Ecological Economics 88 (2013) 76–85

Contents lists available at SciVerse ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon

Analysis

Dealing with preference uncertainty in contingent willingness to pay for a nature protection program: A new approach

Louinord Voltaire [a,*], Claudio Pirrone [b], Denis Bailly [b]

[a] UMR-AMURE, Université de Brest, 12, rue de Kergoat, CS 93837, 29238 Brest Cedex 3, France
[b] UMR-AMURE, Université de Brest, 12, rue de Kergoat, CS 93837, 29200 Brest Cedex 3, France

ARTICLE INFO

Article history:
Received 8 December 2011
Received in revised form 11 January 2013
Accepted 18 January 2013
Available online 24 February 2013

JEL Classification:
Q20
Q26

Keywords:
Contingent valuation
Preference uncertainty
Payment card
Uncertainty calibration
Willingness to pay
Nature protection

ABSTRACT

In this paper, we propose an alternative preference uncertainty measurement approach where respondents have the option to indicate their willingness to pay (WTP) for a nature protection program either as exact values or intervals from a payment card, depending on whether they are uncertain about their valuation. On the basis of their responses, we then estimate their degree of uncertainty. New within this study is that the respondent's degree of uncertainty is "revealed", while it is "stated" in those using existing measurement methods. Three statistical models are used to explore the sources of respondent uncertainty. We also present a simple way of calculating the uncertainty adjusted mean WTP, and compare this to the one obtained from an interval regression. Our findings in terms of determinants of preference uncertainty are broadly consistent with a priori expectations. In addition, the uncertainty adjusted mean WTP is quite similar to the one derived from an interval regression. We conclude that our method is promising in accounting for preference uncertainty in WTP answers at little cost to interviewees in terms of time and cognitive effort, on the one hand, and without researcher assumptions regarding the interpretation of degrees of uncertainty reported by respondents, on the other.

1. Introduction

Researchers have developed a variety of individual preference-based methods for estimating the demand for environmental goods in order to cope with the absence of market prices (for a review see Champ et al., 2003). One of the most widely used methods is contingent valuation (CV). Through surveys, CV presents individuals with a hypothetical market for a change in the quantity and/or quality of a particular non-market good and elicits preferences by asking them about their willingness to pay (WTP). The amount of money they are willing to pay thus provides a monetary indication of their preferences for the good.

The microeconomic theory of consumer behavior is based on the assumption that individuals have well-defined preferences for any choice they are faced with (the assumption of completeness) (Pindyck and Rubinfeld, 2005). In the context of non-market valuation, this implies that for any change in the provision of a particular good, each individual is capable of expressing his preferences in monetary terms by stating an exact WTP (Hanemann et al., 1996). Empirical CV studies show, however, that some people feel uncertain about their answers to valuation questions, and therefore are unable to name a specific sum (e.g. Bateman et al., 2005; Håkansson, 2008; Hanley et al., 2009). Although a single unifying theoretical model explaining such uncertainty has not yet emerged (Brouwer, 2012), a consensus seems to exist among researchers on a number of underlying hypotheses. In Shaikh et al. (2007) some of these are listed, including: (1) lack of experience or unfamiliarity with the good being valuated; (2) prices of both substitutes and complementary goods; (3) insufficient information about the hypothetical market presented in the questionnaire; (4) inability to make a tradeoff between the commodity offered and their money, apart from the hypothetical nature of the exercise; (5) difficulty of understanding the policy proposed and the way in which it would be achieved. Another argument is provided by Svedsater (2007) who argues that respondent (or preference) uncertainty is related to the fact that interviewees have insufficient time to think about the valuation task.

Different approaches have been developed and applied for allowing people to express their uncertainty when answering WTP questions. The information collected is often used to correct the disparity sometimes observed between actual and stated payments (e.g. Blumenschein et al., 1998; Champ and Bishop, 2001; Champ et al., 1997; Ethier et al., 2000; Poe et al., 2002), a phenomenon known as hypothetical bias (Schulze et al., 1981). Overall, it was found that these approaches can be effective at mitigating this bias (see Champ et al., 2009; Morrison and Brown, 2009). However, current preference uncertainty elicitation approaches are not without their problems (Akter et al., 2008; Loomis and Ekstrand, 1998), which suggests the need for further development. In this paper, we make an attempt to

* Corresponding author. Tel.: +33 2 98 01 70 87; fax: +33 2 98 01 69 35.
E-mail addresses: louinord.voltaire@univ-brest.fr (L. Voltaire), claudio.pirrone@univ-brest.fr (C. Pirrone), denis.bailly@univ-brest.fr (D. Bailly).

0921-8009/$ – see front matter © 2013 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.ecolecon.2013.01.009

overcome these problems by proposing an alternative way for capturing respondent uncertainty. In addition, we empirically explore the determinants of respondent uncertainty. According to Akter et al. (2008) very little is known about this issue. Finally, we develop a calibration technique of collected uncertainty information for estimating the mean WTP.

The good being valuated is a nature reserve project in the gulf of Morbihan (France). As is well known, prior to any public decision-making, an economic valuation is recommended to justify the public intervention in question. To this end, beneficiaries have to be clearly identified, and asked about their preferences. In general, when considering nature protected areas, nature-based tourists are regarded as one of the main beneficiaries (Secretariat of the Convention on Biological Diversity, 2008), and as such, are asked about their WTP for those areas (e.g. Baral et al., 2008; Dharmaratne et al., 2000; Mmopelwa et al., 2007; Walpole et al., 2001). Therefore, within an ex-ante valuation framework of new nature reserves, we are interested in determining the amount of money that tourists would be willing to pay to benefit from these areas.[1]

The remainder of the paper is structured as follows. In Section 2, we present the main preference uncertainty elicitation approaches applied and their weaknesses. This is followed by an introduction to our approach. In Section 3, the empirical attempts to explain preference uncertainty are explored. Section 4 describes the case study and data collection methods. The statistical results are presented in Section 5, and the determinants of preference uncertainty are discussed in Section 6. The calibration technique is presented in Section 7, and concluding comments are provided in Section 8.

