Mobility biographies in three generations – socialization effects on commute mode choice

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Abstract

The mobility biography approach is increasingly recognised in travel behaviour studies. Related empirical studies analyse key events and mobility experiences over the life course of individuals. In addition to these personal experiences, social context and socialisation through family members play an important role in this respect. This paper presents a theoretical framework for analysing commute behaviour over the life course of different generations and gives preliminary empirical results. The empirical work is based on a retrospective survey conducted annually since 2007 at TU Dortmund University (Germany). The relationship between the travel mode use, the individual and parental attitudes towards travel modes, and residential locations over the life course is investigated. Our findings indicate that attitudes and residential locations of the younger generation in a family are associated with the same variables of their parents. The residential characteristics and attitudes in turn are significant predictors for travel mode use on commute trips. These preliminary results indicate the relevance of socialisation effects for commute mode choice.

1. Introduction

In current transport research, significance of individuals’ experiences, life phases and key events over the life course for their travel behaviour is increasingly recognised. Even though Hägerstrand (1975) already pointed out the
importance of the life path in the 1970s (Hägerstrand 1975), the life paths were neglected in travel behaviour studies for a long time. Just recently Lanzendorf (2003), Scheiner (2007) and Beige/Axhausen (2006) have picked up their importance and introduced the mobility biography approach. Recent studies in this field focus on changes in mobility behaviour caused by key events such as residential relocation or changes in the job, the household or the family structure (Scheiner/Holz-Rau 2013a). The approach provides insights into causality and the general linkages between mobility and its impact factors.

Apart from relatively suddenly occurring changes by residential relocations or other key events, individual behaviour is driven by personal norms, values and preferences, which are relatively stable over time. These factors may have their origin, on the one hand, in changes in a person’s life course, and on the other hand, in social networks and contexts including peer groups, school and family (Bauer 2012:2).

This paper analyses the linkages between family members’ preferences for travel modes, residential location characteristics, and mobility behaviour over the life course. In particular, the influence of attitudes and residential location on commute mode choice is analysed over two generations. The recent debate about mobility socialisation and mobility biographies is summarised and a research design for the analysis of travel behaviour by intergenerational mobility biographies is introduced. Subsequently, the preliminary empirical work is presented and interpreted.

2. Research Background

This study is based on two main theoretical perspectives: the current discussions about mobility socialisation as well as the mobility biographies.

2.1. Mobility Socialisation

In social sciences the perspective on socialisation changed fundamentally in the last decades. Socialisation has been analysed especially in psychology and social science (Hurrelmann 1988; Bauer/Grundmann 2007; Min et al. 2012). In these disciplines socialisation describes broadly “... the process of the emergence, formation, and development of the human personality in dependence on and in interaction with the human organism, on the one hand, and the social and ecological living conditions that exist at a given time within the historical development of a society on the other.” (Hurrelmann 1988:2). While in the 1950s until the 1970s the individual was believed to be passive (Bauer 2012:16ff) current socialisation studies assume that the individual is active and influences the environment, and vice versa. However, socialisation agents such as school, media, peer-groups and families influence the individual (e.g. Baslington 2007). The transmission of values and behavioural patterns is still primarily an object of investigation in psychology and social sciences (Min et al. 2012; Liefbroer/Elzinga 2012). Nonetheless, socialisation may have an influence on other subjects of interest in other disciplines (e.g mobility behaviour).

In mobility research the term mobility socialisation has been introduced in recent years. Most studies so far are theory driven and can be traced back to psychologists and social scientists (Haustein et al. 2009; Limbourg et al. 2000; Tully/Baier 2011). Tully and Baier (2006) define mobility socialisation as a process that makes the individual be a part of the mobile society. The outcome of this process is a mobility lifestyle which determines individual mobility behaviour in the long-term (Tully/Baier 2006:120 in Tully/Baier 2011:197). Mobility socialisation models focus on the spatial level. Tully and Baier (2011) present the multi-level, zone-, and island-model, three educational theories from the 1980s (Baacke 1987; Zieher 1983 in Tully/Baier 2006). While the latter two theories focus on appropriation of space, the multi-level model is appropriate to analyse a variety of mobility dimensions, such as travel mode choice. The multi-level model distinguishes between a) the macro-level, including e.g. infrastructural, social, technical constraints; b) the meso-level, comprising socialisation agents working as role models; and c) the personal micro-level, including attitudes, values and capital. Hence, it points out the importance of social circumstances among other constraints, and it is in line with Hurrelmann’s definition of socialisation.

