GENDERED ACTIVITY SPACES: TRENDS OVER THREE DECADES IN GERMANY

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With 3 figures and 7 tables
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Summary: The paper studies gender differences in activity patterns and activity spaces (in terms of trip frequencies and travel distances to various activities) over the period 1976 to 2008. The results show gender convergence both in trip frequencies and travel distances. The growth of activity spaces is less pronounced in large cities than in small towns and municipalities, supporting the hypotheses of sustainability in transport development in the cities and of diverging patterns in travel trends between cities and the countryside. A cohort analysis of commute and shopping trip distances shows cohort effects as well as changes over the life-course. Again, the results reflect increasingly egalitarian gender roles.

Zusammenfassung: Der Beitrag untersucht Geschlechterunterschiede in Aktivitätsmustern und Aktionsräumen (im Sinne von Wegehäufigkeiten und zurückgelegten Distanzen für verschiedene Wegezwecke) im Zeitraum 1976 bis 2008. Die Ergebnisse zeigen die Konvergenz der Aktivitätsmuster und der zurückgelegten Wegelängen zwischen den Geschlechtern. Das Wachstum der Aktionsräume ist in den Großstädten deutlich geringer als in Mittelstädten und kleinen Gemeinden. Dies stützt die These der Nachhaltigkeit der Verkehrsentwicklung in den Städten sowie der 'Schere' der Verkehrsentwicklung zwischen Stadt und Land. Eine Kohortenanalyse für Berufs- und Einkaufswegelängen zeigt Kohorteneffekte sowie biografische Veränderungen im Lebenslauf. Auch darin spiegelt sich ein zunehmend egalitäres Geschlechterverhältnis.

Keywords: Activity space, travel behaviour, gender, cohort analysis, longitudinal analysis

1 Introduction

Since the late 1970s a research area connecting gender with travel behaviour has developed as a subfield of a broad scientific discussion about gender questions. Geography plays an important role in this context. Two distinct approaches should be distinguished between. Firstly, cultural studies investigate the meaning and importance of mobility for the social construction of gender, using qualitative-hermeneutical approaches (Cresswell and Uteng 2008; Letherby and Reynolds 2009). Secondly, the majority of studies are mostly quantitative approaches in the field of transport geography that investigate the relevance of gender for mobility and travel behaviour (Hanson and Hanson 1980; Nobis and Lenz 2005; Sandow 2008; for a discussion of both perspectives see Hanson 2010). Both these approaches overlap to a certain extent in that feminist perspectives dominate, and some recent work attempts to bring the two strands together (Kwan 2002; Schwanen 2007; Schwanen et al. 2008). Both perspectives also share a focus on certain elements of travel behaviour and mobility, e.g. activity spaces, and the options people have in terms of access and participation in transport (car availability, access to public transport, proximity to facilities). Activity spaces, measured in terms of commuting distances, have been one of the key starting points in the research field 'gender and travel' (Madden 1981). The general message of this research is that women's commute trips are shorter than men's both in distance and duration (e.g. Crane 2007), and with respect to distances travelled this holds for other purposes too (Hanson and Hanson 1980; Scheiner 2010a). Trends concerning these observations are studied relatively rarely, however. For Germany, there are no related longitudinal studies.

In this paper we study gender differences in just two elements of activity spaces over the period 1976 to 2008: trip frequencies and trip distances, both categorised by activity type. We ask whether and how these differences have changed over time, and how marked they still are today. What is more, we investigate spatial differences in activity spaces and related trends, and we present a cohort analysis of trip distances categorised by gender.

In the following section we discuss the theoretical background and the empirical state of the research. Section 3 presents the data and method-

ology of analysis. Section 4 describes the results. The paper finishes with some conclusions and an outlook on future research.

2 State of the research

Since the 1970s gender has increasingly become an issue in geography (McDowell 1999; Fleischmann and Meyer-Hanschen 2005 for Germany). Taking the specific needs of women as a starting point, feminist geography quickly developed a comparative perspective on differences and inequalities between women and men, as well as a differentiated gender perspective highlighting heterogeneity within the genders. Somewhat later, a radical-constructivist perspective developed that negated any naturalist notion of gender ('sex'), finding its gateway in social constructions of gender (Butler 1990).

