



Incorporating needs-satisfaction in a discrete choice model of leisure activities



Thijs Dekker^{a,*}, Stephane Hess^{b,1}, Theo Arentze^{c,2}, Caspar Chorus^{a,3}

^aDelft University of Technology, Transport and Logistics Group, Faculty of Technology, Policy and Management, Jaffalaan 5, 2628BX Delft, The Netherlands

^bInstitute for Transport Studies, University of Leeds, 36–40 University Road, LS2 9JT Leeds, UK

^cEindhoven University of Technology, Urban Planning Group, Faculty of Architecture and the Built Environment, P.O. Box 513, 5600 MB Eindhoven, The Netherlands

ARTICLE INFO

Keywords:

Leisure activities
Needs-satisfaction
Hybrid choice models
Bayesian modelling

ABSTRACT

In this paper we extend the behavioural scope of discrete choice models for leisure activity-travel choices. More specifically, we investigate to what extent choices for leisure activities and related travels are driven by the satisfaction of needs. In addition to conventional attributes (such as activity costs), our regret based discrete choice model incorporates latent variables representing the anticipated level of individual needs-satisfaction by a particular leisure activity. The latent variables are calibrated with the help of subjective indicators of needs-satisfaction associated with the leisure activities. Results show that needs-satisfaction allows us to decompose a substantial share of the unobserved heterogeneity in leisure activity-travel decisions across respondents. Identifying the structural drivers of anticipated needs-satisfaction also enables a better prediction of leisure activity choice.

© 2014 Elsevier Ltd. All rights reserved.

1. Introduction

Recent work in this journal (e.g. [Ettema and Schwanen, 2012](#); [Ettema and Zwartbol, 2013](#)) stresses the importance of increasing our understanding of factors determining leisure related travel. These studies highlight that (joint) leisure trips and related decisions regarding trip destinations are determined by more than personal characteristics and preferences. They argue that leisure activity participation should be analysed within the social network. Individual drivers of leisure trips, including the extent to which they satisfy individual needs ([Tinsley and Kass, 1978](#); [Melamed et al., 1995](#); [Tinsley and Eldredge, 1995](#)), should however not be neglected. [Barnett \(2013\)](#) acknowledges that both our personal characteristics and the (social) environment affect the way in which we spend our spare time. Given the context-sensitivity and complexity of leisure activity participation it comes as no surprise that [Dillard and Bates \(2011\)](#) conclude that limited (theoretical) consensus exists concerning what motivates our leisure decisions.

In this paper, we focus on individual ‘needs’ (e.g. [Arentze and Timmermans, 2009](#)) and related ‘satisfaction’ ([Tonn, 1984a,b](#)) as

driving factors behind choices for leisure activities. Needs are conceptualised as an inherently dynamic factor developing over time and triggering activity participation. For example, the presence or absence of an individual’s need for physical exercise is likely to drive the decision to visit the gym, go for a walk, or relax on the sofa. The notion of ‘needs’ as covered by [Arentze and Timmermans \(2009\)](#) relates to *ex ante* levels of desire for e.g. physical exercise, socializing, and entertainment which drive decisions.⁴ Conducting a leisure activity satisfies particular needs up to a certain degree and depending on the speed at which needs regenerate, activities are repeated or new activities are pursued. [Tonn \(1984a,b\)](#) builds on the same types of desires and stipulates individuals select leisure activities in order to satisfy their physiological, sexual-sensual and group belonging needs given a set of economic and time-geographic constraints.

Inter-temporal changes in needs, as a result of ‘needs-creation’ and ‘needs-satisfaction’, can only be studied by examining a panel of individuals over a longer period in time. Indeed, [Arentze and Timmermans \(2009\)](#) conduct a synthetic micro-simulation study over a period of 63 days. Most leisure related surveys, however, rely on one-off surveys (e.g. [Nijland et al., 2010](#); [Ettema and](#)

* Corresponding author. Tel.: +31 15 278 2015; fax: +31 15 278 2719.

E-mail addresses: t.dekker@tudelft.nl (T. Dekker), s.hess@its.leeds.ac.uk (S. Hess), t.a.arentze@bwk.tue.nl (T. Arentze), c.g.chorus@tudelft.nl (C. Chorus).

¹ Tel.: +44 113 343 6611; fax: +44 113 343 5334.

² Tel.: +31 40 247 2283.

³ Tel.: +31 15 278 8546; fax: +31 15 278 2719.

⁴ The notions of ‘needs’ and ‘needs-satisfaction’ are conceptually different from the *ex post* evaluation of satisfaction as studied in the satisfaction-related literature (e.g., [Ettema et al., 2012](#); [Pedersen et al., 2011](#)). The former relates to desire, whereas the latter can best be described as evaluating whether a particular leisure activity lived up to the a priori expectations.

Zwartbol, 2013) centred around a recent or hypothetical leisure choice. One-off surveys by definition provide a static representation of the driving needs and the potential of activities to satisfy those needs. In fact, when individuals are presented with multiple similar hypothetical leisure choices within the same survey, as would be the case in a stated choice experiment, the researcher is more likely to measure what we label as 'long-term', 'stationary', or average needs and needs-satisfaction. That is, people who in general have a higher need for physical exercise are usually more likely to make active leisure choices in an attempt to satisfy that need, whereas people with high needs for socializing might visit a bar more frequently.⁵

The primary goal of this paper is to show that anticipated needs-satisfaction arising from leisure activity participation forms an important explanatory variable in selecting leisure activities. Specifically, the inclusion of anticipated needs-satisfaction forms a relevant behavioural extension to discrete choice models of leisure activity choice.

