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Residential self-selection, reverse causality and residential dissonance. A latent class transition model of interactions between the built environment, travel attitudes and travel behavior

Paul van de Coevering[a,1], Kees Maat[b], Bert van Wee[c]

[a] Academy for Urban Development Logistics & Mobility, Breda University of Applied Sciences, Netherlands
[b] Faculty of Architecture and the Built Environment, Delft University of Technology, Netherlands
[c] Transport and Logistics Group, Delft University of Technology, Netherlands

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ABSTRACT

Travel-related attitudes and dissonance between attitudes and the characteristics of the residential built environment are believed to play an important role in the effectiveness of land use policies that aim to influence travel behaviour. To date, research on the nature and directions of causality of the links between these variables has been hindered by the lack of longitudinal approaches. This paper takes such an approach by exploring how people across different population groups adjust their residential environments and attitudes over time. Two latent class transition models are used to segment a population into consonant and dissonant classes to reveal differences in their adjustment process. Interactions between (1) the distance to railway stations and travel-mode-related attitudes and (2) the distance to shopping centres and the importance of satisfaction with these distances are modelled. The models reveal mixed patterns in consonant and dissonant classes at different distances from these destinations. These patterns remain relatively stable over time. People in more dissonant classes generally do not have a higher probability of switching to more consonant classes. People adjust their built environments as well as their attitudes over time and these processes differ between classes. Implications for policies are discussed.

1. Introduction

Governments generally aim for more sustainable travel behaviour (Banister, 2008). One approach to this is to develop built environments that are conducive to the use of alternatives to the car (walking, cycling and public transport). In recent decades, policy measures such as densification and transit-oriented development have been applied for this purpose. While integrated spatial and transport planning is receiving increasing attention in policymaking, the causality and strength of the relationship between the built environment and travel behaviour (the BE-TB link) remains subject to academic debate. The research has been summarised in many reviews (see: Van Wee and Maat, 2003; Boarnet, 2011; Ewing and Cervero, 2010; Gim, 2013; Cao et al., 2009; Mokhtarian and Cao, 2008; Bohte et al., 2009; Chatman, 2014; Næss, 2014).

E-mail address: coevering.p@buas.nl (P. van de Coevering).
[1] P.O. Box 3917, 4800 DX Breda, Netherlands.

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1.1. Direction of causality

The causality debate revolves around the residential self-selection hypothesis. It assumes that people self-select in neighbourhoods that are conducive to the use of their preferred travel modes based on their travel abilities, travel-related attitudes, needs, and preferences (Handy et al., 2005; Cao et al., 2009; Bohte et al., 2009; Litman, 2005). For example, people with a favourable attitude towards public transport may choose to live in close proximity to railway stations. Overall, the literature supports the residential self-selection hypothesis, but the outcomes are mixed (Ewing and Cervero, 2010). While some studies, such as Kitamura et al. (1997), Bagley and Mokhtarian (2002) and Lund (2003), concluded that attitudes are more dominant than built environment characteristics, others found a significant influence of the built environment on travel behaviour, even after controlling for residential self-selection (Schwanen and Mokhtarian, 2005; Bohte, 2010; Van de Coevering et al., 2016; De Abreu e Silva, 2014; Lin et al., 2017). For more extensive reviews on this subject, we refer to Cao et al. (2009), Bohte et al. (2009), Ewing and Cervero (2010) and Gim (2013).

People are not always able to fully self-select, as they may be constrained by their income, household circumstances, supply in the housing market or other conflicting residential preferences. Moreover, life course events such as having a child can influence the needs and preferences of households, which may result in the occurrence of residential dissonance over time (Schwanen and Mokhtarian, 2004; De Vos et al., 2012). In addition to moving house (residential self-selection), people can adjust their attitudes towards their current residential neighbourhood in order to reduce residential dissonance. This reverse causality may occur for two reasons. First, according to the theory of cognitive dissonance (Festinger, 1957) people do not only adjust their behaviour but also their attitudes if dissonance occurs. In this case, people may adjust their travel-related attitudes to their residential choices. Second, according to Cullen (1978), people will have positive and negative experiences during their daily routines in their current social and spatial context and consequently adapt their attitudes over time. For example, if they live close to a railway station, people may become more familiar with public transport, start to see it as a good alternative travel option and consequently adjust their attitudes and travel behaviour (Bagley and Mokhtarian, 2002; Bamberg, 2006; Chatman, 2009; Bohte et al., 2009; Van de Coevering et al., 2016).