Still, little empirical data on mobility socialisation is available (exceptions are e.g. Haustein et al. 2009; Limbourg et al. 2000). Haustein et al. (2009) point out the role of socialisation for the formation of habits (Haustein et al. 2009), and first empirical data about the role of socialisation agents in mobility socialisation are published by Baslington (2008). Similar to other findings in the field of socialisation and learning, she concludes that the younger
generation tends to copy the older generation’s behaviour due to routine learning (Baslington 2007: 7). The existing studies give important information about the relationship between parents’ and children’s travel behaviour but they use personal data whereas spatial circumstances are insufficiently regarded or not at all addressed. Moreover, to our knowledge, the few studies about socialisation in the field of transport are based on cross sectional data. Longitudinal analysis might lead to a better understanding of mobility socialisation since the transmission of values and preferences is a slow, long-term process.

In summary, theoretical approaches from psychology and sociology dominate the recent debate about socialisation. Empirical results stress the importance of the intergenerational transmission of values and behaviour (Min et al. 2012; Liefbroer/Elzinga 2012). In mobility studies empirical data also point towards the importance of socialisation effects (Baslington 2007, Haustein et al. 2009) but there is still a need to introduce spatial context into empirical analyses and to examine socialisation effects over the life course. Moreover, the analyses focus on the socialisation of adults on children but socialisation of parents may be effective over the whole life course.

2.2. Mobility Biography

The mobility biography approach supports the study of socialisation effects over the life course. Originally, in social sciences the biography approach describes a qualitative approach of narrative interviews with a small number of individuals. Conversely, the life course approach is a quantitative approach which aims to identify typical life course trajectories in society (Sackmann 2007).

In transport research this differentiation does not exist. The term mobility biography is used for quantitative approaches to analyse travel behaviour over the life course. The rising awareness for the importance of the life course for travel behaviour can be seen in the increasing attention the mobility biography approach receives. Mobility biographies intend to draw a picture of mobility behaviour over the life course as precisely as possible but generally applicable. Mobility biographies aim to better understand travel behaviour. Lanzendorf (2003) claims that the individual mobility biography consists of three different domains, namely the lifestyle, accessibility and mobility domain (Lanzendorf 2003:9). Scheiner (2007) puts mobility biographies into a broader context arguing that the employment, residential and household biographies determine the mobility biography (Scheiner 2007:162). Both scholars emphasise the interdependency of the partial biographies and domains and underline the importance of key events. According to these authors, a key event in one domain or partial biography may cause changes in the others and finally in mobility behaviour. In addition, individual experiences over the life course have a potentially great influence on travel behaviour. For example a person born and raised in a bicycle-friendly city might move to a car dominated city and keep using the bike. Whereas no information about these personal backgrounds are available in cross-sectional datasets, biographical data offer this additional information and contribute to a more comprehensive understanding of his/her behaviour and can lead to more appropriate conclusions.

To date, empirical work applying the mobility biographies approach is rare (exceptions are Ohnmacht/Axhausen 2005; Beige/Axhausen 2006; Scheiner/Holz-Rau 2013a; Scheiner/Holz-Rau 2013b), possibly hindered by the time consuming and labour intensive collection of longitudinal data. The existing studies mainly analyse the role of key events in the life course. Therefore, there is still a gap in research to analyse the formation of travel behaviour in the long-term. In consequence, long-term impact factors, such as family socialisation, are underexplored.

3. Intergenerational Socialization within Mobility Biographies

The theoretical frameworks of socialisation plus mobility biography provide new perspectives for mobility research. However, mobility behaviour has been analysed barely applying the two methodologies, with the notable exception of Klöpper and Weber (2007). Therefore, the following section presents a methodological research design towards the combination of the socialisation and mobility biography approach.

