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Modeling travel behavior by the structural relationships between lifestyle, built environment and non-working trips

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ABSTRACT

In the context of sustainable urban transport in developing countries, individuals' travel behavior faces multiple factors which influence their mobility patterns. Recognizing these factors could be a favorable method to organize more regular and sustainable trip patterns. This study aims to identify the less well-known lifestyle along with more popular built environment as the main factors which shape travel behaviors. Employing data from 900 respondents of 22 urban areas in city of Shiraz, Iran, this paper explores travel behaviors as non-working trip frequencies by different modes. Results of structural equation model indicate a strong significant effect of individual's lifestyle patterns on their non-working trips. However, built environment impact on travel behavior is small compared to lifestyle. Besides, other variables such as travel attitudes and socio-economic factors stay crucial in the mode choice selection. These findings indicate the necessity of regarding lifestyle orientations in travel studies as well as objective factors such as land use attributes.

1. Introduction

In recent decades, Iran like many developing countries, have encountered the growth of usage private vehicles as a dominant pattern of trips in urban areas. Reports suggest that, Iran is the second-largest oil-consuming country in the Middle East and Iranian domestic oil consumption is mainly diesel, gasoline, and fuel oil. In 2013, FGE estimates that Iran imported almost 17,000 bbl/d of petroleum products, of which roughly 85% was gasoline (EIA, 2014). The daily trips by cars are among important sources of energy consumption and air pollution. Among the world's top ten most polluted cities, four are in Iran, according to data based on a 2013 World Health Organization index. Automobile use in large cities of Iran has extended in the past years according to transportation ministry estimates (The guardian, 2014). To manage this increasing energy consumption, we should first recognize the factors which shape individuals travel patterns and the reasons behind vast car use.

There is a huge body of researches concerned with the impact of built environment indicators (e.g. high density, mixed-land use, design and accessibility) on the individual's travel behavior (e.g., Crane, 2000; Ewing and Cervero, 2001; Handy et al., 2005; Stead and Marshall, 2001; Cervero and Murakami, 2010). Accordingly, multiple studies investigate the factors which influence urban trip patterns in Iranian cities by considering demographic and land use characteristics (e.g. Etminani Ghasrodashti, 2009; Soltani and Esmaeili, 2011; Masoumi, 2013). Cited studies which have been conducted in cities with high traffic jam, indicate a strong impact of demographic characteristics, in contrast to urban form and built environment, in determining individual mobility patterns (Soltani and Etminani Ghasrodashti, 2010: 151). The results manifest that

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apart from urban form characteristics, some hidden factors play a crucial role in shaping the mobility patterns in Iranian cities; these factors can be derived from culture, lifestyle, individuals' attitudes and beliefs toward mobility modes.

In recent years attention to the impacts of subjective factors such as attitudes, beliefs, personality and also lifestyle on travel patterns has significantly increased (Mokhtarian and Salomon, 2001; Bagley and Mokhtarian, 2002; Anable and Gatersleben, 2005; Ory and Mokhtarian, 2009; Van Acker et al., 2014). These studies have tried to answer the question that how the subjective factors such as lifestyle and attitudes along with land use attributes could influence travel behavior. Although they argue the lifestyle as the patterns of leisure and consumption, in most of studies it has limited to how people express their social position through behavioral patterns. In contrast, in present study the lifestyle is explored as the pattern of consumption and leisure activities by different modes of mobility. Besides, built environment factors along with socio-economic characteristics and attitudes toward travel and residential neighborhood have been taken into account as other factors affect travel behavior.

The paper is organized as follows. Section 2 reviews the literature on the interaction of travel behavior, built environment and lifestyle in brief. Section 3 expresses the data used in the study. Section 4 indicates the empirical results. The final section concludes the paper.

