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STATED PREFERENCE VALUATION METHODS: AN EVOLVING TOOL FOR UNDERSTANDING CHOICES AND INFORMING POLICY

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Abstract

We examine the value of Stated Preference (SP) valuation methods as part of the environmental economist's toolbox. We review a number of policy design issues where we believe SP methods have advantages over alternative approaches. We also discuss the role of SP methods in exploring a few aspects of peoples' preferences and values which have wider implications for economics and behavioral sciences: (a) the effects of information, learning and knowledge; (b) testing the standard model of compensatory, rational choice; (c) the influence of behavioural levers such as social norms; and (d) the role of "deep" drivers of preference heterogeneity, such as personality and emotions. We also review what is known about the extent to which hypothetical choices reveal something about people's true preferences. Finally, we speculate on some areas where SP methods may be useful in the future.

Keywords:

stated preferences, non-market valuation, environmental economics methods, information, choice, social norms, preference heterogeneity

JEL:

Q51, D6, H4

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1. Introduction

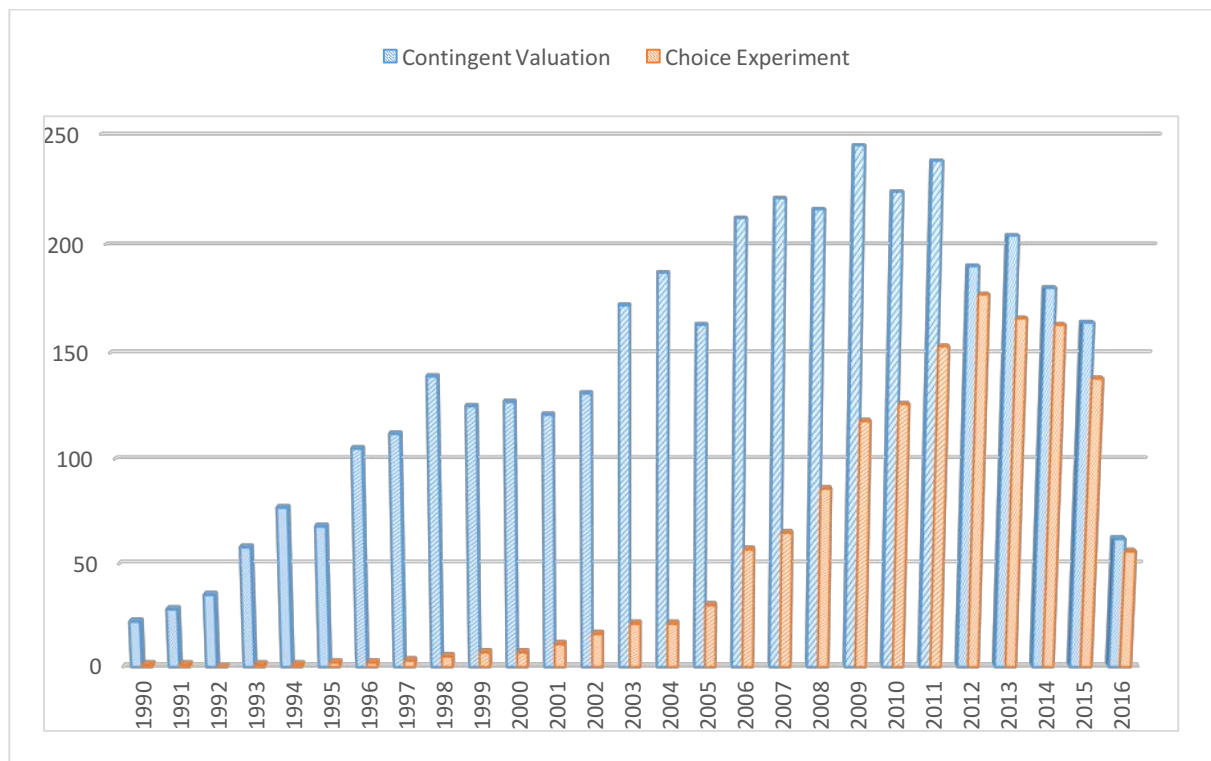
The aim of this paper is to explore the value of Stated Preference (SP) valuation methods as part of the environmental economist's toolbox. We do not offer a full account here of "how to do" stated preferences, since many such texts exist ([e.g., Hanley and Barbier 2009](#)); whilst for a comprehensive discussion of emerging guidelines of how best to undertake SP studies in policy analysis we refer the reader to [Johnston et al. \(forthcoming\)](#). Our main objectives are instead to (i) investigate a number of policy design issues where we believe SP to have advantages over alternative approaches, and (ii) to think about the role of SP methods in analysing four fundamental aspects of peoples' preferences and values, which have wider implications for economics and behavioural sciences. These "fundamental aspects" are (a) the effects of information, learning and knowledge on choices; (b) testing the standard model of compensatory, rational choice; (c) the influence of behavioural levers such as social norms on individual choice; and (d) the role of "deep" drivers of preference heterogeneity, such as personality and emotions. Before doing any of this however, we first review what is known about the extent to which the most important working assumption in SP methods – that hypothetical choices reveal something about people's demand for non-market goods – can be defended. This is necessary, since unless one is willing to accept this assumption, the insights we can obtain from SP studies are greatly devalued.

The two types of SP valuation methods are contingent valuation, where the environmental good is defined as a whole; and choice modelling ([discrete choice experiments; Carson and Czajkowski 2014](#)), where the environmental good is described as a bundle of attributes. For example, suppose we are interested in how much an individual will benefit from extending the area of forest in their neighbourhood. This value could be measured using contingent valuation, where people are simply asked to express a value for extending the existing forest.

