



# A comprehensive study of life course, cohort, and period effects on changes in travel mode use



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## ABSTRACT

This paper studies changes in people's travel mode use from one year to the next. It is informed by three distinct discourses: travel behaviour change, the mobility biographies approach, and cohort analysis. The data used is the German Mobility Panel (GMP) 1994–2008 in which households and their members are asked three times in three subsequent years to report the trips they made over a week. The changes reported are regressed to key events over the life course, cohort effects and period effects, while various sociodemographic and spatial attributes are controlled. Due to the non-independent nature of panel observations, a cluster-robust regression approach is used. The findings suggest that behind the aggregate stability in travel mode use over time there is much change 'under the surface', induced by life course changes, individual and household sociodemographic, and spatial context. The changes found induced by life course related key events favour the notion of mobility biographies. However, taken over all key events seem to be relatively loosely associated with mode use changes. Nonetheless, various significant effects of baseline variables suggest that mode use may change even in the absence of a key event.

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## 1. Introduction

Changes in individual travel behaviour have become a major field of research in transportation studies in recent years (Ampt, 2003; Cao et al., 2007; Ker, 2008). Such changes may occur on a day-to-day basis (Pendyala, 2003) or in the longer term. In the latter case they have been linked to people's life courses and conceptualised as being triggered by key events in an individual's mobility biography (Lanzendorf, 2003; Scheiner, 2003). However, behavioural changes in the long term may not just be part of individual mobility biographies, but also of collective cohort and/or period related changes, in which individual life courses are embedded.

This paper studies changes in people's travel mode specific trip rates (for convenience: mode use) from one year to the next. The data used is the German Mobility Panel (GMP) 1994–2008 in which households and their members are asked three times in three subsequent years to report the trips they made over a week. The changes reported are regressed to key events over the life course, cohort effects and period effects, plus various sociodemographic and spatial attributes.

The goal of this paper is to contribute to and extend the recently emerged mobility biography approach by simultaneously studying this rather comprehensive set of baseline and change variables. Knowledge about the impact of life course related key events and other variables may contribute to understanding of the effectiveness of planning schemes, particularly those which are related to such events (e.g. residential moves).

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This research is informed by three distinct discourses: behavioural change, the mobility biographies approach, and cohort analysis. Within the context of this journal, the use of the mobility biographies approach is relatively novel. In the next section the state of the research is introduced. Subsequently, the data and the methodology are described, followed by the results. The paper finishes with an outlook to further research.

## 2. Travel behaviour change – state of the research

Travel behaviour change has long been (relatively) neglected in research, even though time geography recognised the usefulness of the life path concept for travel studies as early as the 1970s (Hägerstrand, 1975). In an early study on the dynamics of travel behaviour, Clarke et al. (1982) distinguished between three levels of dynamics: first, short-term micro-dynamics, capturing people's 24 h daily activity/travel choices (see for an overview of day-to-day variability of travel Pendyala, 2003); second, macrodynamic modifiers, addressing behavioural responses to transitions and trigger events over a period of some years; third, macrodynamic processes over a lifespan which are related to aging, life-cycle stages and cohort membership.

More recently, a line of research has emerged in this context that investigates travel behaviour changes triggered by temporary interventions which aim either to break habits and make choices more deliberate, or to change actual behaviour, or both. Studies are typically either based on awareness raising concepts, e.g. by making participants reflect their travel schedules or by providing information on alternatives to the car (Kenyon and Lyons, 2003), or on the provision of public transport (PT) tickets to drivers for free (Fujii and Kitamura, 2003), or both (Bamberg et al., 2003). Other studies focus on changes in transport infrastructure, such as the temporary closure of a major road (Fujii and Gärling, 2003). The authors found that those who changed from driving to PT during the road closure continued one year later to use PT more frequently than those who did not swap.

Studying behavioural changes is key to effective travel demand management as it may help clarify the triggers that make individuals re-evaluate their habits and possibly change their behaviour. In addition, such studies can help identify the population groups that are most resistant to change in order to effectively target others who are less resistant. The interventions studied may well be understood as key events in an individual's life. The focus in the related research is, however, not so much on life course related events, but on the effects of policy measures or other incentives on travel.

A second strand of research in this context is the mobility biography approach. This perspective focuses on changes in travel behaviour that are associated with key events and/or 'biographical processes' over a life course (Lanzendorf, 2003; Scheiner, 2003; Van der Waerden et al., 2003; Axhausen et al., 2006; Harms, 2007; Scheiner, 2007).<sup>2</sup> The theoretical underpinning of this approach is that travel behaviour is relatively habitual as long as daily requirements and conditions are stable. However, an individual's behaviour may change due to adaption to new circumstances and/or learning processes. This basic idea is studied within the framework of several life domains, including household situation and the family, employment, and spatial context (particularly with respect to the residence). Changes may occur on different, but interrelated temporal scales. A household type change, for instance, is normally long-term. It may induce medium- to long-term changes in mobility, for instance in terms of residential choice and vehicle holding, and these in turn may affect short-term daily travel behaviour. Key events that have been identified as transport relevant in this approach can be categorised into three life domains:

- household and family biography, including leaving the parental home, formation of a household with a partner/founding a family, birth of children, divorce, children moving out (Goodwin, 1989; Zwerts et al., 2007; Lanzendorf 2010);
- employment biography, including the commencement of job training or university entry, entry into the labour market (Harms, 2007), change of job or education, income changes (Dargay, 2001), retirement (Ottmann, 2007);
- residential biography, including residential moves and associated changes in spatial context (Bagley and Mokhtarian, 2002; Krizek, 2003; Scheiner, 2003; Stanbridge et al., 2004; Axhausen et al., 2006).

Some commentators treat gaining a driving license or the purchase or disposal of a car as key events that may affect mobility biographies. However, a note on causality is warranted here. As these key events imply pre-decisions that can be interpreted as a form of 'self-commitment' with respect to travel mode choice (Simma and Axhausen, 2001) they may be regarded as parts of the mobility biography rather than as determinants. It should be noted that other elements in the mobility biography framework also raise questions of causality. Travel behaviour changes are typically treated as the outcome in this framework, assuming that they are induced by residential relocations, for example. However, research on residential self-selection has argued in favour of bi-directional causal relationships (Cao et al., 2007; Scheiner and Holz-Rau, 2007). For instance, travel preferences and travel choices such as the decision to own a car may trigger residential choice or workplace choice.

Processes of learning may also be induced by experience gathered over longer periods. For instance, there is ongoing debate about the effect of socialisation in childhood and adolescence on adult travel behaviour (Baslington, 2007). Travel

<sup>2</sup> For an overview on biographical (or life course) approaches in sociology and psychology see Mortimer and Shanahan (2006), for biographical approaches in the field of residential relocation and migration see Stovel and Bolan (2004) and Kulu (2008), for an application to tourism and long-distance travel see Frändberg (2008).

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