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Organizational Behavior and Human Decision Processes 106 (2008) 143–152
ORGANIZATIONAL BEHAVIOR AND HUMAN DECISION PROCESSES
www.elsevier.com/locate/obhdp

Reference dependence in iterative choices

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Received 1 July 2005
Available online 29 January 2008
Accepted by Robyn Dawes

Abstract

Valuation of goods often proceeds from a series of hypothetical pairwise choices. We examine reference dependence on the outcome of such evaluations in a large-scale study in which respondents make a series of choices between areas that differ on cost of living and the quality of lakes and rivers. We uncover three substantial reference effects. First, we find that respondents' choices are altered by being told the national value of water quality. For these people, consistent with prospect theory, changes in water quality below the 65% referenced national standard are treated as losses and given more weight while identical changes above 65% are treated as gains and given less weight. Second, we find that the sequence of iterative choices matters in a surprising way. The iterations proceed by encouraging switching either by degrading the chosen alternative or improving the item chosen. We show that improving the item not chosen produces the greatest switching, a result consistent with prospect theory, but only if the item changed in the iteration becomes the reference alternative. Finally, we find a strong starting reference effect. That is, we show that the trade-off in the first choice reflected in the change in cost of living divided by the change in water quality has a substantial impact on the final valuation. We assess the relative impact of these three reference effects and suggest ways of dealing with them for valuation of non-market goods.

Keywords: Contingent valuation; Iterative choice; Reference dependence; Loss aversion; Starting point bias; Water quality valuation; Diminishing valuation

Survey methods often provide the only way to generate individual valuations for non-market commodities. The particular methodology analyzed here is an iterative choice task in which respondents make a series of structured pairwise choices trading off gains in environmental quality against increases in cost of living. A distinctive aspect of this approach is that the sequence of decisions makes it possible to estimate each respondent's trade-off rate.

The survey was developed as part of an EPA funded study to value improvements to lakes and rivers. As the valuation aspect is detailed elsewhere (Viscusi, Huber, & Bell, 2004), we will focus on three reference effects that alter the outcome of the valuation exercise. The first reference effect involves whether respondents are given national data on water quality before making their choice; the second characterizes the impact of the particular sequence of iterative choices, and the third demonstrates strong starting point effect from anchoring on the first choice task. We build a general model that characterizes valuation as a function of respondent characteristics and these three reference effects. This model permits an assessment of the relative magnitude of these reference effects and suggests ways of dealing with them.

The goal of the iterative choice task in our study was to estimate each individual's monetary value for water quality in lakes and rivers. This is a difficult task for respondents, as they are unfamiliar both with EPA's measure

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doi:10.1016/j.obhdp.2007.10.005

of water quality and with its trade-off against cost of living. Accordingly, we sought a task that would be comprehensible and meaningful while at the same time subject to relatively few distortions. To do so, we frame the decision in terms of a hypothetical market choice in which respondents are asked to imagine moving to one of two regions that are otherwise identical except for the percentage of good water bodies and the annual cost of living. To motivate and help them articulate their values, we ask respondents to think about how these attributes affect their lives (Fischhoff, 1991). We define good water for the respondents following the terminology developed by the United States Environmental Protection Agency (1994) as the percent of lakes, rivers and streams in which it is safe to swim, from which fish are safe to eat, and for which the water sustains a healthy aquatic environment.[1]

Framing the decision in terms of a hypothetical marketplace choice was designed to limit both omission and status quo biases (Baron & Ritov, 2004; Samuelson & Zeckhauser, 1988). When choosing between pairs of new regions, neither alternative represents the default or the status quo. More important, the method deliberately abstracts from the individual's current context. This abstraction has, in our view, two benefits. First, making a trade-off independent of one's current holdings limits idiosyncratic values a person might bring by virtue of, say, living next to a particular lake or having beliefs about local water quality that contradict the survey questions. This generalized context thereby limits interpretations and inferences that can destabilize valuations (Medin, Schwartz, Blok, & Birnbaum, 1999). Second, framing the choice as a trade-off in a market context has conceptual advantages compared to the referendum method recommended for contingent valuation studies in the Arrow report (Arrow et al., 1993). In particular, a referendum vote for a $200 annual tax to improve water quality imposes both benefits and costs on all people in the region. By contrast, the choice of an alternative in a free market mainly affects the individual while having minimal impact on either the water quality or the cost of living of other citizens.

The risk here is that making judgments more abstract can make them less meaningful and therefore more open to context and reference effects. Accordingly, other aspects of the survey were designed to increase interest in, and to encourage elaboration on, the choice alternatives. The web-based survey defined the monetary and water quality dimensions and provided warm-up choices with easy dominated choice options, where one area is better on both cost of living and water quality. If a respondent incorrectly selected the dominated alternative, we reviewed that choice and provided the option to reverse it.

[1] More detail on the precise meaning of water quality and the attribute training is provided in Viscusi et al. (2004).

Once familiar with the attributes in play, respondents made an initial choice similar to the one shown in Fig. 1, where Region 1 offers lower water quality but lower cost of living than Region 2. Respondents could indicate no preference, after which the iterative process ends. Alternatively, if they indicated a preference for one of the two regions, that triggered a subsequent round of choices to better identify the trade-off rate. Each subsequent iteration depended on the response to the previous question, following a decision tree similar to that shown in Fig. 2. The bottom row of Fig. 2 gives the final dollar outcome as one of 19 possible paths, each of which defines a specific trade-off value or puts bounds on the respondent's value of water quality.

Our sample consisted of approximately 4000 surveys executed using Knowledge Network's national panel. These web-based surveys took place in six different waves between 2002 and 2004. Across and within the waves, the implementations differed with respect to the starting choice, the information provided, and the locus of change in the iteration processes. These variations are critical for assessing the impact of reference effects on the final valuations.

As discussed earlier, a number of aspects of our assessment method were designed to minimize reactions to water quality as a protected value (Baron & Spranca, 1997; Ritov & Baron, 1999; Viscusi, Magat, & Huber, 1987). Ultimately, the question of whether we were successful with respect to protest votes is an empirical one, measured by the frequency of protest votes. In our study, protest votes are indicated by persons who continue through the decision tree until they accept a dominated alternative that is worse on both attributes and remain with that choice despite a reminder. Overall, 5% of respondents exhibited such protest behavior—67% of those protesting initially chose the region with high water quality, while 33% came from those who initially chose lower cost of living. Thus, people who support clean water were more likely to protest, but generally very few protested.

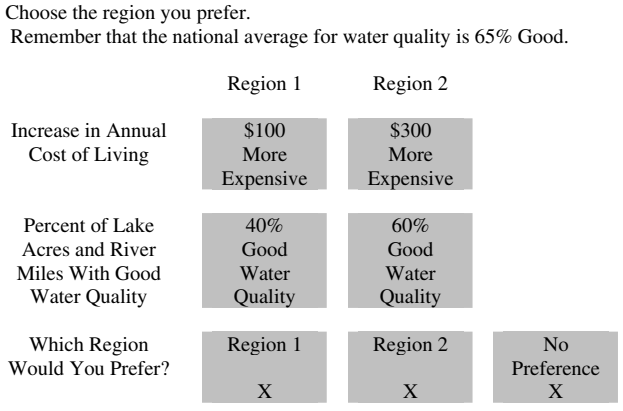

Fig. 1. Example of the initial choice task.