



Hanley, N. and Czajkowski, M. (2019) The role of stated preference valuation methods in understanding choices and informing policy. *Review of Environmental Economics and Policy*, 13(2), pp. 248-266.

(doi: [10.1093/reep/rez005](https://doi.org/10.1093/reep/rez005))

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Deposited on: 7 May 2019

# **The Role of Stated Preference Valuation Methods in Understanding Choices and Informing Policy**

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## Abstract:

This article examines the role of Stated Preference (SP) valuation methods in the environmental economist's toolbox. Overall, the article makes the case for using SP methods in a wide range of settings, showing how the approach can be used to both inform policy and gain a better understanding of people's choices and preferences. First, we provide an overview of SP methods and discuss a number of policy design issues where we believe SP methods have advantages over alternative approaches. The ability of SP to overcome "hypothetical market bias" is briefly reviewed. Next, we discuss how SP methods can be used to address research issues concerning people's preferences and choices, which have broader implications for economics and behavioural sciences. These research issues are (a) the effects of information, learning and knowledge; (b) testing the validity of the standard model of consumer choice; (c) the influence of behavioural drivers such as social norms; and (d) the role of "deep" determinants of preference heterogeneity such as emotions and personality. Finally, we identify some research areas where SP methods may be particularly useful in the future.

*JEL codes*

Q51; D6; H4

*Keywords*

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

*Acknowledgements*

Mikołaj Czajkowski gratefully acknowledges the support of the National Science Centre of Poland (Opus 2017/25/B/HS4/01076). We both thank two anonymous reviewers for their comments on an earlier version of the article.

## INTRODUCTION

This article examines the role of Stated Preference (SP) methods in the environmental economist's toolbox.<sup>1</sup> SP methods rely on information on consumer choices that are made in experimentally-controlled hypothetical settings, in contrast to Revealed Preference (RP) methods, which gather information by observing individuals' actual market choices (Carson and Czajkowski, 2014). The most prominent use of SP methods has been for studying people's preferences and Willingness-to-Pay (WTP) for non-market goods. We have two main objectives for this article: first, to show how useful SP methods are to environmental policy analysis, and second, to discuss the role of SP methods in addressing research issues concerning people's preferences and choices, which have broader implications for economics and behavioural sciences.<sup>2</sup> These research issues are: (1) the effects of information, learning and knowledge on individuals' choices; (2) testing the validity of the standard model of consumer choice; (3) the influence of behavioural levers such as social norms on individual choice; and (4) the role of "deep" drivers of preference heterogeneity such as emotions and personality. Overall, we make the case for using SP methods in a wide range of settings, relying on examples from recent work to illustrate how the approach can be used to both inform policy and gain a better understanding of people's choices and preferences.

We begin in the next section with an overview of SP methods, highlighting their advantages over RP methods and discussing the debate about the validity of SP methods. In the following

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<sup>1</sup> This article is part of a symposium on the state-of-the art of environmental valuation methods. The other articles in the symposium are Alberini (2019), which compares stated and revealed preference studies concerning the estimation of the Value of a Statistical Life and the energy efficiency gap, and Mendelsohn (2019), which reviews revealed preference valuation methods and recent studies.

<sup>2</sup> We do not discuss how to undertake SP studies, since much has been written on this topic ([Hanley and Barbier 2009](#)). For a comprehensive discussion of emerging guidelines on how best to undertake SP studies, see [Johnston et al. \(2017\)](#).

two sections, we summarize the benefits of using SP approaches, first in policy analysis and then in understanding people's preferences and choices in a broader context. The final section discusses future directions for SP research.

## **AN OVERVIEW OF STATED PREFERENCE METHODS**

In SP studies, respondents' hypothetical choices are used as data to infer their preferences and their WTP for changes in environmental goods.<sup>3</sup> The analysis typically draws on random utility theory ([McFadden 1974](#)). Estimating the utility function parameters for changes in environmental goods (or their attributes) and income allows for the calculation of marginal rates of substitution, and thus the marginal WTP for these changes. In the remainder of this section, we first present an overview of SP approaches. Then we discuss the advantages of SP methods over the main alternative approach to valuation – Revealed Preferences. Finally, we discuss the debate about the validity of the SP approach and ongoing efforts to refine and improve SP methods.

### **SP Approaches**

There are two main approaches to SP valuation – Contingent Valuation (CV) and Choice Experiments (CE). Environmental economics researchers first started using CV to a significant extent in the mid-1970s (e.g., [Brookshire, Ives, and Schulze \(1976\)](#); [Randall, Ives, and Eastman \(1974\)](#)). The CE method was developed later, in the 1980s ([Louviere and Woodworth 1983](#)), and was first applied in environmental economics in the 1990s ([Carson, Hanemann, and Steinberg 1990](#), [Adamowicz, Louviere, and Williams 1994](#), [Hanley, Wright, and Adamowicz 1998](#)).

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<sup>3</sup> SP methods are also used to examine changes in states of health and in transport economics.