Transport geography has a considerably longer tradition, but was essentially a subfield of economic geography until the 1960s. In this context it worked with aggregate spatial data on questions of economic exchange, location and transport infrastructure (Otremba 1980). The analysis of daily activity spaces and other behavioural issues of households and individuals on the micro level found a place in transport analysis as a consequence of dissatisfaction with aggregate modelling and the theoretical foundations lain by time geography (Hägerstrand 1970; Carlstein et al. 1978) and, in Germany, the Munich school of social geography (Maier et al. 1977), plus the increasing availability of micro data and computer-aided analysis. Human activity patterns in space and time have been recognised to be extremely complex, involving trip and activity durations and their temporal distributions, travel distances, activity participation, travel mode choice, trip chain complexity, and more (Carlstein et al. 1978; Stopher et al. 1981). To put it briefly, the key question in this context was "Who does what, when, where, how often, how long and why?" (Schwesig 1988, 17). Asking this question provided the basis for the gendered approaches that entered transport studies around 1980, taking a feminist perspective (Rosenbloom 1978; Hanson and Hanson 1980; Giuliano 1983).

The constructivist perspective mentioned above dominates in qualitative mobility studies that often employ culturalist perspectives (Cresswell and Uteng 2008; Letherby and Reynolds 2009), but it is hardly represented in transport geography. Instead, two other research directions dominate here: empirical studies and planning studies.

Empirical studies compare men and women (or seek to find significant gender effects) in terms of travel mode choice, trip and activity patterns, travel distances and activity spaces. The key result found is that women drive less often than men, while they tend to make more trips as car passengers, by public transport or on foot (Simma and Axhausen 2003 for Austria, Polk 2004 for Sweden, Nobis and Lenz 2005 for Germany). What is more, they make shorter trips than men on average, an observation that is particularly well documented for commuting (Brennecke 1994 for Germany, Turner and Niemeier 1997 for the USA, Van Acker and Witlox 2011 for Belgium; Sandow 2008 for Sweden, EU 2006 for various countries, Scheiner 2010a for different trip purposes in Germany). Women also make more complex trip chains (Krause 1999 for Germany, McGuckin and Murakami 1999 for the USA, Krygsman et al. 2007 for The Netherlands) and undertake different activities to men – more shopping, errands, escort trips, but less commute and business trips (Brennecke 1994, Nobis and Lenz 2005 and Scheiner 2009 for Germany, Hamilton 2005 for the UK; for children escort trips see McDonald 2008 for the USA, Schwanen 2007 for The Netherlands, Zwerts et al. 2007 for Belgium).

Naess (2008) finds that gender differences interact with spatial context. Men tend to compensate for a lack of close-by facilities in the neighbourhood by longer trips, while women tend to limit their activity spaces, activities and/or needs. Another result that suggests constraints in women's activity spaces is that women seem to be more sensitive to distance; they tend to relocate their residence more than men when their commute trip is relatively long (Prashker et al. 2008 for Tel Aviv), and they tend to accept a job only within relatively short distances or restrict their job-search to a limited area (Madden 1981; Giuliano 1983; MacDonald 1999; all these authors argue from a US perspective). Vance and Iovanna's (2007) results for Germany point to constraints in car access even in car owning households. They find that having fewer cars than drivers in a household reduces women's driving more than men's.

Besides empirical work, transport und urban planning and policy studies focus on women's needs and their specific constraints in terms of access to activities and transport systems (Krause 1999 for Germany, Ortoleva and Brenman 2004 for the USA, Polk 2008 for Sweden). This research is closely related to studies of population groups suffering from mobility constraints and social exclusion. That is to say, a perspective on women as being dis-

advantaged in transport and access dominates this research, and it attempts to counteract this by aiming for social equity as an element of sustainability (FGSV 1997; Hamilton and Jenkins 2000; Greed 2008).

Several distinct theoretical approaches can be identified from the literature that aim to explain observed gender differences in travel.

