



The built environment, travel attitude, and travel behavior: Residential self-selection or residential determination?

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ABSTRACT

In examining the impacts of the built environment on travel behavior, studies focused on residential self-selection mostly assume that people self-select residential built environment based on their travel preferences. However, the residential self-selection hypothesis is challenged for a number of reasons including the arguments that at least in some societies a large percentage of people do not have the privilege to self-select their residence and the built environment may have a significant influence on a person's travel attitude. To shed some light on this debate, this paper makes use of data from a household activity-diary survey conducted in Beijing, China, in 2011–2012 to examine both the hypothesis of residential self-selection and that of residential environment determination. We adopt the natural experimental approach and divide the sample into two groups based on whether or not the respondents had much freedom in regard to choosing where to live: one with the possibility of self-selection and the other one without this possibility. We found reciprocal influences between residential built environment and travel attitude/preference for the first group and influence of residential built environment on travel preferences for the second group. We argue that the complex relationships between the built environment, travel attitude, and travel behavior are featured by both residential self-selection and residential determination. Failing to acknowledge the effects of the built environment on travel attitude may lead to the overestimation of the influence of residential self-selection on the link between the built environment and travel behavior and underestimation of the influence of the built environment on travel behavior.

1. Introduction

Over the past two decades, the possible confounding effects of residential self-selection on the influence of the built environment on travel behavior have attracted considerable research attention. On the premise that households may self-select their residences into neighborhoods based on how they like to travel, studies show that the effects of the built environment on travel behavior may be at least partially attributable to travel attitude (e.g., Bohte et al., 2009; Cao et al., 2009a,b, 2010). There is an extensive literature addressing the issue of residential self-selection, which has generated many insights into the complex relationships between the built environment, travel attitude, and travel behavior. Yet, the knowledge concerning residential self-selection is far from complete. One assumption underpinning this literature is that people have a high level of freedom in regard to where they live and that most realize their travel preferences when making residential choices. However, in reality, this is often not the case. In cities where the state is greatly involved in housing provision, a high proportion, perhaps even the majority, of urban households have little

to no freedom in regard to their place of residence (Wang and Lin, 2014). It has also been argued that even in countries where the housing system is largely market-oriented, many factors such as a lack of affordability and limited housing options, may prevent households from settling in their preferred neighborhoods (Næss, 2005; Schwanen and Mokhtarian, 2004). Further, travel-related attitude is but only one of the many factors determining residential choice and the observed relationships between the built environment and travel are dependent on the nature and context of residential sorting (Chatman, 2009; Manaugh and El-Geneidy, 2015; Cao and Chatman, 2016). More importantly, the literature supporting the argument of residential self-selection often ignores the possibility that the built environment may influence travel attitudes, because over time individuals may adapt their travel preference/attitude to the residential built environment (e.g., Schwanen and Mokhtarian, 2007; Cao et al., 2009b; Chatman, 2009; Naess, 2014; Kamruzzaman et al., 2016). Some recent studies have shown that there are reciprocal influences between the built environment and travel attitudes (Van Acker et al., 2014; Silva, 2014; Ewing et al., 2016). In other words, both the residential self-selection and the environmental

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determinism are possible. Ewing et al. (2016) find that both directions of influences between the built environment and travel preferences are statistically significant. However, they argue that it seems more plausible in terms of causal logic to defend a causal effect of the built environment on travel preferences than another way around, especially when a cross-sectional analysis design is adopted. The major reason is that residential self-selection can only be realized if respondents had exercised residential choice. However, most cross-sectional data provide information on the built environment and travel attitude at the time when data were collected, no information on travel attitude when residential choice was made and if travel attitude played a role in the choice.

The existing attempts to address the possible bi-directional influences between the built environment and travel attitude, or the argument for residential self-selection or for environmental determinism (Ewing et al., 2016), have mostly analyzed the same set of data and compared models under different assumptions concerning the role of the built environment and travel attitude in shaping travel behavior (e.g., Bagley and Mokhtarian, 2002; Ewing et al., 2016). In the present study, we adopt a different study design – the natural experimental approach (Heinen et al., 2015). Two groups of respondents are identified based on their degree of freedom when making choice about residential place: one group was supposed to have chosen their residential place (or have much freedom in residential choice) and the other group was allocated housing and thus did not have much choice. We follow the existing studies (e.g., Bagley and Mokhtarian, 2002; Ewing et al., 2016) to develop models under different assumptions (residential self-selection and residential environment determination) for the first group; as for the second group, only the assumption that residential built environment influences travel attitude/preference is tested because their residential place was externally given and thus the assumption of residential self-selection can be ruled out (Wells and Yang, 2008; Zhang et al., 2017). Data were drawn from a household activity-travel diary survey conducted in 2011–2012 in Beijing, China. Both recursive and non-recursive structural equations models are developed.