To explain how CV and CE approaches differ and how they can be used, suppose we are interested in how much an individual will benefit from extending the area of forest in their neighbourhood. The value of this change to the individual could be measured using either CV – in which people are asked to express their WTP for such a policy as a whole – or a CE, in which, consistent with the Lancasterian perspective on utility ([Lancaster 1966](#)), the forest is described in terms of a collection of its characteristics or attributes; combinations of levels of these attributes are then used to describe alternatives that are presented to respondents, who are asked to choose the alternative that they consider the best ([Hanley, Wright, and Adamowicz 1998](#)). For example, people could be asked whether they would vote yes in a referendum regarding a policy that would provide a specific change to a particular forest if this meant an additional cost to them (CV approach). Or they could be asked to choose from among a series of alternatives representing potential forest policies, described in terms of experimentally-varied combinations of attribute levels that represent possible future changes to the forest (its size, age structure, recreational facilities) and the cost to the respondent (CE approach). Which of these two approaches is best typically depends on the research or policy question at hand.<sup>4</sup>

A very large number of SP studies have now been published in the literature, and their use has been increasing. The overall number of valuation studies published each year is growing, with

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<sup>4</sup> Note that there is not a consensus in the SP literature concerning the best categorization of SP methods. Although historically, CEs were proposed as an alternative approach to CV, [Carson and Louviere \(2011\)](#) argue that CEs are merely a form of elicitation used in CV studies. Thus, not all CVs are CEs (e.g., when they use non-discrete choice formats) and not all CEs are CVs. In practice, single choice format studies (yes or no to a new policy at a cost, using payment cards, etc.) are usually referred to as CVs, while studies that use many choices and/or a choice from many alternatives for a single respondent are usually referred to as CEs.

SP approaches more frequently cited than RP approaches, such as hedonic pricing<sup>5</sup> and travel cost models,<sup>6</sup> as a methodology for estimating non-market values.<sup>7</sup>

### **Advantages of SP Methods**

In principle, SP approaches have three clear advantages over RP methods. First, SP methods make it possible to measure WTP for sets of environmental goods that do not currently exist, such as a new forest park or reductions in local air pollution below the minimum currently observed in a city. Second, the ability to exogenously and systematically vary the attributes of alternatives from which the respondent chooses serves the joint purpose of allowing for causal inference (cf. [Angrist and Pischke 2010](#)) and increasing the efficiency of the estimation of preference parameters ([Scarpa and Rose 2008](#)). Third, SP methods allow us to estimate non-use values – values that people may hold for goods even if they do not directly use them – which leave no “behavioural trail” for RP methods to exploit. Non-use values have been shown to be important components of economic value for many environmental resources ([e.g., Aanesen et al. 2015](#)), which means this is an important comparative advantage of SP over RP methods. However, a clear disadvantage of the SP approach is that it is based on responses in hypothetical markets rather than on actual behaviour, which means there is a potential for hypothetical bias, whereby stated WTP amounts differ in a systematic fashion from the unobserved but true WTP. We consider this potential problem in detail next.

### **Hypothetical Bias and the Debate about the Validity of SP Methods**

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<sup>5</sup> This method is based on observing the effects of environmental qualities or attributes on the prices of market goods (e.g., houses and proximity to parks).

<sup>6</sup> This method estimates the demand for visiting a site, with travel cost used as a proxy for the market price of this good.

<sup>7</sup> See Appendix Figure 1 for details.

Almost from the start of their use in environmental economics, SP valuation methods uncovered behaviour that was thought to be potentially at odds with the standard neoclassical economic theory describing consumer choice and welfare measurement ([Carson and Hanemann 2005](#)). These anomalies were sometimes attributed to the hypothetical nature of SP choice settings. Simply put, hypothetical bias means people systematically over- or under-state their WTP values in an SP exercise because no actual payment is made or received in exchange for an actual change in the quantity or quality of a good. In fact, many of the observed anomalies (such as differences between WTP and Willingness To Accept compensation – WTA) were later shown to be quite robust across a range of non-market and market situations, and to exist well beyond SP applications ([Poe 2016](#)). Nonetheless, the issue of hypothetical market bias remains a key target for critics of SP methods.

The economics profession's response to hypothetical bias has varied, ranging from rejecting SP methods altogether, to ignoring the problem, to attempting to improve survey design methods in general and developing ex-ante / ex-post methods to reduce hypothetical bias in particular ([Carlsson, Kataria, and Lampi 2016](#)). As a result, it became obvious that poor survey design and administration could easily induce all sorts of anomalous behaviours, including but not restricted to hypothetical bias. On the other hand, CV studies that invest considerable effort to understand people's decision processes, that present a credible choice scenario with a well-defined good and a coercive payment mechanism, and that include a survey design that enhances the respondent's belief in outcome and payment consequentiality generally appear to produce results that are well-behaved and robust.

Insights from mechanism design theory (the theory of designing economic mechanisms and incentives in strategic settings) have led researchers to choose the best response formats for mitigating hypothetical bias, thus maximising the extent to which SP methods are able to reveal



the underlying demand for environmental goods (e.g., [Mitchell and Carson 1989](#), [Carson and Groves 2007](#)). The aim of such efforts was to make the statement of respondents' true preferences (their true maximum WTP) their best available strategy: that is, to make survey questions *incentive compatible*. The necessary (but not sufficient) conditions for ensuring incentive compatibility identified in the literature thus far are:

1. Respondents need to see the survey as being consequential. That is, they should view their responses as potentially influencing the supply of a public good and the costs of this change to them ([Vossler, Doyon, and Rondeau 2012](#));
2. The payment must be coercive. That is, the payment vehicle must be able to impose costs on all individuals if the government undertakes the project ([Carson and Louviere 2011](#));
3. The survey should be viewed by respondents as a take-it-or-leave-it offer, which means that they must not see their stated choices as influencing any future choice situations ([Carson, Groves, and List 2014](#)).<sup>8</sup>