1. According to gender role-based approaches, women take on household and family responsibilities more than men, leading to constraints in their time budgets, ties to the neighbourhood, and complex everyday schedules involving manifold activities and trips (Turner and Niemeier 1997; MacDonald 1999; Kwan 1999). This hypothesis of household responsibilities is based on the fundamental distinction between paid work (employment) that is primarily done by men, and unpaid non-market household work that is primarily accomplished by women, which leads to unequal economic power relations between the genders.
2. A second hypothesis highlights women's limited access to economic, social and temporal resources (Giuliano 1983; MacDonald 1999). Characteristic here are lower income levels (Madden 1981; Clark and Wang 2005), occupational segregation (Reskin and Hartman 1986), constrained access to cars (Dobbs 2005) and 'time poverty' because of women's responsibilities for household and family work and their use of slow transport modes (Turner and Grieco 2000). The 'spatial entrapment' hypothesis addresses lack of access in a specific way. It claims that women tend to be trapped in their neighbourhood due to their responsibilities, lack of transport and occupational segregation. This hypothesis is challenged by England (1993) in a study of female clerical workers in suburban Columbus, Ohio, and discussed since (MacDonald 1999; Carter and Butler 2008). The idea of spatial entrapment is related to the 'spatial mismatch' hypothesis that was formulated by Kain (1968) to explain the exclusion of ethnic minorities from labour markets that followed the suburbanisation of jobs in the USA. This hypothesis was later extended and reformulated for other issues of inquiry, including the mismatch between 'female' jobs and women's places of residence (McLafferty and Preston 1992; Gilbert 1998). Both the debates about spatial entrapment and spatial mismatch are to a large degree centred on the USA (reviews by MacDonald 1999; Preston and McLafferty 1999).
3. A third explanation pattern focuses on gender specific and gender-related attitudes, norms, and preferences. Women's stronger commitment to children and social relations in general may result in better 'sensors' for sustainability and protection of the lifeworld and the environment (Brennecke 1994; Hjorthol 2008). Women's lower wages and limited job-search areas may reflect specific search preferences or strategies that rely on social networks more than men do (Hanson and Pratt 1995; Preston and McLafferty 1999). Such subjectivities may also be related to gendered identity formation (Law 1999, McDowell 1999).
4. Feminist theory highlights patriarchal power relations that may operate over and above economic inequality (Walby 1990). These power relations impact social role patterns, the availability of resources, and norms likewise. As a result, observed gender differences in activity patterns and travel mode choice are subject to these power relations, more specifically to women's weak negotiating position in the household or on the labour market.

A nuanced understanding of all these hypotheses has been developed in the literature, highlighting the within-group heterogeneity among women (and, less so, among men), including the intersections of gender with ethnicity, social stratum, culture, and local context (McLafferty and Preston 1992; Gilbert 1998; Preston and McLafferty 1999). For instance, gender inequalities may be fuelled or mitigated by such diverse factors as local employers' strategies, religious tradition and dogmatism, or the availability of public transport. These intervening factors are not further investigated here due to our very straightforward empirical focus (see below).

However, none of these four theoretical approaches has clearly acknowledged the sociological analyses of late modernity that have emerged since the 1980s. These have convincingly outlined a fundamental change in gender relations in the context of social change and individualisation (Beck 1986). The lack of reference is particularly remarkable as the bulk of research on gender and travel itself reflects this social change. The educational expansion of the 1960s, emancipatory social movements, the enormous increase in welfare, increasing female employment and the individualisation of lifestyles have all contributed to this change. Formerly clear gender specific structures in society have become increasingly blurred, including structures in travel

behaviour. As a consequence, travel behaviour is affected more by other social structures than by gender (Scheiner 2006).

However, there is relatively little empirical evidence for such trends. Crane (2007) finds for the USA that commute distances converge only moderately between women and men over the period 1985 to 2005. Differences in commute duration become even larger because women tend to achieve ever higher travel speeds due to their declining use of public transport; thus, women's relatively short commute trip durations get even shorter. Sandow (2008) reports persistent differences in commute distance for Sweden over the period 1991 to 2003. In contrast, Hjorthol (2008) finds gender convergence in travel mode choice and trip purposes for Norway over the period 1992 to 2005. Scheiner (2006) reports strongly declining gender effects on travel mode choice and travel participation in Germany over the period 1976 to 2002.

In men's and women's time budgets there is convergence as well. This is mostly due to increasing female employment. For instance, mothers' participation in the labour force increased from 41 percent (1975) to 64 percent (2002) in West Germany (Best and Lanzendorf 2005). As a consequence, gender specific structures in other activities change as well (Bianchi et al. 2000 for the USA, Kan et al. 2011 for 16 developed countries).

We know even less about the extent to which such changes are due to period, cohort or age effects. Most recently, the mobility biography approach has attempted to separate changes induced by learning processes or key events over the life course from cohort specific changes (e.g. increase in driving license holding from one generation to the next) (Lanzendorf 2003; Scheiner 2007; Ottmann 2009). Such cohort changes show interactions with gender as well. For instance, the strong increase in car availability in recent decades is mainly due to women catching up (Beckmann et al. 2005).

In the following, we study gender differences in two elements of activity/travel behaviour over the period 1976 to 2008: trip frequencies and trip distances, each categorised by activities. We also investigate spatial differences in activity spaces and related trends, starting from the hypothesis that in the 1970s gender relations were structured in a particularly traditional way in rural areas. From that point, a catch-up process could have taken place in precisely these areas. What is more, we study whether a cohort's specific activity spaces change over the life course, or remain stable.