We define anticipated needs-satisfaction as a latent construct potentially driving leisure activity participation in addition to standard explanatory variables, such as accessibility and socio-economic characteristics. Tinsley and Kass (1979) already acknowledged that needs are inherently latent constructs. Its latent nature implies that, in contrast to standard explanatory variables, variations in individual needs and anticipated needs-satisfaction across individuals and leisure activities cannot be directly observed. A related goal of this paper is to deal with certain methodological challenges surrounding the inclusion of latent constructs, such as anticipated needs-satisfaction, in a discrete choice model of leisure activity choice. We infer about this latent construct through its impact on observed choices in a stated choice experiment, and through a series of subjective 'needs-satisfaction' statements based on Nijland et al. (2010).

To properly represent the latent nature of needs-satisfaction and the correlation it introduces between the observed leisure choices and responses to the subjective needs-satisfaction statements, we develop a structural equation model (SEM). SEMs are common practice in mathematical psychology in relating a series of indicators to psychometric constructs (e.g. Song and Lee, 2012). Recently, SEMs have been introduced in the discrete choice modelling literature to allow for the inclusion of latent constructs as explanatory variables of choices and are also known as hybrid choice models or integrated choice and latent variable models (ICLV) (e.g., Walker and Ben-Akiva, 2002; Bolduc et al., 2005). The choice model applied in this paper is that of Random Regret Minimization (Chorus, 2010), which is a regret minimization based counterpart of the conventional Random Utility Maximization model. This choice for the regret based approach was based on empirical performance (model fit and out of sample predictive ability) of the regret and utility based approaches, on our data.

The ICLV model deals with measurement error as a result of the subjective needs-satisfaction statements being imperfect measures of latent anticipated needs-satisfaction. Moreover, it accounts for the possible existence of a spurious relationship between

socio-economic characteristics and leisure activity participation. That is, socio-economic characteristics may explain leisure choice both directly and indirectly by explaining variations in latent needs-satisfaction. The ICLV model should thus be preferred over the direct inclusion of the subjective needs-satisfaction as explanatory variables in the choice model.

In the developed model, both the stated activity-travel choices and subjective statements on activity specific needs-satisfaction are treated as a set of dependent variables which are linked by means of the latent needs-satisfaction terms, which in turn have a set of explanatory variables of their own. This set of explanatory variables enables the researcher to identify the driving factors of needs-satisfaction, which might be used to generate more accurate predictions of future decisions. One of the main advantages of the proposed approach is its ability to decompose otherwise unobserved heterogeneity in activity-specific utility into variation of utility that is associated with the anticipated needs-satisfaction, and other factors. We study the role of needs-satisfaction in the context of a stated choice survey on leisure trips selected by elderly people.

Overall, this results in a methodological paper enabling researchers to study the driving factors behind needs-satisfaction of leisure trips, including the role of geography-related factors. The structure of the paper is as follows. Section 2 discusses how subjective ratings of need-satisfaction can be incorporated in an integrated choice and latent variable modelling framework based on the random regret framework. Section 3 presents the data collection effort. The empirical analyses (model estimation and validation) are discussed in Section 4. Section 5 wraps up with conclusions and a discussion of our findings.

2. A ICLV model accounting for needs-satisfaction

This section describes the proposed hybrid choice, or integrated choice and latent variable model (ICLV) linking subjective statements regarding needs-satisfaction to the responses in a stated choice experiment. The ICLV structure can be decomposed into a regret-based choice model, a measurement model and a structural equation (e.g. Bolduc et al., 2005).

2.1. The choice model

In each scenario of the stated choice survey, individual n is presented with a set of possible leisure activities J . The individual is requested to select his/her most preferred leisure activity and is subsequently presented with a sequence of T similar choices. The presented leisure activities in this paper differ in terms of their accessibility characteristics such as travel time, travel cost and activity costs.

The typical way to analyse these stated choices in a Random Utility Maximisation (RUM) framework (McFadden, 1974) is to assume that the individual selects the activity generating the highest level of utility. As an alternative, the Random Regret Minimisation (RRM) model assumes individuals select the activity associated with the lowest level of regret (Chorus, 2010).⁶ In this study, we hypothesize that the regret attributed to a specific leisure activity not only varies due to differences in accessibility characteristics X , socio-economic characteristics Z , but also due to the extent to which the leisure activity has the ability to satisfy our needs S . The main difference between S and X, Z is that S is not directly observable to the researcher. We can only imperfectly measure anticipated

⁵ Since these hypothetical choices typically do not relate to a leisure activity that will instantly satisfy an individual's present needs, individuals are more likely to decide based upon their long-term (or stationary) needs and preferences. Alternatively, needs-satisfaction can also be interpreted based on the (constant) level of needs existing at the time of the survey. Within a specific socio-economic group some respondents will be above and some will be below their average needs, at the specific moment in time the survey was filled out. These variations are likely to cancel out within the socio-economic group due to asymmetric developments in needs over time across the respondents. Accordingly, the model is able to identify through the structural equation (see Section 2.3) whether some socio-economic group generally has a higher or lower level of anticipated needs-satisfaction than other socio-economic groups.

⁶ We only present results for the RRM model specification, which was selected as the best fitting model. To our knowledge, this paper presents the second application of the RRM framework in an ICLV setting (see Hess and Stathopoulos, 2012 for another example). Moreover, it also is the first time the RRM model is estimated using Bayesian methods.

Download English Version:

<https://daneshyari.com/en/article/7486113>

Download Persian Version:

<https://daneshyari.com/article/7486113>

[Daneshyari.com](https://daneshyari.com)