2. Literature review

Since 1970s, activity-based modeling led to offer more realistic representation in individuals travel behaviors compared to traditional trip-based travel demand models. Activity-based modeling predicts travel behaviors through differences in household factors (such as socio demographics and life stage) and non-household factors (built environment, socio environment, travel policies).

In this regard, vast studies argue that travel behaviors has notably influenced by built environment via different variables. Some research have explored the impacts of land use attributes on motorized and non-motorized trip frequencies (e.g., Handy, 1993; Boarnet and Sarmiento, 1998; Boarnet and Crane, 2001; Chatman, 2008); while others have been conducted on vehicle mile traveled (Chatman, 2008). Moreover, to decrease methodological limitations, some studies have tried to search the impact of built environment on individual mode choice (e.g., Cervero, 2002; Chatman, 2003; Ewing et al., 2004; Frank et al., 2008; Lee et al., 2014). On the other hand, built environment factors are undoubtedly one of the most heavily research subject in travel studies and the most cited factors of land use are named as Ds. The original "3Ds" created by Cervero and Kockelman (1997), are density, diversity, and design, followed later by destination accessibility and distance to transit (Ewing and Cervero, 2001, 2010; Ewing et al., 2009). However, most of research have simplified travel studies and suffer from ignoring the subjective factors which influence individual trip patterns.

Travel behavior can also explain by social expectations about behavior such as norms, values, beliefs, attitudes and finally lifestyle. In this regard, two leading theories consist of value-belief-norm theory (Stern et al., 1999) and the theory of planned behavior (Ajzen, 1991; Fishbein and Ajzen, 1972) support this fact that perceived social norms are considered to be another possible determinant of behavior. Therefore, a hierarchy of decisions is made by travelers where decisions at a higher level (such as lifestyle) determine the scope of actions at lower levels (such as travel behavior).

The notion of lifestyle in transport studies was introduced by 1970s. At the early stage, lifestyle concept was defined as behavioral responses in terms of socio-economic differences, personal and social actions (Reichman, 1977). Using this definition, some travel studies tried to investigate the impact of lifestyle on travel patterns, but in fact they just refer the lifestyle to some objective characteristics such as stage of life or household composition (e.g., Salomon and Ben-Akiva, 1983; Cooper et al., 2001; Hildebrand, 2003). Moreover, some studies indicate that households with similar socio-economic attributes do not travel in similar patterns (van Wee, 2002; Mokhtarian and Cao, 2008). This disparities in travel patterns among individuals originate from various lifestyles. So, considering the lifestyle just as observable behaviors result from socio-economic differences between groups may not clearly explain the trip behaviors.

In another definition, lifestyle is behavioral patterns which derived from underlying opinions and orientations, including beliefs, interests and attitudes (Kitamura, 2009). Therefore, in some travel studies lifestyle has referred to individual's attitudes toward work, family, money, status, and the value of time. For example, in order to determine the subjective factors which influence travel demand, Collantes and Mokhtarian (2007) introduced lifestyle groups such as status seeker, workaholic, family/community-oriented and frustrated. They found that, Individuals with a family-oriented lifestyle as well as individuals with a frustrated lifestyle frequently used their car for short-distance trips, family-oriented lifestyle was related with fewer long-distance leisure trips and also, workaholics travel significantly fewer short distance as well as long-distance trips for leisure purposes.

So, individuals indicate their social situation via specific patterns in consumption and leisure. Therefore, some studies focus on lifestyle expressions which are observable patterns of behaviors and reflect someone's lifestyle. Using this definition of lifestyle, in an empirical study conducted by Scheiner (2010) in order to modeling trip distance traveled, lifestyle data was collected as leisure preferences, values and life aims, esthetic taste and frequency of social contacts. The results of the study indicated that lifestyle has the strongest impact on leisure trip distances.

Similarly, Van Acker et al. (2014) in a travel study utilized holiday aspects, literary interests and leisure activities as the long-term lifestyle decisions to develop a modal choice model. She found that, car availability tends to be higher among respondents with a more active lifestyle.