The rest of the paper is organized as follows. We review the relevant literature in Section 2 and discuss the theoretical background and conceptual frameworks underpinning this empirical study in Section 3. We describe the research design and data in Section 4 and present the empirical results in Section 5. In the final section, we offer our conclusions and suggest related research directions.

2. Built environment and travel attitude: a literature review

2.1. Studies supporting residential self-selection

Hundreds of studies have investigated the associations between the built environment and travel behavior (see reviews, e.g., Stead and Marshall, 2001; Ewing and Cervero, 2010; Boarnet, 2011; Stevens, 2017). However, a causal link between the built environment and travel behavior has yet to be confirmed (Cao et al., 2009b). Residential self-selection, which refers to the propensity of people to choose where to live based on travel attitude, is a key issue confounding this relationship. Because of the residential self-selection issue, many scholars argue that the observed correlations between built environment characteristics and travel behavior are at least partially attributable to travel-related attitude (Kitamura et al., 1997; Bagley and Mokhtarian, 2002).

Several studies have provided empirical evidence concerning the importance of travel attitude/preference in residential choices, which offer support to the residential self-selection hypothesis. In a study about residential and travel choices in Cardiff, UK, Hammond (2005) found that > 50% of the respondents chose their commute modes before or simultaneously with their decisions on residential location and that most of the respondents realized their expected commuting mode in residential choices. In a study focusing on households who moved to transit-oriented developments (TODs) near rail stations in California, it

was found that one third of the respondents placed access to public transit among their top three reasons for deciding to live in a TOD, and those who cited access to public transit as the major motivation for their residential location choice tended to use this mode much more than did those who ranked access to public transit lower (Lund, 2006). In a study of the San Diego metropolitan area, 53% of the 999 respondents surveyed explicitly considered travel access of some kind when choosing where to live, and those who cited travel access as an important consideration at the time they made their residential choice were more likely to live in neighborhoods that afforded access to their preferred travel mode (Chatman, 2009). Based on a sample of 1904 respondents in the San Francisco Bay Area, Schwanen and Mokhtarian (2007) reported that individuals concerned about the environment and who, therefore, wanted to reduce private car use were more likely to reside in high-density neighborhoods in downtown areas than low-density suburban neighborhoods, whereas the opposite holds for people who prefer fast, flexible, and comfortable auto travel. All these studies seem to suggest that travel-related attitudes play an important role in residential choice and thus render support for the argument of residential self-selection.

Various methodological approaches have been adopted to address the residential self-selection issue. These approaches included direct questioning, statistical control by incorporating attitudinal factors, instrumental variables models, sample selection models, joint discrete choice models, structural equation models, and longitudinal designs (Mokhtarian and Cao, 2008). Regardless of the method or methods used, most studies reported the significance of residential self-selection in confounding the relationships between the built environment and travel behavior. Nevertheless, the built environment remains a significant determinant of travel behavior, even when residential self-selection is controlled for (Cao et al., 2009b). Several studies have quantified the relative contributions of residential self-selection and the built environment on travel using a sample selection model (e.g., Bhat and Eluru, 2009; Cao, 2009; Zhou et al., 2008) or propensity-score matching (e.g., Cao, 2010; Cao et al., 2010). They reported that residential self-selection accounted for about 19 to 49% of the observed influence of the built environment on travel behavior (Bhat and Eluru, 2009; Cao, 2010; Cao, 2009; Cao et al., 2010; Zhou et al., 2008). Mokhtarian and van Herick (2016) recently conducted a meta-analysis of the studies with a focus on quantifying the influence of the built environment and residential self-selection on travel behavior. The study revealed that the true effect of the built environment itself (i.e., the proportion that is not due to self-selection) ranges from 34 to 98% (Mokhtarian and van Herick, 2016).

2.2. Studies questioning residential self-selection

Notwithstanding the reported evidence in support of the hypothesis of residential self-selection, mismatch between the residential environment and travel preferences is widely evident even in North American and European cities where residential choice is largely market-based. For example, De Vos et al. (2012) estimated that in Flanders, Belgium, approximately 51.4% of respondents exhibit some degree of dissonance between the neighborhood in which they live and the kind of neighborhood they would prefer. Schwanen and Mokhtarian (2005) also reported a conservative estimate according to which about 16% of respondents experience residential dissonance in the San Francisco Bay Area.

There are several reasons that may contribute to these residential mismatches. A principal point of consideration in this regard pertains to whether residents successfully choose where they live according to their travel preferences. One concern is that travel attitude/preference is only one of many, even conflicting factors that need to be traded off in the housing choice process, thus lowering the probability of finding the matched neighborhood (Chatman, 2009; Næss, 2009). For example, studies reported that safety and housing price seemed to be more

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