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Preferences, rational choices and economic valuation: Some empirical tests

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ABSTRACT

This study focuses on the respondent rationality hypothesis, usually assumed to be true in Discrete Choice Experiments. We examine lexicographic preferences, the influence of consistency, and the role of task complexity in the individual choice process. To this end, we carry out rationality tests in a survey on forest recreation. Results show that choice set orderings do not impact on choice probability. If a violation of continuity or consistency axioms does impact on choice probability, the Willingness-To-Pay estimators calculated using the total sample and the sub-samples of "irrational" respondents are not significantly different. This serves as a basis for discussing the traditional concept of rationality.

1. Introduction

The "rational" or "irrational" character of people's behaviours is an important area of research in economics and in psychology (Kahneman et al., 1991; Kahneman, 2000). As Lancsar and Louviere (2006) have pointed out, standard economic theory and standard economic valuation methods distinguish two main approaches: the choice-based approach and the classical preference-based one. Whereas the former concerns decision makers' choice behaviour (revealed preferences), the latter assumes that decision makers have preferences dictating their possible choices. Discrete Choice Experiments (DCE) is a stated preference method widely used in environmental valuation studies, and which belongs to the latter category. Even though its name may be somewhat confusing, this method is clearly based on the standard preference approach, and assumes that respondents behave rationally. It relies on restrictive assumptions about individual behaviours (Ryan and Bate, 2001), without which the utility function could not beestimated.

The DCE literature proposes different "*rationality tests*"[1] that can be regarded as "*a form of construct validity testing*" (Foster and Mourato, 2002). Violations of these tests are signals of anomalous choices with regard to standard economic theory (Campbell, 2007). This result relates back to the difficulty of taking into account heterogeneity in applied economics (Cavailhès, 2005).

Various rationality axioms have been tested in the literature. In order to assess the *monotonicity*, which stipulates that "*more is preferred to less*" (Lancsar and Louviere, 2006), the easiest test consists in including a dominant alternative in one choice set (Bennett and Blamey, 2001). A dominant alternative is defined as being at least as good as a second alternative in terms of every attribute. A rational respondent is expected to choose it. If not, he/she may not have understood the questionnaire or may not have taken the task seriously (Ryan and Bate, 2001).[2] The *transitivity* axiom can also be tested. It stipulates that, for three alternatives of a choice set, if $A \succ B$ and $B \succ C$, then $A \succ C$. This axiom has been tested by McIntosh and Ryan (2002) and by Holmes and Boyle (2005). The

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[1] "*Rationality tests*" is used here as a generic term for all tests of assumptions about respondents' behaviour.

[2] This non-satiation test (San Miguel et al., 2004) is applicable in single question surveys (Foster and Mourato, 2002) but may not be used for qualitative attributes (Lancsar and Louviere, 2006).

completeness axiom states that people have "*well defined preferences between any two possible alternatives*" A and B (Lancsar and Louviere, 2006) i.e. $A \succ B$ or $A \prec B$. It has been tested by Ryan and San Miguel (2002) with repeated choice sets. The answer was based on a scale of $A \succ B$ to $A \prec B$ with intermediate responses $A \succcurlyeq B$, $A \precsim B$ and $A \sim B$. The same scale for "common" and less "common" goods allows for comparison between the levels of formed preferences. Hanley et al. (2002) test *consistency* (Campbell, 2007) by repeating one choice set. Respondents are supposed to give the same answer twice.[3] Furthermore, in DCE, respondents are assumed to consider all attributes of the alternatives of a choice set and to choose the alternative they prefer (Campbell et al., 2006): this is the so-called *continuity* axiom. But some respondents may rank the attributes and make choices according to the one with which they associate the "*highest priority*" (Lancsar and Louviere, 2006). This axiom states that even if the quality of an attribute decreases, there is always a higher level of another attribute that maintains the same utility level (Ryan and Bate, 2001).[4] Such respondents are said to exhibit lexicographic preferences (Lancsar and Louviere, 2006). Two reasons may explain such choices (Sælensminde, 2006): respondents' real preferences or simplified heuristics. Campbell et al. (2006) and Campbell (2007) tested the continuity axiom by asking respondents for the attribute they considered in making choices. Ryan and Bate (2001) and Sælensminde (2006) considered that someone who has always chosen alternatives proposing a given level of an attribute has "*apparent*" lexicographic preferences for the latter (when the question arises).[5] Both tests aim at identifying those respondents who are not willing to trade their "preferred" attribute for an improvement in the quality of another (Lancaster, 1971). But they do not prove that the respondents do not trade the remaining attributes (Lancsar and Louviere, 2006). Scott (2002) therefore proposed a combination of the two tests and found that a "lexicographic preferer" (someone who has lexicographic preferences) always chooses alternatives proposing a given level of the attribute said to be his/her preference. Finally, fatigue and learning biases may occur in DCE (Hanley et al., 2002), mainly due to the cognitive difficulty (Swait and Adamowicz, 2001) and task complexity. They can be studied by varying the number of levels, the number of attributes, the number of alternatives or the number of choice sets (Caussade et al., 2005). Hanley et al. (2002), for instance, designed questionnaires that vary with regard to the number of choice sets. This approach is based on the *symmetry axiom* that stipulates that the choice sets ordering should not affect preferences (Hauser and Shugan, 1980).

