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Residential self-selection and travel mode use in a new inner-city development neighbourhood in Berlin

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ABSTRACT

The purpose of this study is to analyse the effects of residential and travel preferences on mode use in a new inner-city development in Berlin. In contrast to the majority of related studies, we consider these preferences in a more holistic way by grouping residents into clusters. The kind of inner-city neighbourhood we studied particularly attracts families and couples who are affluent and have high levels of car ownership. However, a comparison of residents' mode choice with that of the general population of inner and outer Berlin shows that this kind of inner-city neighbourhood encourages even those households who are known to prefer driving to use modes other than the car. Moreover, we found variety in mode use which could be traced to the variation in reasons for residential choice (as an outcome of residential and travel preferences). This underlines the fact that preferences have a strong effect on travel behaviour, even in a homogeneous neighbourhood. Overall, the study suggests that new inner-city development neighbourhoods with a variety of housing types provide opportunities for sustainable daily mobility. At the same time the study area could have been better adapted to the various preferences of its future residents – for example, by reducing the number of parking spaces to further stimulate use of sustainable modes of transport.

1. Introduction

The concept of residential self-selection (RSS) effects on travel behaviour has emerged as a major field of research in transport studies over the past two decades. Put briefly, this research argues that geographical differences in travel behaviour are not (or not only) caused by the travel opportunities provided by the built environment in which someone lives, but are to some extent motivated by households' residential choices based on their residential and travel preferences and other social and personal characteristics, which results in sociospatial/attitudinal segregation of population groups (Cao et al., 2009; Mokhtarian and Cao, 2008). This debate did not, however, emerge from psychology or sociology, but from the land-use/transport discipline. It was, and still is, driven mainly by planning studies, and it seeks to establish that some of the observed spatial differences in travelling may in fact be caused by attributes of the spatial context in which people live, and hence may be affected by urban planning decisions.

While up to the 1990s RSS was controlled for by including sociodemographic variables in travel behaviour studies, the paper by Kitamura et al. (1997) marked a new departure, being one of the earliest efforts to simultaneously control for neighbourhood and travel preferences. Since then, a bulk of empirical, methodological and theoretical research has contributed to the considerable importance that the field has today.

Most studies in this field focus on mode choice, which sounds natural as it appears more intuitive that different individuals have distinct preferences for different modes, while it seems less intuitive that people would have preferences relating to travelling certain distances, travel time budgets, or levels of trip chaining – although these ideas are not actually very wide of the mark. As travel distance and time are typically conceived of as cost factors, one may well argue that travel-related residential self-selection may refer to travel distances or willingness to travel (De Vos and Witlox, 2016; Elldér, 2014; Naess, 2014; Scheiner, 2010).

This paper adds another empirical facet to the field. While studying mode use – as with most other related research – it is based on a survey in a newly established area of Alter Schlachthof in the inner-city area of Berlin. This area is relatively homogeneous in terms of population structure, and the majority of its residents moved into the area no more than a few years prior to the survey. It can thus be seen that self-selection has actually taken place shortly before the survey. Consequently, we expect only weak effects of sociodemographics on

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mode use (because of homogeneity – for example, Ettema and Nieuwenhuis (2017) find very limited effects of sociodemographics on car use in a study of those recently moving into transit-oriented developments (TODs) in the Netherlands), but variety in mode use owing to various reasons for self-selecting (as an outcome of preferences). In other words, our study allows for a more nuanced understanding by providing evidence for the heterogeneity of residential and travel preferences of people choosing the same neighbourhood, and the consequences this heterogeneity has for travel, while most studies in the field place emphasis on travel preferences. Thus, this study focuses on the identification and characterisation of resident groups who, for different reasons, have decided to move into the same residential neighbourhood and the question to what extent they differ concerning their daily mode use.

To assess the combined influence on mode use of a variety of preferences, we consider residential preferences in a more holistic way by grouping residents into clusters. On the other hand, we do not look at the role of RSS for travel relative to effects of the built environment, which is the focus of most related research, as we do not compare different study areas.

A second point that makes this study unique is that the area is a major example of a planned attempt to support family re-urbanisation in Germany – that is to say, it was an explicit attempt to attract middle- and upper-class families to reside there, who were otherwise expected to move into suburban environments (see Frank, 2016, on similar developments elsewhere). Hence, by comparing residents' mode choice with that of the general population of inner and outer Berlin, the study allows us to find out whether, and if so to what extent, an inner-city neighbourhood encourages even affluent households with high levels of car ownership to use modes other than the car. This would encourage policies on urban form aimed at reducing car use even among those population groups who are typically associated with high levels of driving: middle-aged, high income households with children owning a car (or two). This paper is structured as follows. Section 2 briefly introduces the current state of research on urban form, residential self-selection and travel behaviour. This is followed in Section 3 by an introduction to the study area, the data and methods. Subsequently the results are presented in Section 4. Section 5 discusses the results and draws some conclusions for policy and research.