The debate over the validity of SP methods over the last 30 years has been very lively, particularly when fuelled by use of the approach in high-profile environmental disasters such as the Exxon Valdez and Deepwater Horizon oil spills (e.g., [Carson 2012](#), [Hausman 2012](#), [Kling, Phaneuf, and Zhao 2012](#), [Bishop et al. 2017](#), [McFadden and Train 2017](#)). Overall, while we would not argue that *all* existing SP approaches lead to valid measures of respondents' true preferences, we believe that enough is currently known about "best practice" concerning SP study design and implementation for the estimates from such studies to provide useful information for economists and policy analysts ([Johnston et al. 2017](#)). Thus, in the remainder

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<sup>8</sup> In addition to the above, there are more specific recommendations for a range of incentive compatible payment formats (e.g., [Vossler, Doyon, and Rondeau 2012](#), [Carson, Groves, and List 2014](#), [Vossler and Holladay 2018](#)).

of the article, we assume that SP studies do indeed deliver estimates of values that are relevant for economists and meaningful for policy analysis.

## USING SP METHODS IN POLICY ANALYSIS

SP methods have been widely used in policy analysis in both developed and developing countries to provide information on the economic benefits or costs of policies that affect environmental quality, or where a change in environmental quality is a side-effect of a policy. In this section, we briefly describe the use of SP methods in a number of specific contexts: in water quality policy; in predicting adoption of Payment for Ecosystem Services schemes; and in reducing illegal wildlife hunting

### **Water Quality Policies in the United Kingdom and United States.**

[Atkinson et al. \(2018\)](#) provide a historical perspective on the use of SP methods in policy appraisal in the United Kingdom (UK), where SP methods have been approved as part of benefit-cost analyses of public policies impacting the environment ([HM Treasury 2013](#)). One focus for SP work has been in the analysis of water quality improvements. This has included analyses of implementation of the EU Water Framework Directive ([Hanley et al. 2006](#), [Metcalf et al. 2012](#)) and strengthening of minimum standards for coastal water quality for bathing ([Hanley, Kriström, and Shogren 2009](#)). SP methods have also been used to measure the benefits of designating new Marine Protected Areas (e.g., [McVittie and Moran 2010](#), [Karlöševa et al. 2016](#)) and in setting standards for improvement of low-flow rivers ([Hanley, Schläpfer, and Spurgeon 2003](#)).

In the United States, data from SP studies have been used as the foundation for benefits transfer models, which allow the transfer of benefit values between different bodies of water for which improvements are under consideration – in order to inform policy on surface water quality improvements. In particular, SP methods have allowed benefits transfer models to be combined with water quality models that predict the physical changes in surface waters when water quality stressors are changed ([Griffiths et al. 2012](#)). This means that benefits can be attached

to specific changes in water quality under a range of policy scenarios. Non-use values (along with health benefits and recreational values) have often been a significant part of the total non-market benefits of such water quality improvements; and guidelines have been provided for the incorporation of non-use values in a wide range of US policy settings ([US EPA 2014](#)). In fact, between 1982 and 2009 the US Environmental Protection Agency (EPA) included estimates of improvements in non-use values in 13 of 16 regulatory assessments related to water quality ([Griffiths et al. 2012](#)).

### **Predicting Adoption of Payment for Ecosystem Services Schemes**

Another area in which SP methods have been useful for policy analysis is in predicting the adoption of Payment for Ecosystem Services (PES) schemes by farmers and other land managers ([Espinosa-Goded, Barreiro-Hurlé, and Ruto 2010](#), [Broch and Vedel 2011](#), [Villanueva et al. 2015](#), [Villanueva, Glenk, and Rodríguez-Entrena 2017](#), [Zagórska et al. 2017](#), [Hasler et al. 2018](#)). Such contracts can vary greatly in terms of the specific pro-environmental actions required of farmers, and details such as length of contract and monitoring requirements. Payment rates are also a key variable for predicting adoption. These contract characteristics can be used as the design attributes in a CE, which is then administered to a sample of farmers or foresters who might be targeted by such a programme. For example, [Sheremet et al. \(2018\)](#) considered a policy of offering contracts aimed at increasing Finnish forest owners' efforts to engage in costly pest and disease control measures, based on the assumption that the social benefits of such actions would outweigh the private benefits.<sup>9</sup> They found that participation rates were likely to depend on the length of contract offered, the management options required, the payment rate for participation, and a bonus offered if neighbours also enrolled in the scheme.

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<sup>9</sup> See Figure 1 in the online supplementary materials for an example choice card.

They also found that there was considerable variation in how any of these contract characteristics affected stated willingness to enrol in the scheme, and that this variation in preferences was partly explained by observable factors describing the forester, for example their experience with a forest disease and their attitudes toward cooperating with neighbours on disease control.