Alternatively, a choice experiment could be used, whereby people are asked to consider changes in each of a set of attributes which describe a particular forest, such as species diversity, distance from their home, size, and the provision of walking trails. Their willingness to pay for a change in the forest can be calculated from the sum of attribute values which describe this change. Which approach is best typically depends on the research or policy question at hand. Both contingent valuation and choice modelling draw on random utility theory as a way of representing how changes in environmental goods affect utility ([McFadden 1974](#)). Both require individuals to trade-off changes in cost or price against changes in environmental quality in a hypothetical market setting.

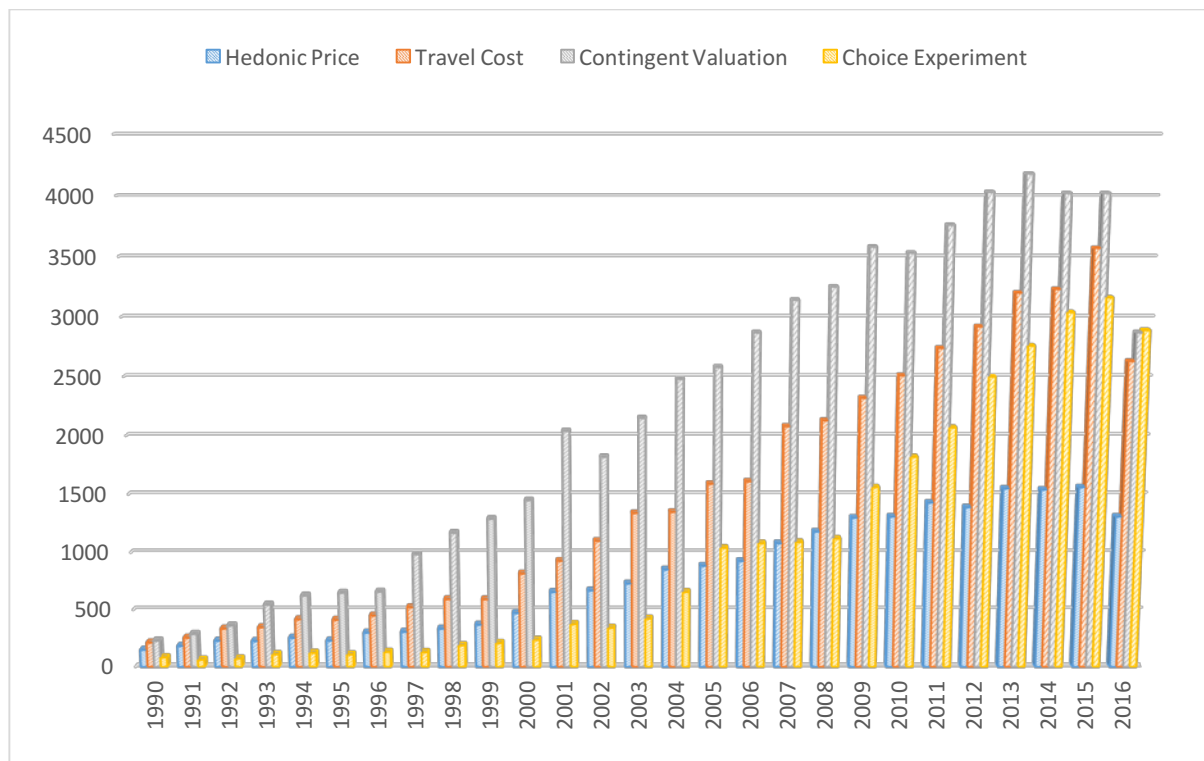
Contingent valuation was first employed to any significant degree in environmental economics in the mid 1970s, by researchers such as [Brookshire, Ives, and Schulze \(1976\)](#), and [Randall, Ives, and Eastman \(1974\)](#). Choice modelling developed as a method in the 1980s ([Louviere and Woodworth 1983](#)) and was first applied in environmental economics the 1990s ([Adamowicz, Louviere, and Williams 1994](#), [Hanley, Wright, and Adamowicz 1998](#)). There are now a very large number of published stated preference studies in the literature, and their use has been increasing. Figure 1a shows this trend: whilst there are still more contingent valuation (CV) studies published each year than choice experiment papers (CE), the overall numbers of both are growing and the difference is shrinking. Figure 1b shows, using a different data source, that SP methods are the most frequently-cited approach to estimating non-market values, compared to revealed preference approaches such as hedonic pricing and travel cost models.

Figure 1a: Number of papers listed in Econ Lit database using various valuation methods¹



¹ The details of the search methodology are available from the authors upon request.

Figure 1b: Number of Google Scholar papers referencing various valuation methods



2. Hypothetical bias in Stated Preferences

Almost from the beginning of their use in environmental economics, SP valuation methods turned up behaviour which was thought to be potentially at odds with standard neoclassical economic theory describing consumer choice and welfare measurement ([Carson and Hanemann 2005](#)). One group of these anomalies was related to various behavioural phenomena, such as systematic differences between values attached to gains compared to losses.² Many of these effects were later shown to be quite robust across a range of non-market and market

² It's worth pointing out here that some of the best known behavioural effects such as loss aversion and WTP/WTB differences were first observed in SP studies.

situations. However, the issue of hypothetical market bias remains a key criticism of SP methods. Simply put, this means people over- or under-state their WTP values in an SP exercise in a systematic fashion due to the fact that no actual payment is made or received in exchange for a change in quantity or quality of a good.

The economics profession's response to worries about hypothetical bias has varied, from rejecting SP methods altogether, through ignoring the 'elephant in the room', to improving survey design methods in general, and developing ex-ante / ex-post methods to reduce hypothetical bias. Such methods include cheap-talk scripts, oath-scripts, time-to-think, certainty-calibration, budget reminder, and opt-out reminders. It also quickly became obvious that poor survey design and administration could easily induce all sorts of anomalous behaviours including hypothetical bias. On the other hand, CV studies that invested considerable time and effort into understanding what people believe, in presenting a credible choice scenario with a well-defined good and a coercive payment mechanism, and where survey design enhances belief in outcome and payment consequentiality generally appear to produce results that are well-behaved.