3 Data and methodology

3.1 Data

Long-term trends in travel behaviour can best be studied in Germany by using data from KONTIV ('continued survey of travel behaviour') and its successor 'Mobility in Germany' (MID). These two surveys together represent a repeated semi-official nationwide survey undertaken on behalf of the Federal Transport Ministry. They are based on the random day principle, i.e. each respondent reports his/her trips for a given random day, including trip purpose, estimated distance (there is no geo-coding available), mode, departure and arrival time. The following analyses use the five surveys available to date: KONTIV 1976, 1982 and 1989, plus MID 2002 and 2008.

Different survey methodologies used in the five surveys result in some problems in comparison. This refers particularly to the KONTIV surveys on the one hand, and MID on the other (Holz-Rau and Scheiner 2006), although the three KONTIV surveys also each have their own specifics (Kloas and Kunert 1994) (see Tab. 1). In the 1989 survey, the collection of the completed questionnaires by couriers led to the under-representation of highly mobile individuals/households. This effect was further intensified due to the substitution of these households with others (Kloas and Kunert 1994). In the 2002 survey, the telephone method was used for the first time and resulted in distinctly higher trip counts compared to the former KONTIV surveys, due to the direct enquiry approach (Smid et al. 2001).

Furthermore, the samples of the surveys are not directly comparable. In the 1976, 1982, 1989 and 2008 surveys the basic population was the 'German-speaking' residential population, and the lower age limit was set at six years in 1989, at ten in 1976 and 1982, but at zero in 2008. In 2002 the whole residential population including foreigners was considered, and the survey was extended to East Germany for the first time. Moreover, in 1989, and to a certain extent in 1982, a random route method was used which took non-registered residents into account, in contrast to the other surveys.

For these reasons this paper is limited to consideration of German individuals (1976 to 1989 and 2008: total sample, 2002: German nationals) aged 18 and older, who live in the old *Bundesländer* (former West Germany). Children and adolescents are excluded from the analysis, because their travel behaviour is subject to specific conditions and needs. The

Tab. 1: Methodological comparison of the KONTIV and MID surveys

	KONTIV 1976	KONTIV 1982	KONTIV 1989	MID 2002	MID 2008
Survey institute	Socialdata (Sozialforschung Brög)	Socialdata (Sozialforschung Brög)	Emnid	DIW, infas-Institut für angewandte Sozialwissenschaft	DLR, infas-Institut für angewandte Sozialwissenschaft
Sampling procedure	Address books	1/3 address books, 2/3 random route	Random route	Registration office	Registration office
Population	German speaking population 10 years or older	German speaking population 10 years or older	German speaking population 6 years or older	Total population	German speaking population
Survey methodology	Mail survey	Mail survey	Written survey, by courier with completion support	Telephone interview (CATI) + mail survey	Telephone interview (CATI) + mail survey
Number of random days	2-3	1	1	1	1
Return rate	72%	66%	64%	42%	21%
Net sample (persons)	41,373	39,239	42,297	61,729	60,713
Sample of analysis (persons)*	26,735	25,911	26,754	27,858	33,234

* after filtering persons under 18 years of age, immobile persons, foreigners, East Germans.
Authors' composition after Kloas and Kunert (1994), Kunert et al. (2002), Smid et al. (2001), Follmer et al. (2010)

resulting net samples (counted in persons) are given in table 1. All distance estimates are self-reported by the respondents[1)].

3.2 Analysis

Our analysis is straightforward and may seem crude in some respects, particularly in that we just distinguish between men and women. We acknowledge that heterogeneity among women and among men is extremely large, and studies that seek to rule out effects of employment, social status or household type – just to name some prominent variables – are of utmost value. However, we are interested in the overall picture in this paper, rather than in specific subgroups or marginal effects of sex, other variables held constant. As Rosenbloom (2006, 7) notes, "so many potentially explanatory variables are tied to sex in society that it may not be relevant whether sex or other intensely gendered variables, such as household role or living alone in old age, explain differences between men and women".

Concerning spatial context, we use municipality size classes as spatial categories as these are available in a comparable form for all surveys, and travel behaviour analyses suggest pronounced spatial differences on a micro-scale basis while differences between regions as a whole are relatively minor (e.g. Scheiner 2006). We distinguish between small municipalities with less than 20,000 inhabitants, medium sized towns (20,000 to 100,000 inhabitants), and cities with more than 100,000 inhabitants[2)]. It should be noted that municipality size is a relatively crude measure for urbanism, particularly as local government reforms since the 1970s have involved changes in municipality size categories. Generally, it should be noted that our method of analysis masks much heterogeneity among women and among men, between different urban areas of the same size, and otherwise.

[1)] The data are provided by the Clearingstelle Verkehr in Berlin. They include the respective basic samples without regional supplements (www.clearingstelle-verkehr.de).