### **Reducing Illegal Wildlife Hunting**

Another policy setting where SP methods have been useful (and have an advantage over RP approaches) concerns efforts aimed at reducing illegal behaviour that has environmental implications. 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 estimates of how those involved in both the supply of and demand for illegal wildlife products would respond to changes in institutions and prices. SP methods can be used to address both the supply side and the demand side of such issues, precisely because data on *actual* behaviour is difficult to acquire since these behaviours are illegal ([St John et al. 2011](#)).<sup>10</sup>

[Moro et al. \(2013\)](#) undertook a CE to examine how changes in livelihood factors (such as the number of cattle a household owns) could be used to reduce illegal hunting of bushmeat in the Serengeti. Illegal bushmeat hunting has long been recognised as being not only a significant threat to wildlife populations, but also an important source of income for the poorest people in rural Africa. [Moro et al. \(2013\)](#) interviewed households in villages around the western edge of

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<sup>10</sup> Of course, it can also be difficult to ask stated preference questions concerning illegal behaviour; thus both the nature of the hypothetical market and the framing of choices need to be carefully considered.

the Serengeti to learn about their preferences concerning different livelihood strategies, including time spent by household members in illegal bushmeat hunting.<sup>11</sup> Holding well-being constant, the authors were then able to estimate the relative effectiveness of different policy options to reduce illegal hunting activity. They found that trade-off rates between days spent illegally hunting, cattle owned by the household and labour income varied depending on household wealth, with between 0.5 and 9.5 additional cows needed to compensate for giving up one week of illegal bushmeat hunting.<sup>12</sup>

To illustrate the demand side of illegal behaviour, we consider the issue of illegal hunting of rhinoceros. The demand for rhino horn represents an immediate threat to the survival of rhino species globally ([Milliken et al. 2012](#)). To counter the illegal international wildlife trade, the global community, through organisations such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and international wildlife NGOs, is pursuing both supply-side trade restrictions and demand reduction through measures such as trade restrictions and support for patrol efforts in protected areas. However, poaching rates remain stubbornly high, due partly to the very high prices for ivory and rhino horn ([Hsiang and Sekar 2016](#)). With these issues in mind, [Hanley et al. \(2016\)](#) use a CE to examine the impact of legalising the trade in rhino horn products on the demand from consumers in South-East Asia, who purchase rhino horn products mainly for medical reasons. Specifically, participants were asked to choose between different rhino horn-derived products that varied 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 of

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<sup>11</sup> See Figure 2 in the online supplementary materials for an example choice card.

<sup>12</sup> See Table 1 in the online supplementary materials for details.

rhino horn.<sup>13</sup> Two choice contexts were used. In the first, consumers were asked to make their choices under the assumption that the current ban on international trade in rhino horn remains. In the second, they were asked to consider how they would choose if the ban were to be lifted. The results indicate that the WTP for any rhino horn product included in the CE was lower under the legalised trade scenario than under the illegal trade scenario, which suggests that if trade were legalised, demand would actually fall. Perhaps consumers are willing to pay more for the prestige of consuming an illegal product.

### **USING SP METHODS TO IMPROVE UNDERSTANDING OF PEOPLE'S PREFERENCES AND CHOICES**

In this section, we turn our attention to the use of SP methods to explore and test theoretical models of how people make choices concerning the environment, and how they form their WTP values for changes in environmental quality. Thus, in this case, SP methods are being used more as a tool for examining conceptual ideas than for addressing a particular policy analysis need. We discuss how SP methods have been useful for increasing understanding of four issues related to people's preferences and choices concerning the natural environment. These are:

- i. the effects of information, learning, and knowledge on preferences or WTP;
- ii. the validity of the standard model of consumer choice;
- iii. the effects of social norms on individual choice; and
- iv. the role of emotions and personality in economic choices.

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<sup>13</sup> See Figure 3 in the online supplementary materials for details.

## **The Effects of Information, Learning and Knowledge on WTP<sup>14</sup>**

There is a large literature, dating back to the early days of CV, that examines how information provided in a survey about a public good affects respondents' WTP for that good. SP methods have turned out to be useful for empirically testing the effects of information and knowledge on WTP ([LaRiviere et al. 2014](#)). For example, SP studies have shown that how much a subject knows about a good before a survey begins is often correlated with their WTP, and, not surprisingly, that people tend to know more about things they care about or have experience with ([Czajkowski, Giergiczny, and Greene 2014](#)). [Czajkowski, Hanley, and LaRiviere \(2016\)](#) find that less informed subjects may be more likely to be influenced by “new” information about a good. Participating in a SP survey requires respondents to “stop and think” about a prospective environmental quality change, which may in itself affect their approval or disapproval of a proposed policy change or project.<sup>15</sup> This has sparked an interest in considering the combined effects of ex ante knowledge and new information that are revealed in an SP study.

[Needham et al \(2018\)](#) and [Czajkowski et al. \(2016\)](#) use SP methods to examine how providing information about the attributes of an environmental public good – in this case, a coastal wetlands restoration project – affects knowledge, and how that new knowledge affects the distribution of WTP for the good, given people's ex ante knowledge level. In these two studies, the subjects' prior knowledge levels about the good's attributes were elicited and different amounts of new information about the good's attributes were provided. Subjects then stated their maximum WTP for the good. Finally, the subjects' ex post knowledge about the good

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<sup>14</sup> The discussion here draws heavily on our work with Jake LaRiviere.

<sup>15</sup> We thank one of the referees for pointing this out.



was measured. Because the authors exogenously varied the information provided in the experiment, they were able to identify causal estimates of the marginal effect of new information on people's knowledge and the marginal effect of changes in knowledge on WTP for the good, given a subject's *ex ante* level of knowledge.

Three main results emerged. First, as subjects were given more information, their marginal learning rates decreased. Second, new knowledge about a good's attributes did not significantly affect WTP for the good. Third, there were systematic correlations between *ex ante* levels of information and WTP – subjects that were *ex ante* more knowledgeable valued the good differently (i.e., their WTP was different) from those who were *ex ante* less knowledgeable. However, learning additional information did not affect these valuations, holding the *ex ante* knowledge levels fixed, indicating that researchers' decisions about how much information to provide in an SP study may not have systematic effects on the mean WTP. This suggests that researchers should instead focus on measuring *ex ante* knowledge about the good across respondents in their sample.