Since this study focuses on the impact of family members’ of different generations on travel mode choice other socialisation agents are left unconsidered. Against the theoretical background we argue that social, environmental and historical circumstances on the macro-level and human interaction on the meso- and micro-level influence travel behaviour at any time. In addition we claim that past experiences are associated with travel behaviour. In the following we focus on intergenerational and biographical effects on the meso- and micro-level. Fig. 1 presents the
life courses of three individuals of three different generations in one family. The individual life course includes, among other partial biographies, the mobility, employment, household and residential biographies (Scheiner 2007). Each partial biography consists of different domains (Lanzendorf 2003). Fig. 1 presents two life-phases as examples, but any other life-phase can be analysed simultaneously.

Based on the considerations above we expect three major effects (on the micro- and meso-level) on mobility behaviour at any time (Fig. 1):

a. Life course effect: individual experiences over the life course (e.g. a person moves to another city. The individual tries three travel modes for commuting. Due to her/his experiences she/he decides to use the bike regularly. Horizontal effects in Fig. 1)
b. Socialisation effect: the influence of socialisation agents’ preferences/behaviour/experiences at the time of interest (e.g. a person commutes to work by bike because the father commutes by bike at the same time. Vertical effects in all figures)
c. Reverse socialisation effect: the impact of socialisation agents’ behaviour when they experienced the life-phase of interest themselves (e.g. travel mode choice during pregnancy. A woman starts to use the car for her trips while she is pregnant because her mother advised her to use the car during pregnancy based on her own experiences. Diagonal effects in Fig. 1)

We assume that the major influence between generations is from the older to the younger generation. For reasons of clarity Fig. 1 contains just one individual per generation. In reality the first and second generation influences the third generation by the (grand-) mother and (grand-) father. The effect of the first on the third generation could be tested simultaneously but we assume that the emotional and spatial relationship is not as close as between the second and third generation. Furthermore the historical context causes more differences in attitudes, norms and values and, thus, direct socialisation effects between the first and third generation are assumed to be not substantial.

Fig. 1: Intergenerational and life course effects on mobility behaviour (Source: authors’ illustration based on Scheiner 2007; Lanzendorf 2003).
In summary, within the methodological framework of intergenerational mobility socialisation over the life course, travel behaviour at a certain point in time is determined (i) by subjective norms and attitudes which are to some extent transmitted from one generation to the next (whether explicitly or implicitly), (ii) by individual experience over a person’s life course, and (iii) by spatial, social, technical and historical contexts. The empirical study focuses on the analysis of the life course effects (a) and socialisations effects (b), while the reverse socialisation effects and the macro context is deliberately excluded.

4. Data and Method

This study uses quantitative data about the employment, residential and household biographies as well as the commute travel behaviour over the life course. The Department of Transport Planning of the Faculty of Spatial Planning at TU Dortmund University collected the data annually between 2007 and December 2012 in first year seminars. Overall 954 students (generation 3), 1787 students’ parents (generation 2), and 1294 students’ grandparents (generation 1) as well as 585 unrelated persons (excluded from analysis) answered the retrospective questionnaires.

4.1. Data

As the sample is unique in structure, it is difficult to appraise the representativeness. However, highly educated individuals are clearly overrepresented (Table 1). The survey does not provide information on income but it is likely that lower income groups are underrepresented. Furthermore, the percentage of foreigners is 4.5% in the sample and 9% in Germany. Hence, foreigners are underrepresented in our sample. In contrast, as most of the respondents live in Dortmund or North-Rhine-Westphalia (Bundesland with the highest population density) it is likely that urban population is overrepresented in the sample. However, since we aim to find intergenerational relations rather than present general figures of travel mode use, we do not expect significant effects of the structural differences between the sample and population on our results (Babbie 2003).

| Table 1: Comparison of selected characteristics in the sample and Germany |
|---------------------------------|---------|---------|
|                                 | Germany | Sample |
| university degree                |         |         |
| Generation 1 born 1946 or earlier (sample average 1931) in % | 4.8 a   | 16.0 male |
|                                 |         | 3.0 female |
| Generation 2 born 1956-1961 (sample average 1956/1959) in % | 8.2 a   | 41.0 male |
|                                 |         | 26.8 female |
| foreigners in %                 | 9.0 b   | 4.5     |