[2)] Initially we suspected that egalitarian gender relations may be concentrated in the largest cities with more than 500,000 inhabitants. However, we found no evidence for this; the values for these cities are very similar to those with 100,000 to 500,000 inhabitants. We therefore decided to treat these cities as one category.

This paper focuses on two straightforward aspects of activity spaces: trip frequencies and trip distances for various activities. Related findings for travel mode choice are available elsewhere (SICKS et al., forthcoming). Due to the differences between the surveys the trip frequencies are not fully comparable (underreport of trips in the KONTIV surveys, see below). The same is true for daily travel distances and distances per trip. We hence limit our analysis to a maximum of eight reported trips, and we study trip distances with respect to mean distance per trip for a given activity. This partially, albeit not fully, compensates for the differences in accuracy of recording, because in the early KONTIV surveys the coupling of activities was underrepresented (HOLZ-RAU 1990), a shortcoming that affects short trips to a larger extent than long trips. Outliers (extremely long trips) cause some irregularities, particularly when the analysis is limited to specific groups. We therefore exclude trips exceeding the following threshold distances: 50 km for commuting, 10 km for maintenance, 20 km for escort, 30 km for leisure. These threshold values reflect reasonable plausibility assumptions; they roughly match twice the values for today's respective mean trip distance, including outliers. The threshold has only been set higher for commute trips, matching a typical threshold for long-distance commuting[3].

For our cohort analysis we make use of the regular time intervals of 6–7 years between the surveys, taking a hypothetical survey in 1995 into account. We use birth cohort spanning a range of 6.5 years. As the data include the year of birth, but not the exact date, we use random assignment to assign respondents at the cohort edges to the appropriate older or younger cohort. This results in a scheme in which each cohort moves into the next oldest cohort in each successive survey.

We focus our interpretation mainly on ratios between the mean values of the attribute considered for men compared to women. We thus assume that survey specific inaccuracies in travel behaviour reporting refer to men and women likewise and so do not have a substantial impact on the ratios.

However, gender/travel studies have repeatedly claimed that at least the 'old' KONTIV design underrepresents women's travel behaviour more than men's, because underreporting of short trips, trips on foot, and small errands 'in between' affects women more than average (STETE and KLINKHART 1997). Such gender specific effects of underreporting in the KONTIV surveys have not yet been empirically proven.

The analysis requires activities to be assigned to trips. In random day travel data the activity at the destination is typically assigned as the trip purpose. For homeward bound trips this results in the activity 'housing'. We assign homeward trips to the trip chain's main purpose using the following hierarchy: employment, business (economic, not personal business), education, escort, maintenance (shopping plus private errand), leisure, other. Trips coded as 'return trips' are assigned the purpose of the previous trip. Other trips are coded according to the activity at the destination.

What is more, assigning distances to activities from the data is not always straightforward. An example may serve to explain (Fig. 1). A person stops on her work trip in the morning to go shopping. After work she goes back home. The shop is located close to the workplace. This trip chain includes a long shopping trip (15 km) and a very short work trip (2 km). One may assume that this person would not have made a 15 km shopping trip, had she not attended her workplace. Job location acts as an 'anchor' or 'peg' (CULLEN and GODSON 1975) in the daily schedule, determining the shop chosen. According to the data structure, however, shopping (trip distance 15 km) would be assigned a considerably larger activity radius than work (mean trip distance (16+2)/2=9). Clearly, using the raw data distance values does not well reflect people's daily scheduling.

For complex trip chains with coupled activities we therefore recalculate distances travelled for specific purposes (for details see SICKS and HOLZ-RAU 2011). We use a simplified hierarchy of activities, distinguishing only between job, business and education (as 'pegs') on the one hand, and other activities on the other[4]. We assume individuals accept the total trip chain distance mainly because of the higher order activity, i.e. the pegs. Hence, we assign only the necessary detour to the lower order activities. In figure 1 this results in a shopping distance of 1 km, which is the detour this person made in order to access the shop.

[3] Working with medians would be an alternative, and it would make threshold distances unnecessary. However, medians also produce irregularities over time. This is due to the right skewed distribution of trip distances plus the dominance of 'sympathetic values' (frequent occurrence of values such as 1 km, 2 km...). This results in relatively arbitrary medians that cause irregularities over time in the ratios between men and women.

[4] When somebody attends his/her workplace and makes a business trip later that day, this business trip is typically not a detour of the job trip. Therefore we assign the same hierarchy level to these two types of trips.