[LaRiviere et al. \(2014\)](#) examine the effects of an external signal being provided to subjects concerning how much they know about an environmental good. The authors hypothesize that if an individual is told that their knowledge about an environmental good is lower than average, then they would likely place a relatively high weight on new information in updating their priors about the characteristics of the environmental good. More specifically, they suggest that individuals who receive “good” news about their knowledge (i.e., that their knowledge is higher than the average for their peers) may react differently to new information than individuals who receive the “bad” news that they do not know as much as others in their social group ([Eil and Rao 2011](#)).

To test this hypothesis, [LaRiviere et al. \(2014\)](#) use SP methods within a workshop-based survey through which members of the public in Norway are tested on their ex-ante knowledge about the conservation of cold water corals.<sup>16</sup> Half of the 397 respondents were told, in confidence, how well they had done on this “quiz” in terms of the number of correct answers – whether their score was higher than the average for that session (good news) or lower (bad news). Then the authors undertook a standard CE concerning protection strategies for cold water corals. The results indicated that these external signals about a subject’s knowledge of the conservation of cold-water corals dramatically affect “well-informed” individuals’ WTP: informing such individuals about their score caused an increase in WTP for extending protected areas that safeguard cold water corals from development pressures such as deep-sea mining by \$85-\$129 per year. However, no such effect was found for less informed individuals. These results suggest that WTP estimates for public goods are a function of both the information states of respondents (how much I know) and their *beliefs* about those information states (how much I think I know).

It is not clear whether the results described above are transferable to other SP contexts, but these studies illustrate the advantages of using an SP approach to investigate the effects of information and knowledge on the value people place on environmental change.

### **Testing the Validity of the Standard Model of Consumer Choice**

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<sup>16</sup> For more detail on the survey procedures, see [Aanesen et al. \(2015\)](#).

One of the assumptions underlying the standard consumer choice model in economics concerns *continuity*. That is, there is always some increase in consumption of one good or desirable attribute that can compensate an individual for a decline in the consumption or availability of another good or desirable attribute. This notion of a continuous set of potential trade-offs is used to define marginal WTP or WTA for a change in the quantity or quality of a public good.<sup>17</sup> In the discussion that follows, we summarise the findings from SP studies that examine choice processes, in particular whether people pay attention to all of the attributes used by researchers to describe a good. However, it is possible that people will refuse trade-offs that they find unacceptable, for instance, for ethical reasons; we first consider evidence on this apparent violation of the standard economic model of choice.

Quite early in the history of CV, researchers identified a range of situations in which some individuals appear to refuse trade-offs between environmental quality and income. Some respondents indicated that there was no increase in income that would sufficiently compensate them for a prospective environmental loss such as a decline in biodiversity ([e.g., Spash and Hanley 1995](#)). Such behaviours were considered to be evidence of lexicographic preferences (i.e., refusals to trade off decreases in one set of goods against increases in another set of goods, because any level of environmental quality is preferred to any amount of income). Such lexicographic preferences can be explained by reference to ethical positions adopted by some respondents ([Spash and Hanley 1995](#), [Rekola 2003](#)). This finding violates the main underpinning of benefit-cost analysis as a way of providing guidance on the social efficiency of public sector project and policy appraisal, since the Kaldor Hicks principle requires that all losses can *potentially* be offset (in terms of aggregate welfare) by equivalent gains. However,

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<sup>17</sup> This also underlies the idea of a smooth indifference curve between two goods from which an individual derives utility.

this finding also raises the issue of whether a small number of individuals with such rights-based beliefs can effectively veto a project from which many others would gain.

More recently, SP methods have been used to examine another challenge to the standard model of consumer choice: the use of heuristics. Heuristics offer a way for consumers to simplify the choice problem and reduce cognitive burdens, given the costs of decision-making and the limited time and cognitive resources available for making decisions. One such heuristic is to *ignore* some of the attributes of a good when making choices ([Hensher, Rose, and Greene 2005](#)), a phenomenon known as *Attribute Non Attendance* (ANA). This is different from simply placing a lower utility weight on such attributes ([Carlsson, Kataria, and Lampi 2010](#)).

SP choice modelling has frequently been used to examine the extent, implications, and causes of such ANA. The extent of ANA seems to depend on the choice context, and can have significant implications for welfare measurement. 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 choices about possible changes to the Irish countryside. When [Campbell, Hutchinson, and Scarpa \(2008\)](#) explicitly allowed for ANA in their statistical choice model, the mean WTP for improvements to countryside attributes fell by around 57%. In another paper, [Colombo, Christie, and Hanley \(2013\)](#) found that when ANA was explicitly allowed for in a choice model, the mean WTP for conservation of biodiversity in Cambridge, England fell by a 40%.

Finally, SP methods can also be used to investigate *why* some people ignore some attributes when making choices ([Alemu et al. 2013](#)). If ANA is a way to simplify choices (i.e., a heuristic), then one would expect that more complex choice situations would lead to a greater degree of non-attendance. Another 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 \(2017\)](#) use the quiz score obtained from Norwegian respondents in the SP study discussed earlier to explain the degree to which an individual is more or less likely to pay attention to the attributes in a CE. They find that knowledge is related to estimated ANA, but not in a simple way, suggesting that knowledge of the good under consideration is not the only factor that determines how much ANA one would expect to occur.