(Source: a authors’ data (n=4620); Statistisches Bundesamt 2013; Statistisches Bundesamt 2011)

4.2. Variables

We utilize the percentage of each travel mode used on commute trips over the whole life course as the dependent variable. In this study a commute trip is a regular trip to work, regardless exceptions. The survey gives information about the travel mode used as well as the duration of a commute episode in years. Duration of a commute episode means the number of years a work trip was made regularly without any change in commute distance or travel mode. It should not be mistaken for daily trip time expenditure. The percentage of car use, for instance, is calculated by the number of years the car was used on work trips divided by the sum of the years a person was employed. This way the life course is taken into account in a simplified way. We distinguish three travel modes: car (including motorbikes and other motorised individual travel modes), public transport (PT), and non-motorised travel modes including biking and walking. As this paper focuses on commute mode choice, only grandparents and parents are considered because most students have not made many work trips yet in their lives.
According to the methodological framework we used residential location and personal attitudes towards the examined travel modes as predictors. Personal experiences and socialisation in turn determine these predictors. Other context variables may be included in future research.

Table 2 summarises the variables used and their measurement. Attitudes towards travel modes are measured on a five-point Likert-type scale ranging from one (“agree”) to five (“disagree”). Attitudes were collected only at the time of survey. In this analysis we assume attitudes are long-term robust characteristics of a person. To our knowledge there are no panel data about travel mode preferences to date (Cao et al. 2007). For the other measured variables the average is calculated (Table 2). This way the analysis concerns the life course and the resulting life course effects.

<table>
<thead>
<tr>
<th>variable</th>
<th>measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>attitude PT</td>
<td>I like to use public transport. In big cities I prefer to use public transport over the car.</td>
</tr>
<tr>
<td>attitude bike</td>
<td>I like riding the bike. I often use the bike for recreational purposes.</td>
</tr>
<tr>
<td>attitude car</td>
<td>I used to carry my children in car. Before I got my driving license I could hardly wait to receive it. I walk just to my car. With the car I feel really independent.</td>
</tr>
<tr>
<td>city size</td>
<td>average number of population of past municipalities of residence (not weighted by duration of episode)</td>
</tr>
<tr>
<td>location city</td>
<td>average location within past municipalities of residence (1 central to 5 border, not weighted by duration of episode)</td>
</tr>
<tr>
<td>location city district</td>
<td>average location within past municipalities of residence (1 central to 5 border, not weighted by duration of episode)</td>
</tr>
</tbody>
</table>

4.3. Method of Analysis

In the following, structural equation models (SEM) are used to estimate the presented hypothetical causal relationships simultaneously. SEM are commonly used in travel studies (Bamberg et al. 2000; Golob 2003; van Acker/Witlox 2010; Strambach/Döring 2012). The method is a mixture of regression analysis and factor analysis. We used the Maximum-Likelihood (ML) method which is commonly used in practice. Among others the root mean square error approximation (rmsea, common threshold values are <= .8 acceptable) and the adjusted goodness of fit index (agfi, the closer to one the better) give evidence about the quality of the model (Weiber/Mühlhaus 2010; Arbuckle 2012).

For reasons of validation we used a split-half sampling procedure for analysis. This means a random subsample of 50% is included in the following analyses. In a later stage the other 50% will be used to validate the results. Thus, the reliability of the interaction structure can be tested. In favour of the validation through the half-split method we deliberately accepted the trade-off of a smaller sample size. However, since the ratio of the sample size (N=416) and the observed variables is bigger than 15 (26.0 for the car models and 34.7 for the other models), we do not expect significant bias due to the sample size (Stevens 1996 in Cao et al. 2007).

The assignment of the variables to the latent constructs is based on an exploratory factor analysis. The factor analysis confirms that the constructs (Table 2) are one-dimensional. Furthermore, Cronbach’s Alpha as a measure of the consistence of the scale suggests acceptable reliability (car 0.71, bike 0.83 and PT 0.69). The data is not normally distributed, but as the total sum of kurtosis and skew does not exceed [2], the deviation is moderate and thus the bias is expected to raise no serious concern (Muthén/Kaplan 1985:187 in Gao et al. 2008:117).

