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The accuracy of proxy responses in a stated choice setting: A re-examination and some controversial conclusions

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ABSTRACT

Data is typically gathered from an individual respondent who represents the group or the household. This individual is often identified as the "primary decision maker" and is asked to provide responses as a proxy for the group given that the cost of interviewing each member individually is impractical and/or expensive. The collection of joint preferences is rarely undertaken, with the use of proxy responses not uncommon in travel behaviour research. Under such a framework, there exists an assumption that the primary decision maker has perfect knowledge of other group member preferences, and bargaining behaviour, and is able to synthesise this information when providing a response on their behalf. The validity of such an assumption however remains an open question, with recent research calling the reliability of proxy responses into account (Bateman and Munro, 2009). In this paper, using three models estimated in willingness to pay space, we examine the accuracy of proxy responses in a stated choice experiment. We find that there is overlap between a proxy response and the own preferences of the individual providing the proxy choice, but while the proxy responses fail to represent the full preference heterogeneity that exists in the actual choices made by individuals, the proxy responses in aggregate provide a suitable replacement for actual data, subject to a number of caveats.

1. Introduction

It is well known that a significant amount of human activity takes place within a group context in which the group not only becomes the primary agent for socialisation and learning but also in affecting decision making and preference formation. Indeed, it is the household that represents the basic consumption unit for the majority of consumer goods purchases, both in terms of consumer durables and non-durables. How the interaction of individual group members influences the group's decision making and preference formation processes therefore represents an important dimension of our understanding of economic behaviour.

The study of group decision making has as its early roots, research undertaken in the field of social psychology (see e.g., Thorndike, 1938). Since its inception, the study of group decision making has included research into such facets as individual behaviour in social contexts, the impact of within and between group interactions on group performance, and the identification and categorisation of means of aggregating individual beliefs and preferences into collective group consensus (Baron et al., 1992; Arrow, 1963).

Accepting the possibility of the existence of significant interaction effects between agents requires an acknowledgement that preference formation may be conditional upon the preferences of other agents present within an agent's cohort. A growing body of literature (mainly in marketing and sociology but only recently in transportation) has recognised this fact. Dellaert et al. (1998), Arora and Allenby (1999), Aribarg et al. (2002), Brewer and Hensher (2000), Hensher and Puckett

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(2008) and Beharry-Borg et al. (2009) are recent examples of attempts to incorporate the effects of both individual preferences and influences into group decision making.

Aribarg et al. (2002) and Arora and Allenby (1999) make use of a hierarchical Bayes model to yield estimates of influence and preference amongst household members whilst Dellaert et al. (1998) and Hensher and Puckett (2008) utilise a two stage conjoint approach to elicit similar information. Both approaches provide the analyst with information on the degree of influence asserted on the preference formation of one agent by another agent. Whilst informative, the above approaches treat the input from an agent's cohort as an exogenous variable.

Decision contexts involving interaction between multiple agents involve elements of both cooperation and non-cooperation. Both elements will be observed whether individual agents attempt to act as a single agent entity such as family members acting as a single household in the context of an automobile purchase; or as separate agent entities in competition with one another, such as a car salesperson attempting to sell a motor vehicle to a family. In both cases the preferences of individual agents may be in opposition, however a convergence of preferences (which may or may not be the goal of all agents present) may be achieved through a process of preference revision and concession (Aribarg et al., 2002; Hensher et al., 2008). The end stage of this process of revision and concession is that of an equilibrium state represented by either agreement (preference convergence) or disagreement (where preferences fail to converge).

Given a situation in which two or more agents interact to some degree in the determination of choice of alternative, the possible outcomes are choice and non-choice agreement, and choice or non-choice disagreement. Choice agreement, the result of cooperation amongst all parties, arises when all agents select the same alternative. Non-choice agreement arising from limited cooperation amongst parties results in the simultaneous rejection of an alternative concurrent with non-cooperation as to the choice agreement of a single alternative. Non-choice agreement thus represents the removal of an alternative from the group's consideration set. Choice and non-choice disagreement represent the inverse positions. Earlier research by Hensher introduced the idea of Interactive Agency Choice Experiments (IACE) (Hensher and Chow, 1999; Brewer and Hensher, 2000; Hensher, 2002) in which a network of agents assess a common set of alternatives either sequentially or simultaneously. More recent research has provided a number of opportunities to explore empirically the bargaining power of group members in the joint choice setting, developing a range of methods (Dosman and Adamowicz, 2006; Hensher and Puckett, 2008; Beharry-Borg et al., 2009), as well as the Interactive Agency Choice Experiment model of feedback and revision of group preferences (Rose and Hensher, 2004; Hensher et al., 2008).

Sitting alongside studies designed to understand group decision making behaviour are studies that use proxy responses provided by a single sampled respondent to reflect the behaviour and preferences of the group. Indeed, the vast majority of studies dealing with decisions that are rightly the domain of multiple agents typically sample the primary decision maker and assume that their preferences reflect those of others in the group. Early research examining the ability of single group members to provide information on the characteristics and observed behaviour of other group members has demonstrated that errors in reported responses are systematically related to the precise relationship between group members, the information being sought, the characteristics of the proxy, whether the proxy participated in events being surveyed as well as the survey administration method (see e.g., Cash and Moss, 1972; Mathiowetz and Groves, 1985; Rodgers and Herzog, 1987; Moore, 1988; Biemer and Lyberg, 2003; Ridolfo and Maitland, 2010).

In terms of using proxy responses to understand group member preferences, research has found significant differences between individual and group preferences (Krishnamurthi, 1988; Corfman and Lehmann, 1993; Arora and Allenby, 1999). More specifically, Dellaert et al. (1998) found that family members are relatively poor predictors of preference, and seem to project other family members' preferences along lines of their own. Arora and Allenby (1999) found that individual-specific attribute sensitivities do not capture group preferences adequately. Arora (2006) conducted a study in which respondents were asked to complete a series of choice tasks in order to determine their own individual preferences, the anticipated preference of others, the anticipated preferences of the group as a whole, and finally the true group preferences. The study found that individuals do poorly in assessing the preference of others, and perceptions of joint preference are different to actual joint preference. More recently, Bateman and Munro (2009) examined the differences in individual and group willingness to pay for reductions in dietary health risks and found significant differences between household and individual values.

These findings have led to a growing concern amongst researchers of the ability to use and rely on the individual responses as a proxy for capturing data on household decision making. Unfortunately, whilst the validity of using individual responses as a proxy for group choice, or for the choice of other individuals, has been questioned, and the transition of individual to group preferences, the ability of individuals to specifically assess the preferences of others is yet to be tested in a meaningful way. In response to this, this paper investigates choice of automobile, where group members are required to provide their own choice as well as a prediction of what they think the other group member will choose. The accuracy of these predictions is examined and the salient attributes in errors of prediction are identified. The paper is structured as follows: Section 2 outlines the modelling methodology that is employed, including the combining of different data sets. Section 3 briefly comments on the sample and the nature of the data collected. Section 4 discusses the results from the modelling process after which Section 5 provides discussion and concluding remarks.

2. Methodology

In this paper, we use two approaches to model the data. Firstly, we apply a nested logit (NL) model to examine differences in preferences across different data sets after allowing for possible differences in error variances, incorporating the 'NL trick'.