Transportation Research Part E 83 (2015) 225–237

Contents lists available at ScienceDirect

Transportation Research Part E

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

The role of perceived acceptability of alternatives in identifying and assessing choice set processing strategies in stated choice settings: The case of road pricing reform

David A. Hensher *, Chinh Ho

Institute of Transport and Logistics Studies, The University of Sydney Business School, The University of Sydney, NSW, Australia

ARTICLE INFO

Article history:
Received 1 July 2015
Received in revised form 24 August 2015
Accepted 29 September 2015

Keywords:
Choice of choice sets
Processing strategies
Acceptable alternatives
Random parameters
Stated choice
Road pricing
Elasticities

ABSTRACT

In designing choice experiments, it is common to present a number of alternatives to a respondent and have them choose the most preferred alternative. However, respondents may ignore one or more alternatives which they deem unacceptable for various reasons. This possibility aligns with the idea of the 'consideration set' which influences the choice of an alternative given the choice set of interest. This paper uses an endogenous choice set model to investigate the influence that contextual effects and socioeconomic characteristics play in explaining variations in the choice sets considered by respondents when they reveal their preferences.

1. Introduction and conceptual context

Stated choice modelling focuses primarily on identifying the role of a set of attributes and attribute levels in establishing individual preference as an alternative/complementary approach to revealed preference modelling. In stated preference studies, a choice experiment is designed to ensure that the combinations of attribute levels that describe alternatives are optimal in a statistical sense; however, the number of alternatives is usually pre-defined in stated choice experiment and this carries forward to the modelling stage without sufficient consideration of the behavioural implications of the relevant choice set. Typically, the number of alternatives presented in a choice experiment (i.e., the size of the choice set) is fixed and individuals are asked to choose the best alternative amongst this set of alternatives or to rank the full set as if all alternatives are relevant. This includes experiments where the number of alternatives is varied across choice scenarios or across respondents but fixed within each choice scenario for each respondent.

In contrast to this common practice in stated choice modelling, respondents may not consider some alternatives imposed in a choice task, and thus assuming all designed alternatives are relevant to each respondent may not reflect the way in which respondents process the information and reveal their preference. This paper proposes the use of an additional response question related to the perceived acceptability of each alternative on offer in establishing individual preference. This approach is along similar lines of supplementary questions that reveal the extent to which specific attributes are attended to or not in attribute processing (see e.g., Hensher, 2010, 2014). The inclusion of the acceptability of an alternative

* Corresponding author.
E-mail addresses: David.Hensher@sydney.edu.au (D.A. Hensher), Chinh.Ho@sydney.edu.au (C. Ho).

http://dx.doi.org/10.1016/j.tre.2015.09.012
1366-5545/

in choice models is effectively an additional endogenous choice response (Rose et al., 2015). Most importantly, the acceptability of each alternative provides a response metric that can guide us in establishing the subset of alternatives that matter in narrowing down the preferred alternative. This is known as the 'choice of choice sets' problem (as mentioned by Louviere and Hensher in 1983) and is typically neglected in choice modelling. Regardless of what information is used to construct a choice set response, without such knowledge it is not possible to establish, from the full set of alternatives, which subset of alternatives are processed in making a preferred choice, and indeed in establishing a rank order for a behaviourally meaningful set of alternatives. The small but growing literature on the perceived acceptability of each alternative posits that when making decisions, people first identify an acceptable set of alternatives, known as a consideration set in the broader literature (especially in marketing research), and it is from this reduced set that the final choice is made.[1] This is also in line with the literature on choice set formation set out in the context of revealed preference data (see Manski, 1977; Swait and Ben-Akiva, 1987).

Despite frequent mention of these features of choice modelling, the great majority of applied choice modelling (using stated choice data in particular) ignores this stage of the choice making process. This might suggest that there is a view that modelling choices with endogenous choice set is either too difficult or that it has little significance in the determination of the choice outcomes of interest. Evidence from a recent study by Rose et al. (2015) rejects the latter explanation. Using an acceptability response to define choice sets of interest, Rose et al. find a large number of differences between parameters associated with the alternatives deemed to be acceptable and those deemed to be unacceptable by the respondent. They show that joint estimation allows the modeller to overcome potential endogeneity bias that may exist between the final choice made and the acceptability responses, where the latter conditions the relevance of an alternative. The authors also conclude that what might be thought of as preference heterogeneity may be linked to the overall acceptability of an alternative.