Six subgroups are identified out of the data. Generation one consists of maternal grandfathers (MGF), maternal grandmothers (MGM), paternal grandfathers (PGF), as well as paternal grandmothers (PGM). Generation two consists of mothers (MO) and fathers (FA). For mothers and fathers, separated SEMs were estimated for each travel mode and each grandparent. Hence, in total twelve models were estimated.
5. Preliminary Results

5.1. Estimation Details

The theoretical hypotheses were strictly tested without allowing any error covariance. This resulted in relatively poor rmsea-values. Good model fits were achieved when two to five error covariances were permitted. Since the regression weights did not change significantly the strict theory based models serve for the analyses at this stage of the study. This way it was avoided to develop empirically adjusted models with little information (Scheiner/Holz-Rau 2013b). The correlation matrix provides the input for the following SGM. Three out of the twelve models will present and exemplify the results. Against the theoretical concept in the following the focus is first on life course effects, which are the horizontal, individual associations (Fig. 1-4). In a second step the focus is on the relationships between the generations. Hence the vertical arrows indicating socialisation effects will be described in the end.

5.2. Life Course Effects

**Car models** The attitude is the strongest predictor for the use of the car. The effect of attitude is more than two times stronger than the effect of the strongest spatial variable in the MGM-MO model (Fig. 2). For MGM the location within the city district is the strongest spatial variable and affects the car use with a regression weight of -0.11 (Fig. 2). In comparison attitude is associated with the car use with a regression weight of 0.27. Similar effects result for mothers. The attitude is more than three times stronger associated to car use than location within the city (Fig. 2). Attitude is in the other car models also the strongest predictor under study. Nevertheless the residential location has an effect on car use. The effect of the residential location within the city as well as within the city district and the effect of the city size differ between the generations. For generation one the effects of the residential location within the city are just significant for grandfathers and weaker than for generation two.

![Diagram](image-url)
In generation two the effects of this variable are significant with regression weights ranging between .14 and .15 (e.g. Fig. 2 lower part). Overall all models show positive associations between the location within the city and car use (e.g. Fig. 2, except PGM). That means the closer a person lives to the border of a city the more she/he uses the car on work trips. In contrast the location within the city district plays a less important role. It is just significantly and negatively associated with car use for the MGM (Fig. 2) and PGF (regression weights -.11/-.26). This means the closer the MGM or PGF lives to the city district centre the more she/he drives. For the other models the location within the city district turned out to be no important predictor for car use. Furthermore, the city size is not associated with the car use. In generation one overall the city size is not significant associated to the car use. An exception is the model of the PGF where the effect is positive and achieves a regression weight of .13. In generation two in all models the regression weights are around zero but slightly negative. Overall the car models achieved best explained variances for the second generation’s car use (Fig. 2-4). In the MGF model 25 % of the variance of maternal car use on work trips is explained by the model. Furthermore the PGF-FA model explains 10% of the variance of the paternal car use and the PGM-FA model 17% of the same.

**Public Transport models** Attitude is also an important predictor for the use of PT but the city size of the residential location is similarly important (in some models even more important). For generation one the attitude is significantly and positively associated with the use of PT. Regression weights range from .11 to .42. For generation two similar results are given. Similar to the car models in the PT models the location within the city is a stronger predictor for the mode choice of generation two than for generation one. The association between these variables varies in generation one. For PGF and PGM location within the city is significantly and positively associated with PT use (regression weights .11/.12). This means the closer a person lives to the city border (in average over the life course) the more she/he uses PT (in average on work trips). In contrast for MGM it is not significantly and negatively associated (Fig. 3). For generation two the results show a more homogeneous pattern. The location within the city is in the majority of the models significantly and negatively associated (e.g. Fig. 3). Overall for generation two the results indicate the more a person lives in the city centre the more this person uses PT for work trips. Possible reasons for this difference between the generations are the increase in the value of the car and suburbanisation processes during the 1960s and 1970s. The association of the variable location within the city district varies also among the models for generation one. It is significantly and negatively associated with PT use for MGF and PGM (MGF -.14/PGM -.11), but not significantly and slightly positively related to PT use of MGM (Fig. 3) and PGF (.08). In generation two these associations are slightly negative but close to zero and thus not as important as location within the city.