Another stream of improvements used insights from mechanism design theory to refine the construction of hypothetical scenarios, and so choose the best response formats for mitigating hypothetical bias (e.g., [Mitchell and Carson 1989](#), [Carson and Groves 2007](#)). The aim was making the statement of respondents' true preferences their best available strategy: that is, to make survey questions *incentive compatible*. To this end, the necessary (albeit not necessarily sufficient) conditions identified thus far in the literature are:

1. respondents should correctly understand and answer the question being asked (including the requirement that the good(s) being valued, including the different attribute levels and cost, are seen as plausible) ([Carson and Hanemann 2005](#));

2. respondents need to see the survey as consequential, i.e. their responses should be viewed as potentially influencing the supply of a public good, and agents must care about these outcomes ([Vossler, Doyon, and Rondeau 2012](#));
3. the payment has to be coercive, i.e. the payment vehicle must be able to impose costs on all agents if the government undertakes the project ([Carson and Louviere 2011](#));
4. following from the Gibbard-Satterthwaite theorem, the message space of a choice question cannot be larger than binary without restricting the space of allowable preference functions, i.e. a binary choice is the only elicitation format that has a potential to be incentive compatible;
5. the survey should be seen as take-it-or-leave-it offer, so that agents do not see their decisions as influencing any other offers that may be made ([Carson, Groves, and List 2014](#)).

Some of the above conditions (correct understanding, take-it-or-leave-it character) can only be evaluated via careful qualitative testing and refinement of the survey instrument. Others (consequentiality, coercive payment mechanism) are possibly easier to satisfy, although they too require making sure that what is written in a survey script, and what is read and understood by respondents is the same thing.³ Finally, some authors impose rather stringent conditions on acceptable elicitation formats ([Carson and Louviere 2011](#)). While certain elicitation formats should probably be avoided altogether, in the light of the bias vs. efficiency trade-off, it remains

³ For example, some recent evidence shows that despite various levels of assuring consequentiality / inconsequentiality of a survey respondents' perception / expectation of the level to which their responses will be consequential remain relatively unaltered ([Czajkowski et al. 2015](#)).

an empirical question to what extent moving away from these incentive compatibility requirements actually biases results.

The validity of SP methods has been thoroughly investigated, particularly because the empirical evidence is often contradictory. Some studies report significant differences between stated and true preferences, whereas others find no significant difference. Recently, [Zawojksa and Czajkowski \(2015\)](#) have critically re-evaluated this evidence. By reviewing the four main types of validity tests – content, construct, convergent, and criterion validity – they argue that comparing SP-based estimates with corresponding criterion measures is the most adequate approach to verify how well SP-based estimates reflect true preferences. By classifying the empirical evidence with respect to whether it (1) deals with private or public goods, (2) uses a coercive or voluntary payment mechanism, (3) can be perceived by respondents as consequential, and (4) uses a single binary choice format, they identified studies that provide meaningful results in terms of providing conditions in which rational respondents can be expected to answer in line with their true preferences. The results of such studies consistently point to the validity of stated preferences under such conditions. When the available evidence is limited only to studies that satisfy the requirements listed above, the evidence becomes univocal – hypothetical bias can be avoided. This conclusion is very encouraging for SP methods, although it obviously comes with many requirements for the design and administration of future SP studies.

3. Stated Preference methods provide useful insights for policy design

SP methods are widely used in policy analysis in the USA, UK, Scandinavia and Australia as a way of providing information on the predicted economic benefits or costs of policies which aim to change environmental quality, or where environmental quality change is a side-effect of

a policy. For example, much use has been made of SP methods in the analysis of water quality improvements, whether as a result of implementing the EU Water Framework Directive ([Hanley and Black 2006](#), [Hanley et al. 2006](#), [Bateman et al. 2011](#), [Metcalf et al. 2012](#)), or toughening standards over coastal bathing water quality. The benefits of designating new Marine Protected Areas in the UK have also been measured using SP methods ([McVittie and Moran 2010](#)). In the UK, stated preference methods have been approved for use more widely in public sector policy analysis, as shown by the Green Book ([HM Treasury 2013](#)), and indeed are used beyond environmental policy settings (e.g., as part of the cost-benefit analysis of major new transport investments).

In the USA, cost-benefit analysis has been part of decision making over water quality regulation since President Reagan's Executive Order 12291. Stated preference data now provide the basis for benefits transfer models used to inform policy over surface water quality improvements, and it has been possible to integrate these benefits transfer models with water quality models which predict the physical changes in surface waters from changing the stressors which act on water quality ([Griffiths et al. 2012](#)). Non-use values have often been a significant part of the total non-market benefits of water quality improvements, along with health benefits and recreational values. Guidelines have been provided for their use in US policy settings ([US EPA 2014](#)).

What attracts policy analysis to SP methods is their unique ability to measure non-use (passive use) values, which are likely to be important in many contexts where environmental quality is changing, even if the main driver of environmental policy change is recreational use. For instance, the US EPA included estimates of improvements in non-use values in 13 out of 16 regulatory assessments impacting water quality between 1982 and 2009 ([Griffiths et al. 2012](#)). The regulatory impact analysis of the Construction and Development federal rule in the USA

made use of a meta-analysis of 45 stated preference studies to estimate the non-use benefits which would be generated by implementation of this regulation. SP methods can also look at WTP for environmental quality changes which go beyond existing observed levels of environmental quality parameters, something which is much harder to do with revealed preference approaches.