### **The Effects of Social Norms on Individual Choice**

There is now a considerable focus in the economics literature on the effects of social norms on individual choice and the role our concern for the well-being of others plays in determining our own choices. People's utility functions can be thought of as being compartmentalised into concern for self and concern for others. Moreover, individuals may also care whether others think badly or well of them for making a particular choice, and change behaviour to follow what others do. Such "social norms" incorporate both what individuals think others do and what they believe others would like them to do, or think that they *should* do. Providing information on such social norms, or manipulating social norms so they become more or less strict, may influence an individual's choices. SP methods are a useful tool for investigating such effects. One focus for this kind of work has been the role of social norms in household decisions about how much to recycle.

[Brekke, Kipperberg, and Nyborg \(2010\)](#) find that people who are "duty-orientated" exhibit different pro-environmental behaviours than others, with duty-oriented people attaching a high weight to their self-image as socially responsible individuals. To investigate the effects of social norms on preferences for recycling, [Czajkowski, Hanley, and Nyborg \(2017\)](#) conducted a CE on household waste collection options in Poland. Individuals were asked to choose between different waste collection contracts that varied 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 for their household. They were also asked to provide information on a range of indicators of their attitudes towards recycling, in particular on how much they cared about the attitudes and behaviours of their neighbours. Their responses were used as variables that explain underlying, unobserved latent variables, which represent the role of social norms; these latent variables were then interacted with preference parameters for recycling and waste collection. The results indicated that people who agreed more strongly with 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 variable that was associated with stronger preferences for greater levels of home recycling (i.e., 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 willing to pay more for a contract that required higher levels of home recycling. These results illustrate how SP methods can be used more generally to investigate the effects of social norms on a range of pro-environmental behaviours.

### **The Role of Emotions and Personality in Economic Choices**

A large literature in behavioural sciences and psychology suggests that emotions affect people’s decisions across a wide range of settings ([Elster 1998](#), [Loewenstein 2000](#)). However, emotions have not played a significant role in either economists’ explanations for (or analyses of) how people make choices or their ideas about what determines preference heterogeneity. Behavioural scientists and psychologists have also considered personality to be an important motivating factor for human behaviour. However, economists have generally not considered personality in their analyses of choices. In the discussion that follows, we briefly review how SP can be used to investigate these two “deep” drivers of choice and preference heterogeneity.

[Rick and Loewenstein \(2008\)](#) argue that three types of emotions may affect behaviour. First, emotions may be attached to the expected outcome of a choice (e.g., going to a football match between your favourite team and a rival). Second, emotions may be attached to the decision-making task itself (e.g., an individual may feel anxious about a decision to go rock climbing with a new partner). The authors argue that both types of emotions (called anticipatory emotions and integral emotions, respectively) can easily be included in a conventional economic model of rational choice, because they are part of the pay-offs of choosing a particular action or alternative.

However, evidence from the behavioural science literature suggests that a third class of emotions – known as incidental emotions – may also matter for decision-making. Incidental emotions occur at the moment the decision is made but are irrelevant to its payoffs. That is, people may feel angry, sad or fearful while making important decisions for reasons that are not connected with the decision itself. Incidental emotions have been shown to influence high level cognitive processes, such as interpretation, judgement, decision-making, and reasoning ([Loewenstein 2000](#), [Blanchette and Richards 2010](#)).

To test whether incidental emotions affect choices concerning alternative environmental goods, we co-authored a study ([Boyce et al. 2017](#)) that involved a CE of changes in coastal water quality in New Zealand. Before completing the choice tasks, participants were assigned to one of three treatment groups. Each group viewed a different set of (5 minute) movie clips (that were unrelated to the environmental good over which people were choosing), which previous research had shown to be effective in inducing the incidental emotions of sadness or happiness ([Feinstein, Duff, and Tranel 2010](#)).<sup>18</sup> We then analysed whether people’s emotional states

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<sup>18</sup> Note that one of the three film clips was “neutral.”

affected either their estimated choice parameters or the randomness of their choices. Our findings suggest that whether people were in a sad or happy emotional state did not affect preferences for coastal water quality, or estimated WTP for environmental improvements, suggesting that variations in incidental emotions do not explain preference heterogeneity in a SP context.

Although this finding is consistent with the standard economic model of choice, it will be important to examine why no effect was found in this context, especially because other researchers have found that incidental emotions have significant effects on behaviour (as discussed above). One possible explanation may be that participants in our experiment were making choices about *public* environmental goods, whereas the behavioural evidence to date concerns choices about private goods. Thus, the extent to which emotions influence decisions in SP surveys that are intentionally designed to get agents to “slow down” and carefully think about choices involving public goods ([Kahneman 2013](#)) is a promising area for future research.

Another factor that behavioural science has identified as being important for explaining choices is personality. Personality is typically defined as patterns of thought, feelings, and behaviour that persist from one decision situation to another ([Wood and Boyce 2014](#)). According to [Grebitus, Lusk, and Nayga Jr \(2013\)](#), “... personality might serve an important role in *consistently* predicting outcomes and explaining variation in economically-relevant behaviours”. It is now possible to measure personality type using a standardised set of questions (e.g., the Ten Item Personality Inventory) that relate to the “big five” personality types: neuroticism, conscientiousness, openness, agreeableness, and extraversion ([McCrae and Costa 2008](#)).