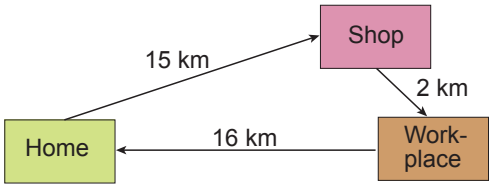

Fig. 1: Example of a trip chain

In trip chains with more than one activity of the same hierarchy level, we equally distribute the total distance to be assigned to these activities. For instance, a trip chain covering a total distance of 24 km and with the activity sequence 'shopping-shopping-escort-home' would be split into 16 km for shopping plus 8 km for escort. Applying this methodology allows distances to be assigned to activities for 98 percent of all trip chains. Missing cases mainly result from missing purposes and distances.

4 Results

4.1 Trip frequencies by activity type

The ratios for participation in activities, as measured by trip frequencies, of men versus women clearly show gender convergence over the past three decades (Tab. 2). For instance, men made more than twice as many job trips as women in 1976 (ratio R=1.38/0.65=2.11). In 2008 men's job trips were 1.38 times as frequent as women's. At first glance it may seem amazing that this is based more on a decline among men than on an increase among women. We suspect that in 1976 even 'non-employed' women may have made some trips to part-time or ancillary employment, while on the other hand the frequency of job trips declined among men because of part-time jobs, unemployment, extended periods of education, telework and demographic ageing. In any case the changes are to a large extent due to shifts in labour market participation among women and men. Job trip frequencies among full-time employees are similar for both genders (Tab. 3).

Conversely, men are catching up in terms of maintenance trips. In 1976 maintenance trips were only half as frequent among men as among women, but in 2008 men achieved 78 percent the frequency of women. The changes are due to a strong decline in maintenance trips among women, and a less pronounced increase among men.

Interestingly, even women in full-time employment shop far more frequently than men (Tab. 3).

Tab. 2: Mean trip frequencies for various purposes

	Men	Women	Ratio
	Job (excluding business trips)		
1976	1.38	0.65	2.11
1982	1.32	0.69	1.92
1989	1.02	0.54	1.88
1995			
2002	0.98	0.67	1.46
2008	0.94	0.68	1.38
	Maintenance*		
1976	0.64	1.28	0.50
1982	0.78	1.42	0.55
1989	0.63	1.17	0.54
1995			
2002	0.77	1.07	0.72
2008	0.73	0.93	0.78
	Escort		
1976	0.05	0.06	0.84
1982	0.06	0.09	0.67
1989	0.03	0.06	0.52
1995			
2002	0.15	0.25	0.58
2008	0.13	0.23	0.57
	Leisure		
1976	1.05	0.91	1.16
1982	1.12	1.06	1.05
1989	1.20	1.18	1.02
1995			
2002	1.20	1.19	1.01
2008	1.13	1.19	0.94

* 1976 to 1989: shopping and errands, 2002 and 2008: shopping.
The empty rows illustrate the duration between the surveys 1989 and 2002

However, for escort trips it is the other way round. There is thus no straightforward evidence supporting the hypothesis that employed women are doubly penalised.

For leisure the gender differences are least pronounced (Tab. 2). The balance shifts over time from men undertaking slightly more leisure trips towards women doing so.

Only for escort trips do gender differences increase over time. This seems amazing. Fathers doing the school or nursery-run, or sitting in playgrounds are now part of daily life in Germany, which was rarely the case in the 1970s. We offer several interpretations.

- We have no information about who is being escorted on a trip, but it is likely that it is mostly a child. The ratios of 0.58 and 0.57 for escort trips in 2002 and 2008 are reasonable and match the values of

Tab. 3: Gender ratios of mean trip frequencies (full-time employees)

	Job	Maintenance*	Escort	Leisure
1976	1.04	0.77	1.82	1.21
1982	1.02	0.75	1.12	1.15
1989	1.05	0.70	1.19	1.00
1995				
2002	0.99	0.80	1.18	1.05
2008	1.01	0.87	1.11	1.00

*See notes below Tab. 2

SCHWANEN (2007) for The Netherlands. We suspect, however, that children accounted for a lower share of escorted persons in earlier surveys, while adults without their own vehicle accounted for a larger share because of lower car ownership levels. The task of escorting these persons was accomplished to a large extent by men, as men more frequently held a driving license and had a car available than women. Children walked or cycled to school independently more often than nowadays. This interpretation is supported by the observation that the ratios of escort trips in families with children aged 0-5 years have shifted over time to include a stronger participation of men (R_{1976}=0,17, R_{2002}=0,40, R_{2008}=0,29), although women in families are still responsible for the largest share of escort trips.

- Escort trips may be underrepresented more in the 'old' KONTIV surveys than in MID, particularly short trips on foot which were mostly mothers' trips. Hence, the ratios for 1976 to 1989 may overrate the level of equity.
- Changing awareness of safety in public spaces may have led to additional child escort trips over time, and these additional trips may be disproportionally made by mothers. Even if fathers are more involved in childcare than in the past, mothers' escort trips may have increased even more.
- Selective (under)reporting of trips may be gender role specific. There is broad awareness now among women of the value of household and family work. Thus underreporting of related trips may have declined over time. What is more, it is possible that men tend to underreport trips made for 'female' purposes.