Another area which SP methods provide useful advice are in predicting uptake of Payment for Ecosystem (PES) schemes by farmers and other land managers, and how this uptake will vary according to the nature of the contracts offered by the buyer of ecosystem services (typically, but not necessarily, the government). There are now many such studies published using an SP approach ([Espinosa-Goded, Barreiro-Hurlé, and Ruto 2010](#), [Broch and Vedel 2011](#)): for a recent survey, see Villanueva et al, 2016. What makes SP very useful here is that the conditions of such contracts and the population to whom they are being offered frequently differ from what we observe from actual contract offers and acceptances. Consider a policy which seeks to increase the efforts of forest owners to engage in costly pest and disease control measures, on the grounds that the social benefits of such actions will outweigh the private benefits ([Sims, Finnoff, and Shogren 2016](#)). Such contracts could vary in terms of the length of the contract, what specific actions are required of the forest owner, how much monitoring of pests and diseases the owner must undertake, and what payment is offered to the forest owner. These contract design features can be used as the attributes of a choice experiment (Figure 2). Once responses have been obtained, the estimated choice model can be used to predict how uptake will vary as these contract terms are varied, and what rates of participation can be expected.

Figure 2: Example of Choice Card used in the study of forest owners' preferences towards engaging in pest and disease control measures

"A typical choice situation consists of two alternative forest disease management contracts with varying characteristics; and an opt-out option, which means that you would not be willing to sign either of the two hypothetical contracts offered in a particular choice situation. We ask you to think about **a situation where a new disease has entered the UK which can potentially impact on your woodland; but which has not so far reached your part of the countryside**. Please remember that these are hypothetical schemes that could be offered at some point in the future, and not schemes which are currently planned or available."

Which of the following Forest Disease Management contracts would you be willing to sign, if any?

	Contract A	Contract B	
Disease management options available	clear fell only	thinning	I would NOT want to sign either of these two contracts
Contract length	10 years	20 years	
Inspection and reporting frequency	Twice per year	Once per year	
Grant payment rate (£/ha/year)	£40	£20	
Bonus payment for bringing in neighbour forest owners (£/ha/year)	£10	£0	
Likely effects of the disease on your forest	25% mortality	50% mortality	
YOUR CHOICE:	☐	☐	☐

An example which investigates the use of collective bonuses on participation rates is reported in [Kuhfuss et al. \(2015\)](#). A sample of French winegrowers were surveyed to understand the factors impacting likely participation in a new agri-environment scheme designed to reduce pesticide use in wine production. One of the attributes was an additional bonus paid to participants if at least 50% of farmers in their area agreed to join the scheme. Results showed that such collective action payments were highly effective in increasing participation and reducing pesticide use.

Another policy setting where SP methods have an advantage over revealed preference approaches concerns measures taken to reduce illegal behaviour with environmental implications. Both the supply side and demand side of the problem can be addressed, in a context where data on actual behaviour is hard to acquire precisely because these behaviours are illegal⁴ ([St John et al. 2011](#)). Important policy questions such as whether liberalising the global trade in ivory will help or damage conservation of African elephants; or how to reduce illegal bushmeat hunting which threatens a wide range of species worldwide, need to be informed by estimation of how those involved in both the supply of and demand for illegal wildlife products would respond to changes in institutions and prices.

With regard to the supply side of the problem, [Moro et al. \(2013\)](#) use choice modelling to investigate how changes in livelihood factors could be used to reduce illegal hunting of bushmeat in the Serengeti. Illegal bushmeat hunting has long been recognised as a significant

⁴ Of course it can also be difficult to ask stated preference questions concerning illegal behaviour, so that the nature of the hypothetical market and the framing of choices needs to be carefully considered.

threat to the populations of both target and non-target species ([Hofer et al. 1996](#)), but also as an important source of income for the poorest in rural Africa ([Nielsen 2006](#), [Knapp 2007](#)), and source of protein for poorer households. [Moro et al. \(2013\)](#) choice experiment asked households in villages around the western edge of the Serengeti about their preferences over different livelihood strategies, where the attributes corresponded to these strategies, along with bushmeat hunting (Figure 3). Based on the choice model estimated from responses, Moro et al could quantify the relative effectiveness of different policy options in reducing illegal hunting activity, whilst holding well-being constant: for example, how many extra cattle a household would need to be given to yield a one-week predicted reduction in time spent bushmeat hunting, or what wage from employment. Latent class modelling of the data showed that these trade-off rates varied between households of different wealth categories (wealth was used to probabilistically explain membership of latent classes; see Table 1). The authors were also able to show the relative effectiveness of policies which simply increase the chance of being caught and fined/put in jail for hunters.

Figure 3. Example of Choice Card used in the illegal bushmeat hunting study

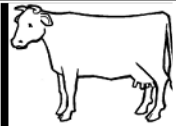
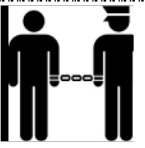
		A	B	C
Number of cows		0	30	1
Wage per month		600,000 TSh	No job	80,000 T Sh
Access to microcredit		Yes	Yes	No
Access to markets		Yes	No	Yes
Likelihood of being arrested		0	2/10	4/10
Time spent hunting per year		1 week	2 months	6 months
Which one would you choose?		[]	[]	[]

Table 1: Trade-off rates to reduce illegal bushmeat hunting. LC (class 1) and LC (class 2) refer to 2 latent classes of preferences estimated from the data. MNL is a multinomial logit model, RPL is a mixed or random parameters logit model.

