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Shopping destination choice in Tehran: An integrated choice and latent variable approach

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ABSTRACT

Integrated choice and latent variable (ICLV) models are increasingly considered in many fields as a means to gain a deeper understanding into the decision process of individuals as well as to potentially improve predictive ability. Literature has shown that the application of ICLV in context of shopping destination choice has not been conducted yet. This study uses data collected from the city of Tehran, Iran on shopping destination choice of 812 individuals. Then these attitudinal questions are used for the development of latent variables regarding the attitude and lifestyle of the participants. By including one latent variable (LV) reflecting the attitudes of clothing and lifestyle's of grocery travelers the structural model reveals a sample distribution of this LV conditional on fundamental socio-economic characteristics. The results of our latent variable model clearly confirm that personal attitude toward clothing shopping center and lifestyle indeed impact destination choice. The results show that our experiment and the expanded hybrid choice model (HCM) allow appropriately identifying and investigating the effects of mixtures of latent attitudes on the intention shopping destination choice.

1. Introduction

Discrete choice analysis is supposed to be a proper approach for evaluating activity travel choice behavior, including travel mode, residential and activity locations, car possession, etc. (Kim, Rasouli, & Timmermans, 2014). Major developments has taken place within the field of discrete choice modeling in order to enhance the decision behavior and making it in alignment with people's preferences, with a particular attention to improve models able to enrich collaboration of elements of major cognitive processes (e.g. incentives, attitudes, perception, information processing and latent constructs). Reviewing the current literature indicates the significance of attitudinal data (Sangho & Mokhtarian 2004; Walker, 2001; Green, 1984; Harris & Keane, 1998; Morikawa, 1989). Researchers have diagnosed that decision makers' attitudes influence their parameter estimates, which will finally affect the out-coming policy suggestions.

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There are a variety of solutions that researchers within the field of environmental economics have utilized to include attitudinal data. The HCM intends to plug the gap between discrete choice models and behavioral theories by illustrating explicitly unobserved components of the decision-making process, like the impact of attitudes, understandings and decision protocols. It unites latent variables with discrete choice models. The origins of the HCM can be tracked to several researchers i.e. McFadden (1986), Ben-Akiva, Mcfadden, et al. (2002), Ben-Akiva, Walker, et al. (2002), Morikawa, Ben-Akiva, and McFadden (2002), Walker and Ben-Aliva (2002) and Ashok, Dillon, and Yuan (2002). A lot of applications in various contexts have traced, including vehicle type choice (Bolduc & Alvarez-Daziano, 2010; Choo & Mokhtarian, 2004), mode choice (Johansson, Heldt, & Johansson, 2006), residential location choice (Kitrinou, Polydoropoulou, & Bolduc, 2010; Walker and Li, 2007), etc. HCM has benefits: Firstly it is able to explicitly model hidden heterogeneity, including the dependence of taste parameters on basic latent variables i.e. attitudes. The second benefit is obtaining statistical efficacy of the parameter estimates owing to the additional information afforded by measures of latent variables by applying an instantaneous estimation approach.

Copious researches have paid attention to developing the specification of the logit model (Vij & Walker, 2014). Developments subsume the integration of flexible error structures and random taste heterogeneity by means of the mixed logit or the multinomial probit model; the comprehension of latent variables showing latent biological, psychological and sociological constructs forming personal preferences, i.e. attitudes, values, norms and affects; the introduction of latent types to capture latent segments with different taste parameters; combination of stated and revealed preference data to enjoy the benefits provided by data type or the representation of individual decision-making behavior in a dynamic context to fulfill interdependencies between decisions made at different periods of time. The HCM blends these and other recent improvements in the choice modeling literature according to a unite framework, resulting in a statistically validated and behaviorally richer model of decision making that counteracts many of the restraints of simpler representations.