This reverse direction of influence has received considerable less attention in literature. To the best of our knowledge, only the studies of Bagley and Mokhtarian (2002), Bohte et al. (2009), Van de Coevering et al. (2016) and Lin et al. (2017) explicitly modelled multiple directions of causality, arriving at different conclusions. Bagley and Mokhtarian (2002) found evidence of residential self-selection but not of reverse causality, while Bohte et al. (2009) found that initial residential self-selection effects diminished after controlling for reverse causal influences. Lin et al. (2017) found reciprocal influences and concluded that direction of influence depends on people's ability to self-select. Van de Coevering et al. (2016) found no evidence of residential self-selection, but instead found reverse causality effects between the distance to the railway station and travel-related attitudes.

The dominant direction of causality between travel-related attitudes and the built environment is extremely important for integrated spatial and transport planning. If residential self-selection is dominant, measures such as densification and transit-oriented development environments would primarily benefit people who already have favourable attitudes towards sustainable travel behaviour. It is the combination of a person's attitude and the selection of a conducive neighbourhood that facilitates this behaviour.

This implies that the impact of the built environment on sustainable travel behaviour is influenced by the share of people who already have a positive attitude towards alternatives to the car and their ability to self-select conducive neighbourhoods. If the reverse causal direction is dominant, the built environment not only has a direct effect on travel behaviour but also an additional indirect effect, through its influence on travel-related attitudes. This would mean that controlling for residential self-selection by incorporating travel-related attitudes would lead to an underestimation of the impact of the built environment (Cao et al., 2009; Chatman, 2009; Handy et al., 2005; Næss, 2005; Næss, 2009).

1.2. Approaches to control for residential self-selection

To date, most evidence on residential self-selection is based on variable-centred models such as regression analyses and SEM modelling and most studies apply cross-sectional research designs (see: Mokhtarian and Cao, 2008 for a review). A simple way to control for residential self-selection is to include socio-demographics and travel-related attitudes that influence both travel behaviour and residential location directly in the models (Bhat and Guo, 2007). Kitamura et al. (1997) were the first to explicitly control for attitude induced self-selection in a cross-sectional design study. Since then, many other studies have controlled for the influence of residential self-selection in this way (Bagley and Mokhtarian, 2002; Bohte et al., 2009; Van de Coevering et al., 2016; Lin et al., 2017). A couple of studies use longitudinal or quasi-longitudinal data (Meurs and Haaijer, 2001; Krizek, 2003; Handy et al., 2005; Cao et al., 2007; Cao et al. 2007; Aditjandra et al., 2012; Van de Coevering et al., 2016; Klinger, 2017). To the best of our knowledge, Van de Coevering et al. (2016) were the first to collect attitudinal data at multiple moments in time. They applied linear cross-lagged panel analysis to asses longitudinal directions of influence. In addition to the inclusion of attitudes and socio-demographics, Schwanen and Mokhtarian (2005) introduced the concept of residential neighbourhood dissonance. They distinguished consonant and dissonant groups of urban/suburban residents and residents with a high/low preference for high-density living and compared their travel behaviour. They incorporated these measures of dissonance in their regression models and found that the impact of dissonance on travel behaviour differs between consonant and dissonant groups. Similar measures of dissonance were used by Frank et al. (2007), De Vos et al. (2012), Kamruzzaman et al. (2013) and Cho and Rodríguez (2014). For a more detailed overview we refer to Cao (2015).

Another less popular approach is based on person-centred analyses, which identify key patterns of values across variables, where the person is the unit of analysis. These analyses – with cluster analysis as a typical example – result in the identification of a small set