	MNL	RPL	LC (class 1)	LC (class 2)
No. of cows for 1 hunting week	1.4725	2.6987	0.4665	9.6819
Job income (1000 TZS) for 1 hunting week	3.5939	5.0815	1.0352	21.4825
Hunting weeks for access to microcredit	0.8480	0.7136	3.2204	0.1552
Hunting weeks for access to market	0.8450	0.7360	3.1702	0.1528

On the demand side, [Hanley et al. \(2016\)](#) use stated preference choice modelling to investigate whether legalising the trade in rhino horn products would increase or decrease demand by consumers in South-East Asia. Demand for rhino horn represents an immediate threat to the survival of rhino species globally (Milliken & Shaw, 2012). To counter the illegal international wildlife trade, the global community is committed to supply-side trade restrictions and demand reduction. However, serious questions marks concerning the effectiveness of these measures exist and poaching rates remain stubbornly high, due partly to the incentives provided by very high prices, particularly in Asian markets. Calls to legalise the trade regime to undermine poaching have been ignored by the international community, fearing it may fuel demand and increase rhino fatalities. However, crucial aspects of demand for horn remain poorly understood and under-researched. The choice card used by Hanley et al is shown in Figure 4. Some 800 members of the public in Vietnam completed the survey.

Figure 4: Example of Choice Card used in the Rhino Horn Experiment

Attribute	Choice A	Choice B	Neither A or B
Source	Semi-Wild 	Wild 	
Rare?	Rare	Very Rare	
Harvesting method	Non-Lethal 	Lethal 	
Price per 100 grams	USD 9,600	USD 2,400	

As may be seen, participants were asked to choose between different rhino horn-derived products which vary according to (i) whether lethal or non-lethal harvesting methods were used to obtain the horn (ii) whether the horn comes from wild or farmed rhinos (iii) how rare the rhinos are and (iv) the price. Two scenarios were used. In the first, consumers were asked to make their choices in the context that the current ban on trade remains. In the second, they were asked to consider how they would choose in case the ban was lifted (each respondent only participated in one of these scenarios). Results showed that people preferred wild to farmed rhino horn, but most interestingly, that they Willingness To Pay (WTP) for any rhino horn product encompassed by the experimental design was lower in the legalised trade scenario than in the illegal trade scenario. This implies that, rather than demand rising if trade were legalised,

it would actually fall – the polar opposite of the “de-stigmatisation” argument made by others. Perhaps consumers are willing to pay extra for the cachet of consuming an illegal product in this case.

In conclusion, SP methods offer valuable insights to important policy design questions in a number of settings. These include case where (i) non-use values are thought to be an important component of benefits; (ii) where we wish to predict the response of suppliers in new Payment for Ecosystem service schemes and (iii) where we wish to understand the supply and demand for illegal wildlife products. The actual range of settings in which SP methods are applied in real-world policy analysis is of course much greater than this (for details, see Hanley and Barbier, 2009), which reveals its utility to policy analysts more convincingly than any academic paper can. However, as we argue below, SP has advantages beyond this policy analysis context.

4. Using stated preferences to investigate our understanding of choices and preferences

In this section, we turn attention to the use of SP methods to explore and test theoretical/conceptual models of how people choose, and how they form their WTP values. Here, then, SP is being used more as a tool for thinking about intellectual ideas, rather than answering a policy analysis need. We consider four ideas:

- (i) the effects of learning and knowledge on WTP;
- (ii) testing “compensatory” choice;
- (iii) the effects of social norms on individual choice;
- (iv) the role of emotions in economic choices;

4.1 The effects of information, learning and knowledge on Willingness to Pay⁵

There is a large literature dating back to the early days of contingent valuation which examines how information provided in a survey about a public good's attributes and its management impact stated WTP. Stated preferences are a useful empirical method for testing the effects of information and knowledge on WTP; and can also be used to examine how people react to new information, and indeed to signals about how much they know about a good ([LaRiviere et al. 2014](#)). How much a subject knows about a good before a survey begins is often correlated with their WTP, whilst people tend to know more about things they care about or have experience with ([Czajkowski, Hanley, and LaRiviere 2014](#)). Moreover, less informed subjects may be more likely to be influenced by “new” information about a good ([Czajkowski, Hanley, and LaRiviere 2016](#)).

[LaRiviere et al. \(2016\)](#) and [Czajkowski et al. \(2016\)](#) test for how providing information about the attributes of an environmental public good affects knowledge; and how that new knowledge affects the distribution of valuations for the public good *conditioning* on a subject's ex ante knowledge levels. The environmental good was a coastal wetlands restoration project in the Tay Estuary, Scotland. Their experimental design allowed an elicitation of subjects' prior knowledge levels about a good's attributes, and exogenous variation in how much new information about the good's attributes is provided to them. Subjects then stated their maximum WTP for the good using a payment card design, and finally posterior knowledge about the good measured. Because the authors exogenously varied information in the experiment, they could identify causal estimates for the marginal effect of new information

⁵ This section of the paper draws heavily on our work with Jake LaRiviere.

provided on knowledge; and the marginal effect of knowledge on valuation for a good, conditioning on a subjects ex ante level of knowledge. The design also provided an opportunity to compare different cognitive models of learning and stated valuation adjustment.

At the beginning of the survey, subjects were given a nine-question multiple choice test over objective facts about historical flood events, flood protection and the ecological attributes of wetlands in order to elicit relevant prior knowledge levels. They were then randomly assigned to an information treatment (low, medium or high) based upon the number of questions they answered correctly. Each candidate piece of information about the good's attributes was related to exactly one of the nine multiple choice test questions. Because the subject's relevant knowledge state was measured at the beginning of the experiment, it was possible to verify which information given them was "new". Subjects' retention of newly-provided information was tested by giving them the same identical quiz at the end of the experiment which they were given at the beginning.

Two main results emerged. First, giving subjects more information caused significant learning, although observed learning is incomplete. As subjects are told more information, their marginal learning rates decrease, which is consistent with a model of imperfect learning and fatigue. Second, new knowledge about a good's attributes did not significantly affect WTP for the good. Systematic correlations existed between ex ante levels of information and valuations: *ex ante* more knowledgeable subjects valued the good less than *ex ante* less knowledgeable subjects. However, learning additional information did not affect these valuations holding the *ex ante* knowledge levels fixed. Further, additional information did not affect the variance of the distribution of valuations.