What concerns us in the contribution of Rose et al. (2015) is that the acceptability of each alternative is combined with its rank order to define the set of elemental alternatives for jointly estimating alternative acceptability and choice. This modelling technique does not account for the role that choice set formation plays in arriving at the selection of an alternative. This paper focuses on the higher level of choice set formation which conditions the lower level in a 'nested' structure of choosing a particular alternative. It differs from the choice set generation methods proposed by authors such as Ben-Akiva and Boccara (1995) in that we treat the choice of choice sets as integral to the overall utility maximising framework and not a conditioning set of exogenous rules.[2]

The approach presented in this paper differs from previous contributions in that we use the responses on the acceptability of each alternative to identify a choice set considered by the respondent and formulate a model to predict both responses: the subset of alternatives considered and the final choice. From a choice task of J alternatives imposed on the respondent, we may construct up to 2^J subsets of alternatives with different combinations of acceptable alternatives. These subsets are referred to as outcomes of candidate choice set processing strategies (CCSPSs), and only one of these subsets is considered by the respondent when they make their final choice. This is in line with the idea of consideration sets.[3] Previous studies combined each alternative on offer with an acceptability response in defining a universal choice set and estimating parameters which can be generic or specific across an acceptability/certainty scale. These studies are interested in establishing different sets of parameters for different levels of acceptability/certainty, assuming *the relevance of all alternatives* offered in the experiment. In contrast, the current paper focuses on likely reasons for each imposed alternative being processed (up to a probability) where the sub-set of alternatives together with the alternative itself defines a choice response. The growing literature on process heuristics offers up many possible explanations for choice set selection, but one of particular interest in the context of choice experiments is the application of context-dependent heuristics such as extremeness aversion and compromise (proposed by Simonson and Tversky (1992) and Tversky and Simonson (1993)), that take into account the variations in attribute levels across a set of alternatives predefined in a choice experiment (Hensher, 2014). Such context-dependent heuristics are an important feature of the empirical inquiry into some rules that might be adopted in 'screening' hypothetical alternatives, especially in the context of a reference or status quo alternative that reflects real market experience. We examine these possible processing rules through innovative ways of introducing attributes into the utility expression of each 'alternative' as defined by a choice set, such as the attribute range across the alternatives in a choice set.

Extremeness aversion or the compromise effect can be explained as follows. If an extreme alternative is defined as one with both the best value on a subset of attributes, and the worst value on other attributes, then a specific form of

[1] In stated choice studies which impose a set of alternatives it is normal practice to ask which alternative is preferred. What we have done however is to proceed with that question but to add in the addition question to identify which alternatives in the set are acceptable. We could have asked these questions in the reverse order but did not do so, and although the reverse order might be interesting, we are of the view that the responses for only three alternatives are likely to be the same (at least for the majority of respondents). A sequence test is a good topic for future research.

[2] We are not able to conclude that our joint approach is empirically better than approaches in which exogenous rules are imposed to define eligible alternatives in choice set generation, but it has the appeal of being more general than approaches which select a few criteria to screen alternatives.

[3] Another way of including the acceptability of an alternative at the time of modelling is to assign a zero probability to alternatives that have been deemed to be out of the acceptable consideration set (Gilbride and Allenby, 2004; Horowitz and Louviere, 1995). However, asking whether an alternative is acceptable or not does not preclude the possibility that the alternative was actually considered when the final choice was made, and hence does not necessarily suggest that the alternative should be assigned a zero choice probability. Although, if at least one other alternative is deemed to be acceptable, then any unacceptable alternative would be expected to have a probability close to zero, and its treatment as outside of the final choice set has greater behavioural merit than maintaining its presence.