Fig. 3: Model of maternal grandmothers’ and mothers’ public transport use on work trips over life (Source: authors’ analysis)
The city size of the residential location has a strong effect on the use of PT on work trips. In generation one the city size is significantly and positively associated with the use of PT of grandmothers (e.g. Fig. 3). In contrast the regression weights are close to zero for grandfathers. For generation two city size is in all models significantly positively associated with the use of PT. That means people living in bigger cities tend to use more PT than others. For MGM and MO the city size has an even stronger effect on PT use than attitude (Fig. 3). The explained variance in the PT models varies. The explained variance of the second generation’s PT use on work trips is .06 in the PGF-FA model, .16 in the MGF-MO, .12 in the PGM-FA, .10 in the MGM-MO model (Fig. 3) and .16 in the MGF-MO model.

Non-motorised models A noticeable result in all non-motorised is that they explain just 5% of the variance of the travel mode use (Fig. 4). This may be due to content inconsistencies of the variables. The measured attitude towards the bicycle does not include attitude towards walking, whereas the finally measured behaviour includes walking and cycling. In consequence it is not surprising that attitude is less important for the use of non-motorised travel modes compared to its role in the other models. For MGM, MGF, and the fathers the effect of attitude towards cycling on the use of non-motorised travel modes is weak and not significant (regression weights; MGF.05, PGF-FA.06/ PGM-FA.08). This suggests that attitude towards cycling and other non-motorised travel modes may differ. Therefore it is unexpected that attitude is still a significant predictor in the other models. The location within a city is negatively and significantly associated to the non-motorised travel mode use of generation one. Just in the MGM-MO model (Fig. 4) this results are not given. In generations two this variable is just for the fathers significantly, negatively related to non-motorised travel mode use. The location within the city district turns out to affect just the paternal grandparents significantly and positively. In comparison the models show city size is an important predictor in all non-motorised models no matter generation or gender. People living in smaller cities over their live course are more likely to walk or cycle to work. For both generations the city size is significantly and negatively related to the use of non-motorised travel modes (regression weights; generation two-.13, MGF-.16/ MGM-.23/ PGF-.23 and PGM-.10). All in all, city size turned out to be a significant predictor for non-motorised travel mode use. In both generations city size is negatively related to the mode used.

Fig. 4: Model of maternal grandmothers’ and mothers’ non-motorised travel mode use on work trips over life (Source: authors’ analysis)
5.3. Intergenerational Socialisation Effects

To analyse the intergenerational socialisation effects the vertical associations are of major interest (vertical arrows in the Fig. 2-4).

**Car models** In the MGM-MO car model strong intergenerational associations are found. The intergenerational effects such as the effect on attitude (.42), city size (.62), location within the city (.31) and location within the city district (.34) are all positive and significant (Fig. 2). We call these associations intergenerational socialisation effects. In the presented model these predictors determine the travel mode use of generation two indirectly. In contrast the realised behaviour affects the travel mode use direct (in Fig. 2 regression weight of .21). We calculate the total socialisation effect by multiplying the intergenerational and personal effects along each arrow and summing up the results (e.g. a) .42 *.45 =.189; .62 *-.03 =-.0186; .31 *14 =.0434; .34 *-.01 =.0034; .27*21=.06 ; b) .189 - .0186 +.0434 -.0034 + .21 +.06 + .02= .50. In the other car models the socialisation effects are ranging from .16 to .21. The direct effect of the realised behaviour is rather small in the other models (MGF-MO .06, PGF-FA .08, PGM-FA .13). Overall in the estimated models for generation two attitude and residential location are the strongest predictors for car use and both are strongly dependent on generation one.

**Public transport models** In the PT model presented the total socialisation effect is .09 (Fig. 3). This extremely small effect is due to negative effects of location within the city and location within the city district. Neglecting the minus/plus sign the amount of the effect is .23. Similar patterns were found for the PGM-FA (total socialisation effect: -.05, effect amount: .37) and the PGF-FA model (total socialisation effect: .094, effect amount: .15). The MGF-MO model has a higher socialisation effect caused by a strong positive association between realised use of PT and other positive associations (regression weight .21, total socialisation effect .26). In contrast in the other PT models the realised behaviour has an effect close to zero. Just the association between the PGM’s and FA’s use of PT is significantly negative (-.18). Another remarkable fact is that the grandfathers’ attitudes are not significantly related to the descendants’ attitudes towards PT (regression weights; MGF-MO.04/PGF-FA.08). In contrast the city size is significantly positively associated to the same of generation two in all models. In summary, in the PT models the total socialisation effects are little but there are significant and strong positive intergenerational associations. The patterns of the associations differ between the models but in general the intergenerational socialisation effects of grandfathers are weaker than the grandmothers’ effects in the estimated PT models.