All the same, the raised intricacy provided by the HCM begs to important questions of identification inadequately addressed in the literature. Any HCM will generally be determined based on theory of individual behavior. Detectable data may then be utilized to validate the hypothesized theory based on which the model specification are characterized. There are two aspects to the identification problem: theoretical and empirical. A model specification is assumed to be theoretically identifiable if no two distinct sets of parameter values engender the same probability distribution of the data. Mostly, estimates shall produce the same probability distribution for the data unless limitations impose multiple parameter sets. Hence, the identification problem is composed of distinguishing the set of limitations needed for obtaining an exclusive vector of consistent parameter estimates.

HCMs extend normal discrete choice by covering various generalizations, for instance by including latent attributes as descriptive variables within the utility function through structural equation modeling. This expansion is expounded as the ICLV model in the literature.

These models overcome these imperfections by letting the incorporation of latent behavioral constructs in the framework used by conventional models of disaggregate decision-making (Vij & Walker, 2015). They were first introduced two-and-a-half decades ago by McFadden (1986) and were developed by Ben-Akiva, Mcfadden, et al. (2002), Ben-Akiva, Walker, et al. (2002). Rapid paces in optimization methods and computational power and the accessible availability of estimation softwares like Python Biogeme (Bierlaire, 2003) and Mplus (Muthén and Muthén, 2011) have led to a positive increase in the number of studies estimating ICLV models. Within the field of logistics and transportation, ICLV models have been used to the investigate travel mode choice (Paulssen, Temme, Vij, & Walker, 2014), path choice (Prato, Bekhor, & Pronello, 2012), car possession (Daziano and Bolduc, 2013), air traveling (Fleischer, Tchetchik, & Toledo, 2012), goods (Ben-Akiva et al., 2008), etc.

Kim et al. (2014) properly listed utilizations of ICLV. Walker and Ben-Aliva (2002) contemplated subjective perceptions of comfort and convenience In terms of travel mode choice behavior for multiple transportation modes as latent attitudes. Temme, Paulssen, and Dannewald (2008) regarded perceptions considering flexibility, convenience, safety as well as the personal values (i.e. power, hedonism and security). Kim, Bae, and Chung (2012) and Atasoy, Glerum, and Bierlaire (2013) applied the personal attitudes to the environment (i.e. environmental preferences or worries) as latent attitudes, which may affect the application of the transportation model. Furthermore, they assumed people's latent attitudes toward particular travel modes like pro-car attitude, dislike of driving a car and preference of water transit. Kamargianni, Ben-Akiva, and Polydoropoulou (2014) investigated preferring walking. Additionally, they studied parents' latent preference for walking affecting the walking preferences of the children. In case of vehicle (or fuel) type choice, Daziano and Bolduc (2013) as well as Jensen, Cherchi, and Mabit (2013) considered the attitude of saving environment a critical latent one, depicting the applications of substitute fuel vehicles (e.g., electric, hybrid, hydrogen fuel cell vehicle, etc.). Glerum, Stankovikj, Thémans, and Bierlaire (2013) assumed pro-leasing and pro-convenience attitudes (e.g., spaciousness, technology, etc.) while modeling electric car purchasing behavior. Mabit, Cherchi, Jensen, and Jordal-Jorgensen (2014) covered personal attitudes towards car features (e.g., enjoyment of driving, comfort, design, etc.) as latent variables in their HCM. Soto, Cantillo, and Arellana (2014) applied other latent attitudes such as personal attitudes to transport policies, environmental issues, and attitudes towards vehicle and technology. Prato et al. (2012) investigated travel route choice behavior by evolving a HCM, which subsumed 5 various personal psychological skills and characteristics as latent variables. Daly, Hess, Patruni, Potoglou, and Rohr (2012) utilized personal distrust in government as a latent variable for discussing people's stated preference for diverse rail security systems. Silva, Sottile, and Cherchi (2014) studied the influences of personal inclination to travel by tours. The finding illustrates that the tent increases the probability to accomplish more intricate tours. Schmid and Axhausen (2017)