[LaRiviere et al. \(2016\)](#) claim that their stated preference experiment has the necessary features to link the literature on information effects in stated preferences to a more general economics

literature on updating and valuation. Specifically, recent advances highlight how cognitive constraints, costly effort, endogenous search and confirmatory bias can influence both learning and subsequent valuation ([Caplin and Dean 2015](#)). LaRiviere et al's results were consistent with three models of preference formation: 1) Confirmatory Bias ([Rabin and Schrag 1999](#)) 2) heterogeneous preferences and endogenous costly information acquisition decisions and 3) a timing lag between learning and preference formation.

In a related paper, [LaRiviere et al. \(2014\)](#) test for the effects of an external signal being provided to people on how much they know about an environmental good. They speculate that if an individual is told that their knowledge about an environmental good is lower than average, then they may place a relatively high weight on new information in updating their priors. Conversely, if they receive a signal that their current state of knowledge is above average, they may place a lower weight on the same, new information. Based on the “good news, bad news” idea, individuals who receive good news about their knowledge may react differently to new information than individuals who receive the “bad news” that they don't know much ([Eil and Rao 2011](#)). Stated preferences are one way to test these kinds of relationship between knowledge, information and the updating process.

Using the same device of an introductory quiz, [LaRiviere et al. \(2014\)](#) evaluate individuals' knowledge about a rather unfamiliar environmental good, cold water corals. Cold water corals are currently threatened by a number of marine activities such as deep sea fishing, oil and gas exploration and mineral extraction. [LaRiviere et al. \(2014\)](#) use a “valuation workshop” format to test the ex-ante knowledge of members of the general public (n=397) in Norway about cold

water corals.⁶ Half of respondents were then told, in confidence, how well they had done on this quiz in terms of the number of correct answers. Respondents were randomly assigned to this treatment. A standard choice experiment on protection strategies for cold water corals was then undertaken.

Results were very interesting. First, the causal effect of objective signals about the accuracy of a subject's knowledge for cold water corals dramatically affects WTP for their protection: informing people about their score causes an increase of \$150-\$200 in WTP for well-informed individuals. However, no such effect was found for less informed subjects. The results imply that WTP estimates for public goods are not only a function of true information states of the respondents but *beliefs* about those information states.

4.2 Testing compensatory choice

One of the 4 axioms underlying the rational choice model of consumer theory is that of continuity: there is always some increase in consumption of one good or desirable attribute which can compensate an individual for a decline in another good or desirable attribute. The notion of a continuous pattern of potential trade-offs is used to define marginal WTP for an increase in a good, and underlies the idea of a smooth indifference curve between two goods from which an individual derives utility. The implication is that for any potential decrease in environmental quality, there is always some increase in income that can fully compensate an individual for this change. However, quite early on in the history of CV, researchers identified a range of situations in which some individuals seem to refuse such trade-offs, in that they were unwilling to state any increase in income which would compensate for a prospective

⁶ For more detail on the survey procedures, see [Aanesen et al. \(2015\)](#).

environmental loss. Such instances were classified by some as an instance of lexicographic preferences, and authors such as [Spash and Hanley \(1995\)](#) and [Rekola \(2003\)](#), and explained by reference to ethical positions taken by some respondents for environmental losses. An implication is that if many individuals have such preferences, then this violates the Kaldor-Hicks potential compensation test which is the main under-pinning of cost-benefit analysis as a way of providing guidance on the social efficiency of public sector project and policy appraisal.

More recently, SP has been used to investigate a related aspect of choice, namely that some individuals do not consider all of the attributes of a good when choosing ([Greene, Hensher, and Rose 2005](#)). One way to explain the tendency to ignore attributes is as a simplifying heuristic given the mental costs of fully-rational choice. This is conceptually different from lexicographic preferences, which stem from an ethical motivation rather than a cognitive burden argument. Ignoring an attribute as a way of simplifying choice tasks is also different from simply placing a lower weight on such attributes ([Carlsson, Kataria, and Lampi 2010](#)), or placing discontinuous values on attribute levels which are above or below some threshold ([Bush, Colombo, and Hanley 2009](#)).

Choice modelling in particular has been a useful tool for investigating attribute non-attendance (ANA), in terms of four issues. These are (i) how extensive is such behaviour? (ii) what is the effect of such behaviour on welfare estimates? (iii) how is such behaviour best modelled? and (iv) what explains such behaviour? The extent of ANA clearly varies across choice context and between attributes. For example, in one of the first papers to consider this issue, [Campbell, Hutchinson, and Scarpa \(2008\)](#) found that 36% of respondents did not consider all attributes in making all of their choices over possible changes to the Irish countryside. Explicitly allowing for ANA in modelling led to a fall in mean WTP for improvements to countryside attributes

by around 57%. [Colombo, Christie, and Hanley \(2013\)](#) in a CE study of biodiversity conservation policy in the UK found that although the greatest degree of attribute non-attendance was no higher than 16%, mean WTP calculated from models explicitly controlling for ANA was significantly lower for most attributes than for WTP from models not controlling for ANA.

How best to model ANA has also been the subject of much enquiry. This relates to several issues, including whether to measure ANA by asking people to report whether they attended to an attribute or whether to infer this non-attendance from the data. Both ideas can be combined with latent class modelling, which can also be used to explore what factors determine non-attendance to different attributes ([Campbell, Hensher, and Scarpa 2011](#)). Finally, a question which has much more general applicability is *why* people ignore attributes ([Alemu et al. 2013](#)). If ANA is a simplifying heuristic, then one would expect that more complex choice situations would lead to a greater degree of selective non-attendance. This provides new insights for a wider literature on the effects of changes in choice task complexity on behaviour (e.g., [Swait and Adamowicz 2001](#), [Caussade et al. 2005](#)).

