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## Life history-oriented residential location choice model: A stress-based two-tier panel modeling approach

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### ABSTRACT

This paper presents a life history-oriented modeling framework to investigate residential location decisions as a two-tier process of location search and location choice. In the first tier, a stress-based location search model is developed by assuming that households search for a new location due to continual stress at different life-domains. The search model adopts a fuzzy logic-based modeling method that mimics the inter-dependencies between push and pull factors. In the second tier, a location choice model is developed that accommodates how location decisions interact with life-cycle events at different life-domains. The model utilizes a latent segmentation-based logit modeling technique to address the panel effect of the households' housing career. The model results suggest that households in general show preference for larger lots, and locations closer to work place, transit stop, and health service. Location choice is found to be significantly influenced by the life-cycle events as well as the lead and lagged effects. For example, the birth of a child magnifies the need of larger lots. The life-history effects, however vary across two segments. Suburbanite households in segment two prefer larger lots following a job change; whereas, urbanite households in segment one show a negative relationship. The adjustment period for a job change is longer than that of addition of a new job. A longer adjustment time is also found in the case of the first time vehicle purchase than acquisition of a vehicle. Presence of children influences suburbanite households to reside closer to work place. Urbanite households with children prefer to live closer to school.

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## 1. Introduction

Choice of residential location evolves over the life-time of the households, as they move from one location to another along the life-course. Households relocate due to continual residential stress along their life-time (Rossi, 1955). Residential stress is induced by the life-cycle events and decisions in different life-domains, which causes discrepancies between the desired and current situation, and results in the aspiration to reside in certain locations. Hence, location choice interacts with multi-domain decisions and changes occurring at different life-stages of the households (Zhang, 2017, 2015). The interactions have a temporal dimension, such as lead and lagged effects, since households require an adjustment period to adapt

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prior or after a change in life-stage (Oakil et al., 2014). Moreover, location decision has an inherent process orientation in relation to location search and determination of location. While households decide to move, they first undertake a search process to identify potential location alternatives and finally move to a location. Although a vast amount of literature exists on modeling residential location decisions (e.g. Pinjari et al., 2011; Eluru et al., 2010; Gehrke et al., 2014; Lee and Waddell, 2010), limited studies have focused on the multi-domain interactions and behavioral dynamics of the process. Life history-oriented approach offers the opportunity to map such process orientation and interactions among different life-domains. Life history-oriented approach addresses the whole life-time or segment of a life-time, and focuses on how interactions among the multi-domain decisions and life-cycle events along the life-time shape people's behavior (Zhang, 2017, 2015; Chatterjee and Scheiner, 2015). Therefore, the research question for this study is: how to develop a modeling framework which is consistent with the theoretical underpinning of the life history-oriented approach that captures the behavioral process of search and location choice, and improves the empirical estimation?

This study proposes a life history-oriented modeling framework that addresses the complex temporal dynamics of the location choice process and captures how location choice interacts with multi-domain changes and decisions evolving over the life-course of the households. Residential location choice is modeled as a two-tier process of location search and location choice. In the first tier, a stress-based location search model is developed. The search model assumes that households search for locations on the basis of the residential stress generated by the life-cycle events and decisions occurring at different life-domains. The residential stress acts as a push factor and the characteristics of the location that holds the potential to minimize the stress acts as a pull factor. The search model assumes that households' search process is constrained by their affordability. Hence, constraints regarding household income and property value are imposed in the search model. The proposed search model follows a fuzzy logic-based modeling method, which offers a mechanism to recognize the release of stress by minimizing discrepancies between the current and aspiration level. The modeling process of fuzzy logic accommodates the stress-driven theoretical framework by addressing the inter-dependencies between push and pull factors. The push and pull factors continuously evolve with the changing stress within households over the life-course.

In the second tier, location choice is modeled, where households choose a location from the pool of alternatives generated in the first tier. The model disentangles the effects of decisions and changes at different life-domains; for example, how purchase of a car, job change, addition of a job, and birth of a child, among others, interact with location choice. The model also addresses the influence of timing of such multi-domain decisions by examining the lead and lagged effects. The location choice model is developed utilizing a latent segmentation-based logit (LSL) modeling technique. The LSL model assumes that correlated sequence of choices exists due to the repeated choices made by the same households during their housing career. The model captures unobserved heterogeneity among the sample households by implicitly allocating them into discrete latent segments using a flexible segment allocation model within the LSL framework. Hence, the model offers the opportunity to test the variation in location preferences by life-history attributes among the households in different latent segments. The models developed in this study uses data from a retrospective Household Mobility and Travel Survey (HMTS) 2012–2013 conducted in Halifax, Canada. The models are developed at the most fine-grained spatial choice unit of parcel.

The remainder of the paper is organized as follows: the second section provides a brief discussion on the theoretical framework used in this study and the context of the study. The third section describes the data used for the empirical application. The fourth section discusses the modeling approach, followed by a discussion of the independent variables used in the model in the fifth section. Model fit comparisons along with discussion of results are presented in the sixth section. Finally, the paper concludes with a summary of contributions and future works in the seventh section.

## 2. Theoretical framework and context

Life-oriented approach focuses on the inter-dependencies among the decisions and changes occurring at different life-domains of people (Zhang, 2017, 2015). Zhang et al. (2011) identified nine major life-domains, such as residence, job, education and learning, health, family life, family budgets, neighborhood, leisure and recreation, and travel behavior; and revealed that interactions exist among the decisions taken in different life-domains (Zhang, 2014). To develop better empirical models of household-level decision processes, it is imperative to examine the interactions among changes in multiple life-domains, since choices at any domain are part of the extended inter-connected choices made hierarchically across different domains (Salomon and Ben-Akiva, 1983; Lanzendorf, 2003).

A life-oriented approach could take a life-course perspective, also known as life history-oriented approach. Life history-oriented approach focuses on the temporal variation of the multi-domain interactions over the life-course. Particularly, it emphasizes on the effects of changes at different domains along the life-course in shaping individuals' or households' behavior (Chatterjee and Scheiner, 2015). The changes during life-course include life-events and decisions taken at different stages along the life-time (Oakil et al., 2014). Such life-events and decisions include birth of a child, getting a job, job change, and household formation, among others (Habib and Miller, 2009). Unlike conventional cross-sectional modeling approaches, which focus on a snapshot of an individual's life-time; the life history-oriented approach considers the whole life-time or a segment of the life-time (Chatterjee and Scheiner, 2015). Among the decisions taken at different life-domains, residential location choice is one of the most critical decisions; since decisions of where to live significantly interacts with decisions of the same domain (i.e. where to work) and decisions in other domains (i.e. whether or not to own a vehicle, and when to make

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