2. State of the research

Because of the multitude of RSS–travel studies – i.e. studies that link travel behaviour with residential self-selection – this section cannot provide an exhaustive overview (see Cao et al. (2009), Bohte et al. (2009), de Abreu e Silva (2014) and Lin et al. (2017) for excellent reviews, and the special issues of Transport Reviews 29(3) and Journal of Transport and Land Use 7(3) for in-depth studies. Cao and Chatman (2015) contain an up-to-date theoretical discussion).

To provide the background for the RSS–travel debate, it is important to note that the majority of studies on the effects of land use on transport take a cross-sectional approach, and tend to rely on correlational structures to propose cause–impact effects, despite the fact that the potential biases of such approaches have long been recognised. The majority of RSS–travel studies also use cross-sectional data, but in theoretical terms they are process-oriented. This is because they typically assume that preferences precede residential choice and, hence, the built environment found at the residence, which in turn precedes travel behaviour. Accordingly, the built environment at the residence is considered endogenous to preferences. ‘Preferences’ in this research is a term with a broad scope, and can refer to attributes of the residence, neighbourhood, and residential location (in brief: residential preferences), and also to travel modes, accessibility and more general features of travelling (travel preferences) (Scheiner, 2014). Residential preferences have been found to be closely connected with travel mode preferences and with preferences for certain social environments, such as heterogeneous or homogeneous populations, more or less privacy etc. (Liao et al., 2015).

Although many scholars note that the interrelations between preferences on the one hand, and travel behaviour and the built environment on the other, *may* not necessarily be unidirectional – i.e. *may* include reverse relationships – only few strongly argue for (Naess, 2009) or empirically account for (Bohte, 2010, p. 81–109, Kroesen et al., 2017) such reverse relationships. This is despite the issue of causality between attitudes and behaviour being recognised by transportation researchers decades ago (Tardiff, 1977). Using data collected in the Netherlands, Bohte concludes that ‘travel behaviour and built environment characteristics (residential location choice) have a greater effect on travel-related attitudes than vice versa’ (Bohte, 2010, p. 102), although it must be highlighted that her models are based on cross-sectional data. Kroesen et al. (2017) provide direct evidence that mode use affects mode attitudes more strongly than vice versa by using cross-lagged panel models. Choocharukul et al. (2008) use data from Thailand to show that travel preferences significantly affect residential preferences. They also trace car use preferences back to a sense of moral obligation to reduce car use. These studies suggest complex interrelationships between travel preferences, residential preferences, residential choice, the built environment and actual travel behaviour.

RSS–travel studies use a variety of methodological approaches (Mokhtarian and Cao, 2008; Bohte et al., 2009; Van Herick and Mokhtarian, 2015), including asking directly for the impact of preferences, statistically controlling for preferences, using instrumental variables to model the built environment at the residence, using sample selection models, using propensity score models and/or other joint models with multiple equations (either discrete choice or structural equations models (SEMs)), and using longitudinal designs (looking at travel behaviour before and after relocation).

RSS–travel studies share a common understanding that RSS can be traced back to two factors: sociodemographics and preferences (Mokhtarian and Cao, 2008). While preferences (also called ‘taste variations’) reflect the way in which households or individuals wish to live, sociodemographics may also to some extent reflect preferences, but they predominantly represent ‘hard’ constraints that households face in terms of income, social roles, age group, or ethnic background – i.e. ‘givens’.

We shall now review some empirical studies. In line with our empirical work we focus on (a) studies conducted in newly developed residential areas and/or sampling recent movers, (b) studies conducted in inner-city, high-density, or transit-oriented development areas and (c) cross-sectional studies that use statistical controls of preferences, either as dimensions or groups (clusters). Further, our review has (d) a certain bias towards European studies, as these include a variety of travel cultures, while the (more dominating) North American research tends to focus on a homogeneous car culture.

Scheiner and Holz-Rau (2007) apply SEMs to data from the Cologne region of Germany. The models simultaneously include the effects on modal shares and vehicle kilometres travelled of: sociodemographics, lifestyles, residential preferences and the built environment at the residence. They find that lifestyles have limited direct effects on travel, but do affect residential preferences and residential choice, which in turn both affect travel behaviour.

Naess (2009) uses a mix of regression modelling, bivariate analysis and qualitative data collected in Copenhagen, Denmark and Hangzhou, China, as well as strong theoretical reasoning to argue that studies controlling for car ownership and preferences as exogenous control variables tend to underestimate the effects of the built environment on travel behaviour, as car ownership and preferences are themselves affected by the built environment someone lives in.

de Abreu e Silva (2014) uses SEMs to analyse data from Lisbon. He models the effects of the built environment on various measures of travel behaviour, including commuting distance, car ownership, number of trips by mode and trip scheduling. He also finds a number of

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