Figure 2 shows a graphic representation of gender convergence mainly in job and maintenance trips. Despite this convergence there are still clear gender differences in activity patterns. These are relatively pronounced for job trips where men's frequency is 38 percent higher than women's. Conversely, escort trip frequency is 75 percent higher among women (0.23/0.13=1.75). In absolute terms, however, these are relatively few trips.

4.2 Trip distances – the extension of activity spaces

We study the extension of activity spaces in terms of mean trip distances for a given activity. Table 4 shows that gender convergence over time is similar to that for activity-specific trip frequencies. For all activities studied men make longer trips than women, and this is true over the whole period under study (all R>1.0). However, the differences steeply decline over time. This is most pronounced for maintenance trips that were 43 percent longer among men than women in 1976, while they were a mere 3 percent longer in 2008. The differences in job and escort trips strongly decline as well, and in leisure the differences were minor even in 1976 (see also Fig. 3).

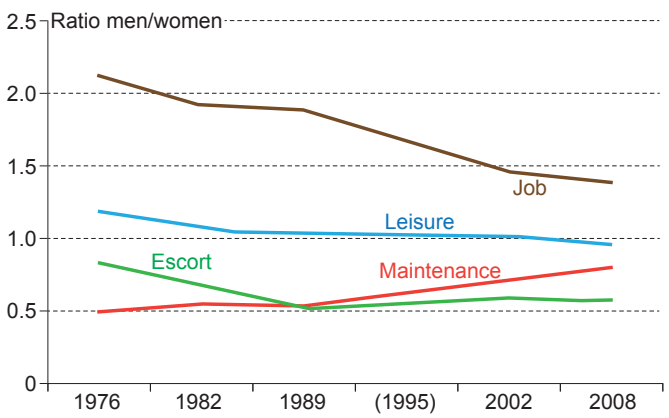

Fig. 2: Gender ratios of mean trip frequencies

Tab. 4: Mean trip distances (km) for various purposes

	Men	Women	Ratio
		Job	
1976	9.6	6.4	1.50
1982	10.3	7.4	1.40
1989	10.7	7.6	1.42
1995			
2002	13.9	10.4	1.33
2008	14.5	11.2	1.30
		Maintenance*	
1976	2.8	1.9	1.43
1982	2.8	2.2	1.31
1989	2.7	2.2	1.20
1995			
2002	2.9	2.7	1.09
2008	2.8	2.7	1.03
		Escort	
1976	4.4	2.9	1.51
1982	5.1	3.5	1.48
1989	5.8	3.3	1.77
1995			
2002	4.8	3.9	1.24
2008	5.4	4.3	1.26
		Leisure	
1976	5.9	5.4	1.11
1982	6.2	5.5	1.13
1989	5.6	5.3	1.06
1995			
2002	7.0	6.5	1.09
2008	6.7	6.2	1.08

Job trips < 50 km, maintenance trips < 10 km, escort trips < 20 km, leisure trips < 30 km.
See also notes below Tab. 2

Thus, gender differences in trip distances have converged as they have in activity-specific trip frequencies. Clear differences can still be seen in escort and job trips. The latter is partly due to gender differences in full-time v. part-time employment. Taking these into account further reduces differences to some extent. For instance, the job trip distance ratio between male and female full-time employees is 'only' 1.24 in 2008, compared to 1.30 for all employees taken together.

In absolute terms gender differences do not necessarily decline, however. For instance, men's job trip distances increase by 4.9 km over the study period, while women's increase by 4.8 km. As an outcome of the general extension of activity ranges over time this leads to a decline in relative difference.

4.3 Urban versus rural areas

It is basic knowledge in geography that the clear cut dichotomy of urban v. rural dissolved into a 'urban-rural continuum' in Germany after World War II (Bähr 2008). Despite the invasion of urban lifestyles into rural areas by way of suburbanisation there remain remnants of rural tradition, lifestyles and economics, e.g. higher fertility, stronger religiousness, or a higher share of agriculture in economic production (Henkel 2004). In the 1970s the former urban-rural dichotomy had already been greatly modified, but it seems probable that urban-rural differences in terms of gender relations were stronger than today. Two hypotheses may be derived from this consideration.
(1) Gender relations in travel behaviour are more traditional in rural areas than in cities. In terms of activity spaces, the gender ratios of trip distances should deviate from 1 more strongly in rural areas.
(2) Starting from strongly traditional gender relations in 1976, the ratios have converged more strongly in rural areas than in cities, while in the latter the gender relations were relatively egalitarian even in 1976.