**Non-motorised models** In the non-motorised models the total socialisation effect is again close to zero. This is mainly due to the negative effects of the city size on the use of non-motorised travel modes (Fig. 4). The amounts of the socialisation effects are ranging from .16 (Fig. 4) to .23. In these models the realised behaviour results to be not significantly associated between generation one and two (Fig. 4, one exception is the MGF-MO model the regression weight of .10). In contrast there are strong positive intergenerational associations between the attitude and the spatial characteristics.

Taking together the intergenerational associations of all models three major results are remarkable. First, the residential location characteristics of the grandparents are strongly positively related to these characteristics of their descendants. Strong positive standardised regression weights (between .29 and .66 with an average of .44) and significant p-values ($\alpha= 0.05$) point to this result in all models regardless of gender. It should be noted that this analysis includes non-movers and movers. People who did never move in their life boost this effect. Second, the travel mode use of generation one has a comparably small effect on the behaviour of generation two. Although in most models this intergenerational effect is positive but less strong and not in all cases significant. In the PGM’s PT and non-motorised models this effect is negative. A possible reason is that fathers are more likely to use the car for work trips than grandmothers, no matter whether the grandmother used PT or non-motorised travel modes. Third, the grandfather influences the descendants’ PT use less than the car and non-motorised travel mode use (MGF-MO .12/ PGF-FA .11 compared to car-models MGF-MO .20/ PGF-FA .13).

6. Conclusion & Outlook

In this paper a concept of life course and intergenerational effects on mobility behaviour has been presented. SEM was used to test the theoretical hypotheses. For car use over the life course, attitude and the location within the city are strong predictors (except for the MGM-MO model). For PT and non-motorised travel modes over the life...
course city size and attitude are important predictors. The results indicate the relevance of intergenerational socialisation effects. They show that the attitudes of parents (here: students’ grandparents; generation one) are strongly positively related to the attitudes of their descendants (students’ parents, generation two). Furthermore the residential locations of generation one and two are strongly and positively associated. In consequence, travel mode choice on commute ways is influenced by the attitudes and residential location choice which are in turn strongly associated with the older generation. Against our expectations, the results indicate that the actual travel mode use of generation one does not influence the travel mode use of generation two in all models (eight out of the twelve models hold no significant regression weights). Taking the gender into account the findings suggest that grandfathers influence the descendants’ attitude towards PT less than grandmothers.

The preliminary analyses presented have their limitations and raise some questions for future studies. First, the findings indicate that the importance of the predictors for commute travel mode formation differs between the generations. Thus, it is likely that the historical context including lifestyle and societal changes as well as technical achievements are important determinants for commute travel behaviour. The theoretical approach presented is designed to include more relevant variables such as travel mode ownership, travel mode accessibility, household structure, and spatial, technical and historical constraints during the life course of different generations. Future studies could explore the interactions between these variables and gain deeper insights into cohort effects in mobility behaviour. Second, the cause-impact structure between attitudes towards travel modes and residential location choice is not clear yet. There is a current discussion about this problem but empirical panel data on travel attitudes has not yet been collected to our knowledge, even though findings on this question have been published by Cao (2007) and others. Third, the role of other socialisation agents than just the family members could be considered in future analysis. Fourth, attitude was just recorded at one point in time. The retrospective measurement of former attitudes is likely to be superimposed and biased by current attitudes and, hence such data should be collected using panel designs. Finally, the variables presented here are based on longitudinal, retrospectively collected data but the models are based on average or weighted average variables over the life course. Based on that, first general insights into commute mode choice over the life course have been presented. Nonetheless, more detailed analysis and further development of the methodical approach may give valuable insights in the future.

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