One possible reason for variations in the degree of ANA across respondents is how familiar they are with the good being valued. [Sandorf, Campbell, and Hanley \(forthcoming\)](#) use the quiz score obtained from Norwegian respondents in the SP study on cold water corals referred to above to explain the degree to which an individual is more or less likely to attend to the attributes in a choice experiment. They find that knowledge is related to estimated ANA, but not in a simple way. Scoring above the average on the quiz, a measure of high knowledge, is associated with an increase in the predicted probability of attending to the Size, Industry and Habitat attributes, and a decrease in the predicted probability of attending to the Cost attribute. They also find that not allowing for ANA produces a significant increase in estimated WTP.

4.3 The effects of social norms on values

There is now a considerable interest in economics in the role of social preferences in individual choice ([Falk, Meier, and Zehnder 2013](#)). Social preferences may be described as concern for the well-being or views of others (“other-regarding preferences”), and as a concept take in motivations for individual choice such as reciprocity and fairness. People’s utility functions can be thought of as being compartmentalised into selfish concerns and concerns for others. Moreover, whilst I may care about the outcomes of choice or policies in terms of how well-off others are than me, I may also care about whether others think badly or well of me for making a particular choice. I may wish to change my behaviour in the direction of what others do, or towards what others expect me to do. Such social norms incorporate both what I think others do, and what I believe they would like me to do. Providing information on a social norm, or manipulating such social norms so they become more or less strict may influence an individual’s choices and thus behaviour. SP methods are a good way of investigating this.

Social norms have been argued to play a stronger role in environmental decisions than other kinds of decisions – for example, in determining our willingness to recycle more, or to reduce our energy use. [Brekke, Kipperberg, and Nyborg \(2010\)](#) argue that people who are “duty-orientated” exhibit different pro-environmental behaviours than others. Duty-oriented people attach a high weight to their self-image as socially responsible individuals. [Videras et al. \(2012\)](#) find that, for a sample of over 2,000 US households, intensity and strength of social ties, and pro-environment community norms, are linked to recycling behaviour: “...individuals who have strong connections with neighbours and who think most neighbours do things to help the environment are more likely to recycle” (p.42). [Bruvoll, Halvorsen, and Nyborg \(2002\)](#), in a survey of 1,162 Norwegian citizens, find that the most frequently cited motivation for home sorting of recyclables was “I should do what I want others to do”.

Stated preference methods provide a way of testing for the effects of different kinds of social norm on intended behaviour or on stated WTP. [Czajkowski, Hanley, and Nyborg \(forthcoming\)](#) use a choice experiment on household waste collection options to investigate the effects of social norms on preferences for recycling. Individuals were asked to choose between different waste collection contracts described in terms of how much waste separation was required (and thus the extent of home sorting of recyclables needed), how often waste was collected, and the cost of the contract. In an earlier study ([Czajkowski, Kądziela, and Hanley 2014](#)), the authors had found that, even though home sorting is costly to individuals in time and effort, a majority of respondents had a preference for more home recycling, even when the total amount of recycling at the municipal level was held constant. [Czajkowski, Hanley, and Nyborg \(forthcoming\)](#) asked a sample of Polish households to provide information on a range of indicators of their attitudes towards recycling, by indicating the extent to which they agree with the following statements:

- *better* – “Sorting waste at home would be more thorough than at a central sorting facility”
- *troublesome* – “Sorting waste at home is troublesome”
- *satisfying* – “Sorting waste myself would give me a satisfaction”
- *careful* – “If I sort waste, I would do it carefully”
- *moral-duty* – “Sorting waste at home is my moral/ethical duty”
- *neighbours-judge* – “My neighbours will judge me unfavourably, if I don’t sort waste at home”
- *i-judge* – “I judge neighbours who don’t sort waste at home unfavourably”
- *cost-saving* – “Sorting waste will allow to reduce my bills”

Likert scale responses on a scale of 1 to 5 indicating agreement or disagreement with these statements were used as variables could explain underlying, unobserved latent variables which in turn were interacted with preference parameters for recycling and waste collection.

Results from a hybrid mixed logit model showed that people who agreed more strongly with our two social norm indicators “My neighbours will judge me unfavourably, if I don’t sort waste at home” and “I judge neighbours who don’t sort waste at home unfavourably” scored higher on a latent variable (labelled LV1 in the paper) which was associated with stronger preferences for greater levels of home recycling (sorting waste into more categories). That is, those who stated that social norms were more important to them had a significantly stronger preference for recycling waste into more categories, and thus for home recycling. These individuals were WTP more for a waste contract which required such higher levels of home recycling. In future work, it would be interesting to see how stated intentions to recycle vary with the strength of a social norm, and with its degree of geographic or cultural proximity to an individual.

4.4 The role of emotions in economic choices⁷

A large literature in behavioural sciences and psychology suggests that emotions affect people’s decisions in a wide range of settings ([Elster 1998](#), [Loewenstein 2000](#)). However, emotions have not featured much in economists’ explanations for how people make choices, nor in their ideas on what determines preference heterogeneity. [Rick and Loewenstein \(2008\)](#)

⁷ Note this section is based on joint work with Christopher Boyce, Mike Townsend and Steve Tucker. See [Boyce et al. \(forthcoming\)](#) for full details.

argue that three types of emotions can be important in shaping behaviour. First, emotions might be attached to the expected outcome of a choice. For instance, deciding to go and watch my local football team (St Johnstone FC) may make me anxious but comforted. Second, emotions might be attached to the decision making task itself: for instance, I feel nervous in deciding to go rock climbing with a new partner. They argue that both of these types of emotions (anticipatory emotions and integral emotions) can easily be included in a conventional economic model of rational choice, since they are part of the pay-offs from choosing a particular action or alternative. However, a third class of emotions, known as incidental emotions, would seem to matter for decision-making according to evidence in behavioural science.