In an application of SP methods to examine how personality affects environmental choices, [Boyce, Czajkowski, and Hanley \(2019\)](#) collected data from three CEs concerned with



improvements in coastal water quality in the Baltic region. For each respondent, we used the Ten Item Personality Inventory to derive scores that measure the degree to which each person's personality is associated with the five personality types. Using insights from the psychology literature, we predicted the role each personality type would play in (i) preferences towards improvements in water quality and (ii) the costs of implementing these improvements. Our results showed a degree of stability in preferences across the choice data sets for each personality type. These results suggest that SP could be used to investigate how personality – an easily-observed personal characteristic – explains preference heterogeneity in future studies.

## **CONCLUSIONS: FUTURE DIRECTIONS FOR STATED PREFERENCES RESEARCH**

This article has discussed what we see as the main advantages of SP methods and shown that they are useful tools both for policy analysis and for investigating a set of more fundamental and generalisable research questions. Moreover, much progress has been made in understanding what constitutes best practice in SP design, which enables us to obtain reliable and informative estimates of people's WTP for environmental improvements and their willingness to undertake pro-environmental actions. In the remainder of this section, we briefly summarize areas where SP methods are likely to be particularly helpful for understanding choices and informing policy in the future.

### **Predicting Environmental Policy Outcomes**

SP methods allow the preferences of the wider public to be considered in policy making, which most economists would agree is desirable from a welfare economics standpoint. The emergence of web-based respondent panels has driven down the costs of SP studies substantially, making

it more cost-effective to collect survey responses. Moreover, SP studies are cheaper and easier to implement as a tool for predicting policy outcomes than Randomized Control Trials. In some cases, incentivised lab experiments offer a practical alternative to SP. Such experiments, however, typically draw on non-representative (e.g., student) subjects, which is an important drawback if we are trying to estimate the preferences of those who will be affected by a policy initiative ([Cason and Wu 2017](#)). Thus we expect that SP approaches, particularly CE, will increasingly be used as a tool for predicting the effects of environmental policy.

### **Exploring Alternative Concepts of Well-being**

As noted in the previous section, SP methods have been a useful tool for examining behavioural issues related to environmental policy ([Shogren and Taylor 2008](#), [Croson and Treich 2014](#)). There is scope for much greater use of SP methods in this area. For example, economists and behavioural scientists have examined conceptual differences between anticipated utility, experienced utility, and remembered utility ([Tinch, Colombo, and Hanley 2015](#)). SP methods can be used to try to differentiate between these different measures of well-being for a particular change in a public good, which may also shed light on the extent to which the utility from the act of donating or paying for such a change can be separated from the utility obtained from the outcome of such a decision. Such studies could be combined with complementary methods such as approaches based on subjective well-being, which are increasingly being used by governments to provide policy guidance ([Welsch and Kühling 2009](#), [Fujiwara 2013](#)). This would provide insights into the links between expected, experienced, and remembered utility in measuring the well-being effects of a particular environmental quality change (e.g., in comparing benefit estimates obtained using subjective well-being methods with those obtained using SP).

### **Investigating How Collective Decisions are Made**

Although mainstream micro-economic theory focuses on individual preferences and choices, in practice, people often engage in bargaining at different levels, from households (e.g., [Lindhjem and Navrud 2009](#), [Rungie, Scarpa, and Thiene 2014](#)) to communities and societies (e.g., [Wilson and Howarth 2002](#), [MacMillan, Hanley, and Lienhoop 2006](#)). Indeed, so-called “deliberative” variants of SP which make use of group deliberation before eliciting individual or collective preferences have become much more common in the literature ([Lienhoop and Völker 2016](#)). This suggests that investigating the ways in which collective decisions are made is a promising future application of SP methods, particularly when combined with structural econometric models ([Ben-Akiva et al. 2002](#), [Mariel and Meyerhoff 2016](#)). For example, such work could consider the process of household decision-making concerning environmental choices, and how this relates to individual preferences and aggregate budgets within the household. This would be particularly interesting when individual household members have different preferences and/or different experiences with assets that are purchased.

In summary, we believe there is an exciting and fruitful future research agenda for SP methods, one that both establishes greater connections between economics and other behavioural sciences in delivering an increasingly comprehensive and rich picture of choices and values, and that serves as a valuable tool for policy analysis. For these reasons, we would argue that SP methods should continue to be an important part of the environmental economist’s toolbox.