2. Respondent Uncertainty Elicitation Approaches

2.1. Previous Research and Limitations

Currently, the most widely used preference uncertainty elicitation approaches are the dichotomous choice uncertainty (DCU), multiple bounded uncertainty (MBU) and two-way payment ladder (TWPL). In the DCU approach, the dichotomous choice "Yes/No" WTP question is followed up by either a numerical certainty scale from 1 (very uncertain) to 10 (very certain) (e.g. Champ and Bishop, 2001; Champ et al., 1997; Loomis and Ekstrand, 1998; Lyssenko and Martínez-Espiñeira, 2012) or a percentage certainty scale of 0% (absolutely uncertain) to 100% (absolutely certain) (e.g. Brouwer, 2012; Chang et al., 2007; Li and Mattsson, 1995; Li et al., 2009). Under the MBU approach, a combination of a payment card (PC) and the polychotomous choice question (Broberg and Brännlund, 2008), the individual faces k bids and is asked to indicate whether he would pay by marking one of multiple responses associated with each bid amount: "definitely yes", "probably yes", "not sure", "probably no" or "definitely no" (e.g. Akter et al., 2009; Alberini et al., 2003; Boman, 2009; Kobayashi et al., 2010; Welsh and Poe, 1998). In the TWPL approach, the respondent is presented with a series of values and asked to tick amounts he would definitely pay, cross off amounts he would definitely not pay, and leave blank amounts for which he cannot say either "definitely yes" or " definitely no" (e.g. Bateman et al., 2005; Hanley et al., 2009). Recently, Mahieu et al. (2012) developed a modified version of the TWPL approach, arguing that the range of the willingness to pay is not observed in the ordinary approach because the endpoints are not elicited. A third step is thus added to the valuation task in order to identify "*more precisely*" these endpoints: respondents are required to specify their bound amounts from ones located between the highest amount for which they say "definitely yes" and the lowest amount for which they say "definitely no".

Despite the popularity of these approaches, they present a number of problems. First, with regard to the DCU approach, it is implicitly assumed that all interviewees interpret the numerical or percentage certainty scale in the same way (Loomis and Ekstrand, 1998). That is, if two individuals A and B each mark a rating of 4 or 40%, then they are considered to have the same level of uncertainty. This assumption works against some empirical findings in the stated preference literature, which show that respondents sometimes exhibit a "scale preference" in which certain individuals tend to be low raters or high raters (Roe et al., 1996; MacKenzie, 1993 cited by Loomis and Ekstrand, 1998). Third, with regard to the MBU approach, while researchers usually assume a uniform interpretation of the verbal certainty scale by respondents (e.g. Alberini et al., 2003), the inverse phenomenon appears to be a more reasonable assumption due to the subjective nature of some used statements (e.g. "probably yes", "maybe yes" or "very uncertain", "not unlikely") (Hanley et al., 2009).[2] Fourth, regarding the MBU and TWPL approaches, the valuation process encourages respondents to report WTP as a range, rather than as a single point (Hanley et al., 2009; Vossler and McKee, 2006). Finally, these approaches, in particular the MBU and TWPL, might prove burdensome and cognitively challenging (Mentzakis et al., 2010) because they require respondents to both understand the logic of the contingent market[3] and think about the level of uncertainty related to their choice to pay or not each proposed amount. Some people, at the moment of interview, for whatever reasons, might be unwilling to invest the time and effort needed to fully exert the valuation task. Consequently, they might express what Alberini et al. (2003) call "false uncertainty".

2.2. An Alternative Approach

In this paper we adopt an alternative way to allow for expressions of uncertainty in contingent WTP answers. Respondents are presented with two separate, similar amounts and asked to choose between two WTP answer options: (1) state an exact maximum WTP; and (2) state an interval of WTP. This valuation question bears some resemblance to the classic and interval open-ended (CIOE) elicitation format developed by Håkansson (2008). Similar to this author, it is assumed that all individuals have a true WTP, but some of them cannot state it because they are uncertain. However, they are able to indicate a range in which it certainly falls. Thus, it is expected that people who are certain of their WTP would choose the first option, whereas those who are uncertain would select the second one.

To the best of our knowledge, this kind of PC design was first used by Mentzakis et al. (2010). However, their valuation question is completely different from ours: respondents have to indicate their minimum and maximum willingness to accept (WTA); then, they have to assess their degree of uncertainty related to each of these amounts on a scale from 0 (not sure at all) to 10 (absolutely sure). Thus, this approach has the same problems as those presented above. Moreover, respondents are pressured to give uncertain valuation responses, since they have to assess how sure they are about their answers regardless of whether the same amount was chosen as the both minimum WTA and maximum WTA. From our point of view, it can be seen as a variation of the TWPL approach introduced by Mahieu et al. (2012) as it aims to identify individuals' bound amounts more precisely by asking them to rate the certainty of their lower and upper values.

Our approach has several advantages. First, no verbal or numerical/percentage certainty scales are needed. Hence, on the one hand, the

[1] Of course, local people are also concerned by the establishment of a nature protected area. Hence, it would be interesting for future research to investigate their preferences.

[2] Combining a graphic rating scale with the verbal certainty scale may help respondents to better interpret these statements. However, this does not solve the problem entirely (Wang and Whittington, 2005).

[3] Broberg and Brännlund (2008) argue that valuation questions are likely perceived as difficult by many people due to their hypothetical nature.