The purpose of this paper is to implement and to improve some of these rationality tests. We think that the ways in which respondents behave and make their choices may differ from economic theory, but that respondents should not be considered to have made *irrational* choices. Their choices are more the expression of some original rational behaviour based on criteria other than standard economics ones. The present paper aims to further understanding of the stated preferences that are expressed in a specific case study of forest recreation services. It is structured as follows. The first section provides information on the methodological framework. The second section sets out the test results. The econometric analysis is presented in the third section. In the last part we conclude by discussing the implications of our findings.

[3] In Hanley et al. (2002), the initial choice set ranks first and the repeated one fourth. Campbell (2007) proposed the repeated choice set at the end of the questionnaire. But since the decision rule is no longer random, this test somehow violates the Random Utility Theory assumptions (Hanley et al., 2002).

[4] Knetsch (1989, 1992) also tested the reversibility of indifference curves, i.e. the endowment effect (Kahneman et al., 1991).

[5] This test does not prove that the respondents do not trade the remaining attributes (Lancsar and Louviere, 2006). An explanation is given in Appendix A.

2. Methodological framework

2.1. Formulation of the choice experiment model

Theoretically based on the Lancaster multi-attribute approach (1966), the functional form of the indirect utility given by the consumption of the good is the sum of the utilities given by the consumption of its attributes. According to the Random Utility Theory (Manski, 1977), each individual i is supposed to face a choice among J alternatives in each choice set. The relative utility associated with choice j, U_{ij}, is the sum of a systematic component V_{ij} and a random component ε_{ij}. The probability that individual i chooses the alternative g rather than the alternative h in a choice set (denoted P_{ig}) is the probability that the utility provided by g will be higher than the utility provided by h (Adamowicz et al., 1994)

$$P_{ig} = Pr(V_{ig} - V_{ih} > \varepsilon_{ih} - \varepsilon_{ig}) \quad (1)$$

Supposing that the error terms ε_{ij} are independent and identically Gumbel distributed, the McFadden conditional logit (1974) can be used to estimate P_{ig}. An alternative model is the multinomial logit that includes the individual characteristics of the respondents and the attributes of the choice. For each choice set,

$$P_{ig} = \frac{\exp(\alpha' w_{ig} + \gamma_g' x_i)}{\sum_j \exp(\alpha' w_{ij} + \gamma_j' x_i)} \quad (2)$$

with x_i the characteristics of individual i (Greene, 2003).

2.2. Study area and attribute selection

Gironde is part of the current Region of Aquitaine in the southwest of France. 69% of the shoreline is covered by state-owned forests, 10% of which are devoted to recreational uses. Coastal forests, which are suitable for many recreational purposes, are frequented by tourists (mainly in summer) and residents. These forests are managed by the National Forestry Office (Métayer, 1999) whose purpose is twofold: to enhance recreational opportunities and to preserve the natural environment. Local councils are in charge of specific tasks such as garbage collection. They also provide financial assistance, as do the council of Gironde and, marginally, the regional council. Hence, different decision-makers operate on sites and are interested in valuing the potential benefits of the policies they plan to implement.

In this context, DCE is the appropriate method since it provides the value of the components of forest recreation (Christie et al., 2007) and not the value of the site. This method is thus more explicit

Table 1
Attributes and levels.

Attributes	Levels
Landscape	1 Clearcutting without replanting 2 Bush replanting 3 Sapling replanting
Cleanliness	1 No dustbin 2 Dustbins collected every second day 3 Dustbins collected every day
Congestion (fill rate of the car park)	1 100% 2 55% 3 25%
Equipments	1 Paths 2 Paths and picnic tables 3 Paths, picnic tables and cycle lane
Distance	(0) (0 km) 1 50 km 2 30 km 3 10 km