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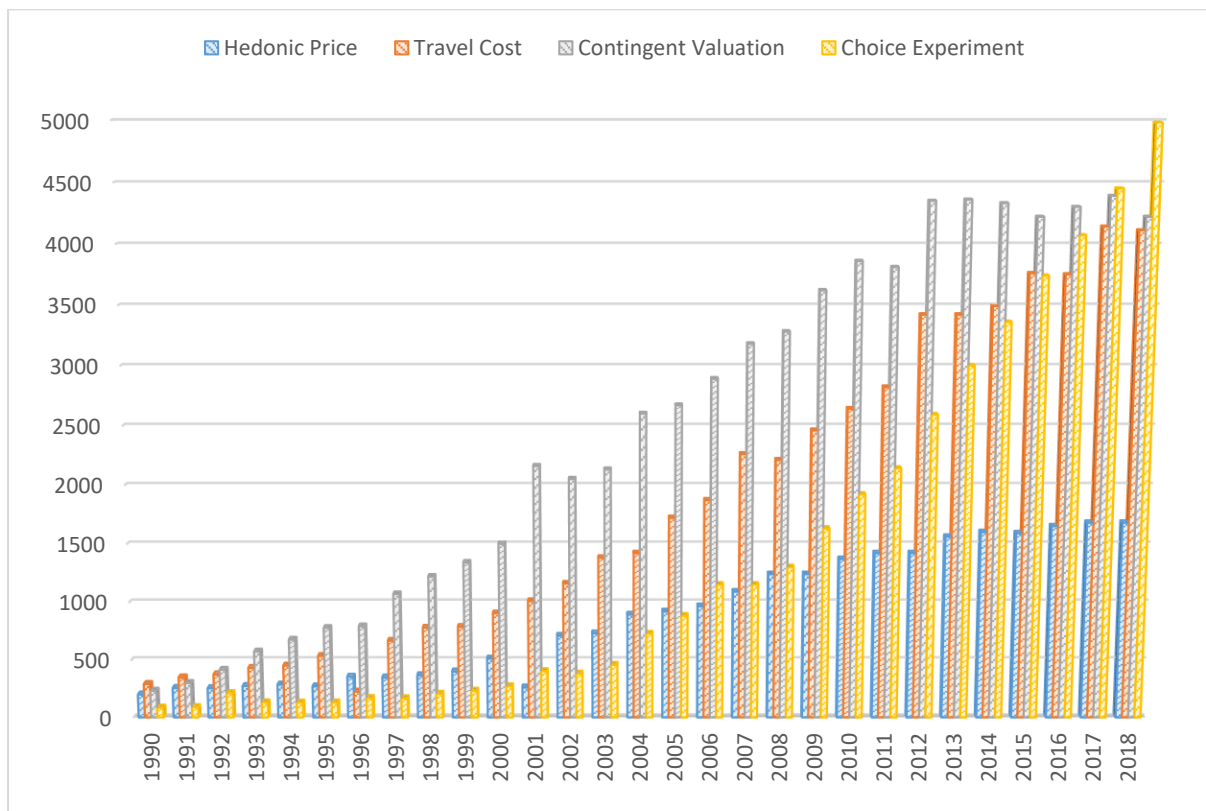
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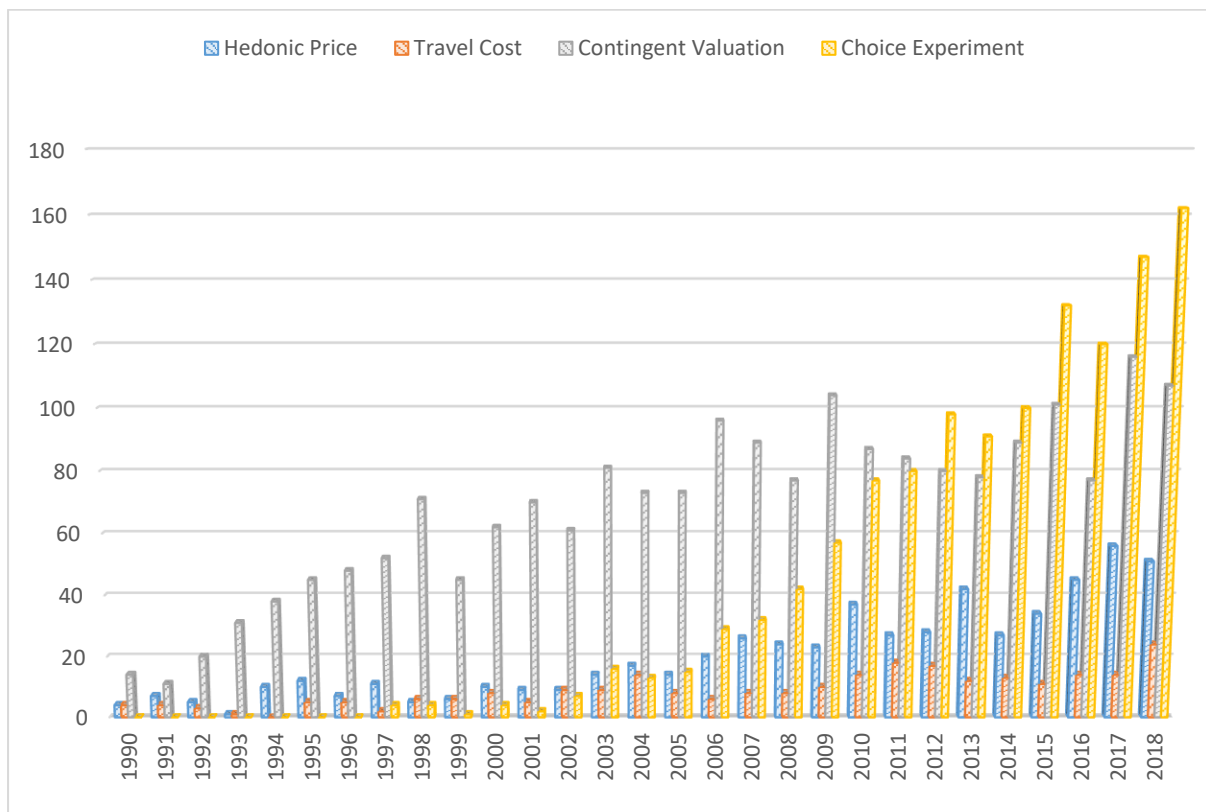
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**Appendix Figure 1a: Number of Google Scholar papers referencing various valuation methods**



Source: the authors

**Appendix Figure 1b: Number of RePEc papers referencing various valuation methods**



Source: the authors

Notes: RePEc refers to Research Papers in Economics (<http://repec.org/>), a popular bibliographic database of economics papers.