelson, L. (2010) "*The Evolution of Decision and Experienced Utilities"* Cowles Foundation Discussion Paper No. 1678.

Scarpa R., Ferrini S and Willis K. (2005) "Performance of Error Component models in Choice Experiments" in Scarpa R. and Alberini A (eds) *Applications of Simulation Methods in Environmental and Resource Economics*. Dordrecht: Springer.

Scarpa, R., Thiene, M. and Train, K. (2008) Utility in WTP space: a tool to address confounding random scale effects in destination choice to the Alps. *American Journal of Agricultural Economics*, 90, 994-1010.

Scitovsky, T. (1976*). The Joyless Economy: The Psychology of Human Satisfaction.* Oxford: Oxford University Press

Stone, A. A., S. S. Shiffman and M. DeVries (1999), Rethinking Self-report Assessment

Methodologies, in D. Kahneman, E. Diener and N. Schwarz, eds., *Well-Being: The*

Foundations of Hedonic Psychology (pp. 26–39). New York: Cambridge University Press.

Tversky, A., Sattath, S. and Slovic, P. (2000) Contingent Weighting in Judgement and Choice. *In Choices, Values and Frames,* Kahneman D and Tversky A eds. Cambridge: Cambridge University Press.

Table 1: Sample choice card

	A	B	Do Nothing
Moorland – intensity of management	Less Intensive – less sheep and burning. More bird species	No Change in Intensity	More Intensive – more sheep and burning
Moorland Fringe – intensity of management	Less Intensive– less sheep and burning. More bird species	Less Intensive– less sheep and burning. More bird species	More Intensive – more sheep, fertilizer and drainage
Valley Bottom Farmland – intensity of management	No Change in Intensity	Less Intensive – less sheep and fertiliser. More bird species	More Intensive – more sheep and fertilizer.
Footpath Network	Improved	Degraded	Degraded
Tax Cost	£5	£55	£0
Please tick the option you prefer.	□	□	□

Table 2 Error component logit model co-efficients for each treatment.

(Coefficients found to be statistically significant at the 95 percent level are indicated in bold).

Treatment	*Decision*		*Experienced*		*Remembered 1*		*Remembered 2*		*Pooled model*	
	Coef.	*S.e.*	**Coef.**	**S.e.**	*Coef.*	*S.e.*	*Coef.*	*S.e.*	*Coef.*	*S.e.*
Mean Values										
Const	1.481	2.130	3.064	1.931	-0.561	2.149	0.147	2.569	-1.720	0.801
MoorLI	-0.148	0.152	**-0.417**	0.184	-0.117	0.163	-0.205	0.300	**-0.220**	0.086
MoorMI	**-0.987**	0.251	**-0.430**	0.198	**-0.657**	0.238	**-1.118**	0.316	**-0.900**	0.111
FringeLI	**-0.566**	0.183	**-0.603**	0.201	**-0.332**	0.157	-0.502	0.294	**-0.542**	0.095
FringeMI	-0.249	0.212	-0.163	0.177	-0.317	0.195	-0.194	0.261	**-0.266**	0.092
FarmLI	**-0.598**	0.225	-0.411	0.235	-0.372	0.233	**-0.542**	0.254	**-0.539**	0.105
FarmMI	**-1.241**	0.267	**-0.550**	0.267	**-0.820**	0.251	**-1.264**	0.416	**-1.120**	0.175
PathD	-0.025	0.210	0.365	0.194	0.184	0.176	**-0.428**	0.210	-0.001	0.114
PathI	**0.482**	0.210	-0.037	0.220	0.421	0.240	0.393	0.363	**0.400**	0.107
Tax	**-0.029**	0.008	-0.005	0.004	**-0.022**	0.004	**-0.038**	0.007	**-0.028**	0.004
Female	**2.125**	1.054	**2.574**	1.048	**3.119**	1.129	2.304	1.362	**3.090**	0.708
Local	**-2.990**	1.280	1.090	0.935	-0.080	1.225	-1.108	1.951	0.000	0.084
Age	0.015	0.033	**0.055**	0.027	0.019	0.034	0.021	0.032	**0.036**	0.018
Error Component										
Sigma	**-2.364**	0.457	**-2.214**	0.384	**-3.481**	0.653	**-3.118**	0.613	**3.200**	0.447
Scale parameters										
Treatment no. 1									1.000	0.000
Treatment no. 2									**0.545**[+]	0.088
Treatment no. 3									0.906	0.133
Treatment no. 4									1.040	0.154
N	798		798		798		651		3045	
LL	-659.95		-708.12		-650.24		-532.29		-2582.8	
Pseudo R^2	0.25		0.19		0.26		0.26		0.23	

+. Significantly different from 1.

Table 3. Explanation of variable abbreviations and coding in table 2

Const	Constant term (= 0 for baseline zero cost, = 1 for option A or B)
MoorLI	Shift to less intensive moorland management
MoorMI	Shift to more intensive moorland management
FringeLI	Shift to less intensive moorland fringe management
FringeMI	Shift to more intensive moorland fringe management
FarmLI	Shift to less intensive valley bottom farmland management
FarmMI	Shift to more intensive valley bottom farmland management
PathD	Degraded footpath network
PathI	Improved footpath network
TAX	Tax increase to the household indicated in pounds
FEMALE	Gender (Female = 1, Male = 0)
LOCAL	Whether respondent considers themselves as a local of the national park (Yes = 1, No = 0)
AGE	Respondent's age in years
SIGMA	Error component for option A and option B.
Scale parameters treatment i	Scale parameter of treatment i relative to the scale parameter of treatment 1.

Table 4: WTP for a change from the current level of provision.

(£ per household per year)

Variable	Predicted	Experienced	Remembered 1	Remembered 2
Moor LI	-£5.4 (-18.3 6.5))	N.A	-£5.8 (£-22.5 10.2)	-£5.2 (£-20.7 10.1
Moor MI	-£34.6 (£ -59.6 -18.5)	N.A	-£31.9 (£-63.1 -10.2)	-£30.1 (£-54.6 -11.5)
Fringe LI	-£20.3 (£-39.5 -7.0)	N.A	-£15.9 (£-35.6 -0.3)	-£13.2 (£-27.0 1.3)
Fringe MI	-£9.9 (£-33.2 5.0)	N.A	-£15.3 (£-40.6 3.5)	-£5.7 (£-22.8 7.7)
Farm LI	-£-22.9 (£-56.6 -4.6)	N.A	-£19.8 (£-58.9 -6.6)	-£15.3 (£-33.6 -0.9)
Farm MI	-£44.4 (£-74.5 -26.6)	N.A	-£40.4 (£-83.4 -13.5)	-£33.7 (£-52.0 -15.5)
Path Degraded	£0.9 (£-11.6 23.8)	N.A	£11.2 (£-8.1 45.9)	£-11.0 (£-19.4 -1.3)
Path Improved	£18.0 (£4.7 39.8)	N.A	£20.9 (£-3.7 54.0)	£10.5 (£-7.5 26.6)

Figures in brackets are 95% confidence intervals estimated by the bootstrapping method (Krinsky and Robb, 1986)

Notes: MoorLI is less intensive management of moorland areas; MoorMI is more intensive management of these areas. FringleLI is less intensive management of the moorland fringe, FringeMI is more intensive management of these areas. FarmLI is less intensive management of valley bottom farmland; FarmMI is more intensive management of these areas.