Incidental emotions occur at the moment of the decision, but are irrelevant to its payoffs. People may be angry, sad or fearful whilst making important decisions for reasons unconnected with the decision itself. For example, an individual may be sad from thinking about an argument they had that morning, or they might be happy from the fact that it happens to be a sunny day. Incidental emotions are known to influence high level cognitive processes, such as interpretation, judgement, decision-making, and reasoning ([Blanchette and Richards 2010](#)) and it has thus been suggested that incidental emotions have the power to “reprogram us into effectively different people” ([Loewenstein 2000](#)).

If incidental emotions do affect our choices, then this is a problem for applied welfare economics and for rational choice theory. If revealed *or* stated values are dependent upon an individual's emotional state at the time benefits or costs are measured, then this introduces a source of context dependence which the Kaldor-Hicks criterion underlying Cost-Benefit Analysis (CBA) was not intended to deal with. If choices are indeed affected by incidental

emotions, then this would create problems for benefit-cost analysis, since it would result in a highly volatile context-dependence for welfare measures.

Hanley et al (2016) implement a CE in an experimental lab setting to test whether incidental emotions do indeed affect stated preferences. A standard choice experiment was designed which focussed on changes in coastal water quality in New Zealand. Before they completed the associated choice tasks, student participants were allocated into one of three treatments. In each treatment, they viewed a short compilation of movie clips which previous research had shown to be effective into inducing the incidental emotions of sadness or happiness ([Feinstein, Duff, and Tranel 2010](#)). Importantly, these movies were completely unconnected with the environmental good over which people were choosing. We included a third treatment of “neutral” film clips – Table 2 lists the clips used – and tested whether the films had been successful in inducing a particular emotional state by asking people to report at the end how the films had made them feel. The sad and happy film clips were indeed effective at inducing sadness and happiness respectively.

We then test whether people’s emotional state at the time of completed the choice tasks affected either their estimated choice parameters or the randomness of their choices. The null hypothesis that people in a sad emotional state will have different preference parameters for coastal water quality than people in a happy emotional state was rejected at the 95% level of significance, as was the null hypothesis that people in a sad emotional state would have significantly more random choices than people in a happy emotional state. Moreover, we could find no evidence of a treatment effect on estimated WTP for environmental improvements. This suggests that incidental emotions do not provide explanatory power in terms of preference heterogeneity in a stated preference context. Whilst being a “comforting” finding relative to the standard economic model of choice and applied welfare economics, it is important to ask why no effect

could be found in a stated preference context whereas other researchers report effects on actual behaviour. One possible explanation may lie with the fact that participants in our experiment were making choices over public, environmental goods. All of the behavioural evidence to date relates to private goods or behaviours. Another possible explanation lies in the theory of planned behaviour, which suggests that mitigating factors such as feelings of control or agency drive a wedge between what we plan to do and what we actually do.

Table 2: Film clips used to induce incidental emotions in each of the experimental conditions

Experimental Condition	Clip 1	Clip 2	Clip 3	Clip 4	Total Time
Sadness (negative valence)	The Champ (Child experiences his hero's death – 2:42)	Born on the 4 th of July (Man injured from war has returned home and is distraught – 1:59)	Forest Gump (Man is at the graveside of his love – 2:01)		6:42
Happiness (positive valence)	Ladder 49 (Man finds out his wife is pregnant – 1:18)	Love actually (Man proposes to a woman – 2:21)	Love Actually (People meeting loved ones at the airport – 1:19)	Indiana Jones (Children return home to their parents – 1:16)	6:14
Neutral	Stock market report (Woman reports on the stock market – 1:30)	Golf grip video (Man describes how to grip a golf club – 1:51)	Abstract painting (Woman describes acrylic painting techniques – 1:06)	Antiques auctions (Man describes items sold at an antiques auction – 1:26)	5:53

5. Summary – new directions for Stated Preferences?

In this last section of the paper, we speculate briefly on some areas where SP methods may be useful in the future.

First, economists and behavioural scientists have thought about conceptual differences between anticipated utility, experienced utility and remembered utility. Stated preferences offer one way of trying to parse between these different measures for a particular change in a public good, which may also cast light on the extent to which utility from the act of donating or paying for such an increase can be separated from the utility obtained from the outcome of such a decision.

Another field where we think SP methods could be particularly useful in the future is investigating deep, underlying factors of consumers' choices. This concept is not new and has been extensively studied in psychology and experimental economics. SP methods have traditionally focused on socio-demographics as the drivers of preference heterogeneity – partly because of their policy relevance, and partly because of endogeneity concerns associated with incorporating attitudinal responses into random utility models directly ([Budziński and Czajkowski 2016](#)). It is now clear, however, that there are other, potentially more revealing concepts which could explain respondents' choices, such as emotions, personality types, social and moral norms, and social network effects ([Chorus 2015](#)). Although mainstream economic theory deals with individual preferences and choices under budget constraint, in practice people often engage in bargaining on different levels – from households ([Lindhjem and Navrud 2009](#), [Rungie, Scarpa, and Thiene 2014](#)) to communities and societies (e.g., [Wilson and Howarth 2002](#), [MacMillan, Hanley, and Lienhoop 2006](#)). Investigating the ways in which collective decisions are made is a yet another promising application of SP methods, particularly when combined with the power provided by structural econometric models ([Ben-Akiva et al. 2002](#)).

Personality in particular seems an interesting prospect for a measurable, relatively stable “deep” underlying driver of economic choices and values ([Boyce, Wood, and Ferguson 2016](#)) which

stated preferences techniques can be used to investigate. Boyce et al comment that: "...*The use of personality psychology (an area of psychology focusing on individual differences in reaction) has the potential to instigate a (new) wave of behavioural economics to predict individual specific reactions to economic circumstance*". We thus see an exciting future research agenda for SP methods, which establishes greater connections between economics and the other behavioural sciences.

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