The Journal of Choice Modelling 11 (2014) 43–56

Contents lists available at ScienceDirect

The Journal of Choice Modelling

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

Stated and inferred attribute non-attendance in a design of designs approach

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ARTICLE INFO

Article history:
Received 14 December 2013
Received in revised form
12 April 2014
Accepted 25 April 2014
Available online 16 June 2014

Keywords:
Attribute non-attendance
Design of designs
Stated choice experiment
Latent class analysis

ABSTRACT

Attribute non-attendance in stated choice experiments (CE) has gained attention in literature, with some studies finding that not all respondents attend to all attributes. While the current studies show that taking non-attendance into account can significantly influence survey results, it is not yet clear what motivates respondents to ignore or pay less attention to some of the attributes. In the present study, we use 16 different split samples designed according to a design of designs plan, varying different aspects of dimensionality, i.e., the number of choice sets, the number of alternatives, or the number of attributes. Firstly, to analyse the relationship between stated attribute non-attendance and the design dimensions we test whether both are significantly associated. Secondly, we estimate equality-constrained latent class models with classes based on pre-defined rules to infer attribute non-attendance and analyse the influence of the design dimensions. Overall, the results indicate a rather weak relationship between stated or inferred attribute non-attendance and design dimensions. However, an interesting finding is that there is an association with the number of alternatives and with the number of sets.

1. Introduction

Recently, the question whether respondents to stated choice experiments (CE) attend to all attributes presented on the choice sets has gained quite a bit of interest. Results from several studies indicate that not all respondents attend to all attributes and that attribute non-attendance (ANA) can significantly bias parameter and subsequent willingness to pay (WTP) estimates (Hensher et al., 2005; Scarpa et al., 2009; Campbell et al., 2011). The awareness that ANA can be an issue when estimating discrete choice models leads to the question of the causes of ANA. One source of ANA might be the complexity of the CE as respondents may employ different answer heuristics when the choice sets become more complex (Scarpa et al., 2009; Hensher et al., 2012). So, respondents may focus only on a subset of attributes.

In the present study we interpret the complexity of the choice task as the design dimensionality of the CE. We systematically vary the number of choice sets, the number of alternatives, the number of attributes and their levels as well

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http://dx.doi.org/10.1016/j.jocm.2014.04.002
1755-5345/

as the level range following a Design of Designs (DoD) approach introduced by Hensher (2004) in transportation research. Using 16 split samples, this study aims to investigate the relationship between these five design dimensions and the attendance to attributes. Influences of choice task complexity have been analysed in terms of several issues such as error variance (e.g., Caussade et al., 2005; Meyerhoff et al., 2014) or the number of status quo choices (e.g., Boxall et al., 2009). However, we are not aware of any study systematically relating ANA to the design dimensionality of the CE in random utility models (RUMs). To our knowledge only Hensher (2006) investigated choice task complexity influences on ANA analysing stated non-attendance data. Being aware of the design dimensions that cause ANA might be important for the researcher not only in the estimation stage, but particularly in the design stage of the CE.

The data used in this study comes from a nation-wide online survey on land use changes in Germany. The attributes we considered were: Share of Forest, Land Conversion and different biodiversity attributes which were aggregated and disaggregated across designs according to different landscape types. This allowed us to systematically focus on the effect of the design dimensions. After answering the choice questions we asked respondents to state their attendance to the attributes they were presented with in the CE. In total we collected 1684 interviews resulting in an average of more than 100 respondents per treatment.

We analyse the relationship between ANA and the design dimensionality in two different ways. Firstly, we report the answers to non-attendance questions across the 16 different designs and identify those design dimensions that significantly influence stated ANA. Secondly, we model inferred ANA by specifying an equality-constrained latent class model (ECLCM) for each design. We then derive inferences of dimensionality impacts on ANA by comparing the membership probabilities of different ANA classes across the 16 LC models. We apply this two-step approach separately analysing stated and inferred ANA since it has been argued that even when respondents stated that they have not attended to an attribute, the models indicate that people have at least partially taken them into account (e.g., Hensher and Rose, 2009). Furthermore, both Scarpa et al. (2013) and Kragt (2013) compared two approaches, one not incorporating and one incorporating stated ANA. Kragt (2013) did this by setting attribute parameters to zero where ANA had been stated by respondents. They found that the constrained LC model, which did not include stated ANA, better matched observed data.

The paper is structured as follows: a literature review is presented in Section 2. Section 3 then explains the design of the study and the sampling procedure. Next, Section 4 outlines the hypotheses to be tested in this study and the modelling approach while Section 5 presents results. Section 6 concludes with a discussion of the results and their implications.

2. Literature review

The literature on attribute non-attendance in stated choice studies can be divided broadly into two main approaches: the stated non-attendance approach and the analytical non-attendance approach. In the Appendix Table A1 with studies investigating ANA is provided. In the former, respondents are asked directly whether they have considered all attributes describing the alternatives of the choice tasks or whether they have ignored one or more attributes while choosing among them. Stated ANA is usually investigated using a binary response variable with the information on ANA commonly being collected after answering all choice sets (serial stated ANA). Alternatively, non-attendance questions may be asked after each choice set (e.g., Scarpa et al., 2009). The answers to these questions are then used to put certain restrictions on RUMs. Among the first studies investigating ANA was Hensher et al. (2005). They used the answers to a binary non-attendance question to specify a mixed logit model in which respondents who stated that they ignored a certain attribute were expected to have zero utility. This approach of individual-level zero marginal utility weights has subsequently been applied in several other studies including Hensher (2006), Hensher et al. (2007) and Kragt (2013). Another way to implement the information gained from a stated non-attendance question into RUMs is to estimate different coefficients for each attribute: one for the group of respondents who stated that they did not ignore the attributes and one for those who stated that they had (Hess and Hensher, 2010; Scarpa et al., 2013; Colombo et al., 2013).

However, the reliability of the stated ANA approach has been put into question. Firstly, it has been argued that a respondent may assign low importance to an attribute although stating that he or she ignored it completely (e.g., Hess and Hensher, 2010). This would lead to an overestimation of ANA (Carlsson et al., 2010). Nevertheless, it should be noted that in some instances it was found that respondents who report having ignored an attribute do indeed have zero marginal utility for that attribute (Balcombe et al., 2011). Secondly, directly incorporating the responses to the non-attendance questions into the RUM may cause potential problems of endogeneity bias (Hess and Hensher, 2010). Thirdly, there is also an increase in literature raising the – still unanswered – question of the reliability of complementary questions regarding non-attendance (Hensher and Rose, 2009; Hensher and Greene, 2010).

Given the limitations of the stated non-attendance approach, there has been increasing interest in literature which analyses different methods of inferring attribute non-attendance. These studies infer the information from the data by using diverse econometric treatments. The modelling approach that has probably been implemented most consists of LC models in which a probabilistic decision process captures the attendance to attributes imposing specific restrictions on the utility expressions for each class. The majority of studies using discrete probability distributions implemented the ECLCM, where ANA is operationalised by allowing some respondents to belong to latent classes with zero utility weights for selected attributes, while non-zero parameters are assumed to take the same values across classes (Scarpa et al., 2009, 2013; Hensher and Greene, 2010; Campbell et al., 2011; Hess et al., 2013).