A number of key results may be highlighted (Tab. 5).

Firstly, mean trip distances have increased considerably since the 1970s. The distance levels should not be interpreted in detail here due to the methodological problems discussed above (see BMVBS 2010 as a more reliable source).

Secondly, distances have increased less in cities than in medium sized towns and small municipalities. This supports the hypothesis of there being more sustainable transport trends in cities and suggests an increasing spatial divide in travel behaviour trends (see Scheiner 2006 for travel mode choice and Scheiner 2010b for car ownership levels)[5].

Thirdly, the ratios support hypothesis (1) claiming that 1970s gender relations were less traditional in cities than in the countryside. Gender differences in trip distances were smaller in cities than in smaller towns and villages. Escort trips were an exception; this again may be due to changes in the structure of escorted individuals (see above). For job trips less traditional gender relations in cities can still be found today, i.e. the "gender gap in commuting" (Crane 2007) applies far more to small to medium sized

[5] Another interpretation could be changes in origin-destination relations. However, reverse commuting has increased considerably more over time in Germany than commuting to cities (Einig and Pütz 2007). This would suggest more than average increases in travel distances for city-dwellers.

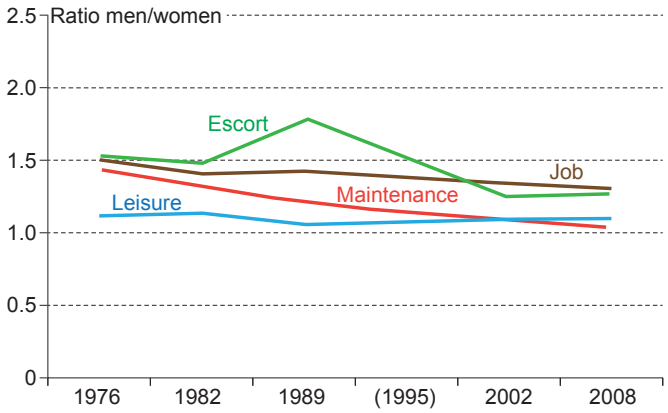

Fig. 3: Gender ratios of mean trip distances

towns and villages than to cities. On the other hand, gender differences in escort trip distances are more than average in cities. This again may have to do with gender specific differences in the structure of escort trips. 'Mum's taxi' is more frequently a 'taxi on foot' to school or the nursery in cities, while 'Dad's taxi' may typically be a car used for longer trips. For maintenance and leisure trips, spatial differences in gender relations are minor.

Fourth, hypothesis (2) that claims a catch up convergence starting from the position of strongly traditional gender relations in rural areas may be supported, albeit with some caution. For three of four activities studied, gender convergence trends are weakest in cities, i.e. the ratios decrease more strongly in small communities and medium sized towns than in cities. Only for job trips is gender convergence (R decline) similar over all community size classes. This is an element of declining urban-rural disparities that, to the best of our knowledge, has not been studied in this way: gender convergence leading to relatively egalitarian relations in activity spaces.

4.4 Trip distances and mobility biography – a cohort analysis

In recent years a mobility biography approach has been developed that studies travel behaviour over an individual's life-course. We do not have panel data that we could use to study individual change over time. However, repeated cross-sectional surveys may be used as 'pseudo panels' for cohort analysis (Lanzendorf 2003).

The catch up in car ownership among women in recent decades has caused women's travel speeds to increase (Crane 2007). Due to people's relatively constant travel time budgets over long periods (Metz 2008) increased speed permits an above-average increase in women's travel distances. We thus expect convergence in gender ratios over time even within cohorts (i.e. with increasing age). What is more, there is some evidence for cohort specific sensitivity to distance from a pilot study, as "the median job trip distances are higher in each subsequent generation than in the previous generation at a given point in time" (Holz-Rau et al. 2010, 12, translated by the authors). Thus we expect relatively constant trip distances over time within a given cohort (the ratios may change anyway). The following results may be highlighted.

1. Cohort effects (table diagonals)

- Job trip distances (Tab. 6) increase considerably within a given age group from one cohort to the next. Gender 'traditionalism', i.e. the overweight of men's against women's distances declines from one cohort to the next, starting with the cohort 1925/1932. For instance, those aged 44-50 years have a ratio of R=1.84 in 1976, but only R=1.50 in 2008. In the two youngest cohorts the ratios are near 1, i.e. men and women born 1977 or later share similar job trip distances.
- Women's maintenance trips distances (Tab. 7) increase within a given age group from one cohort to the next, while for men they are stable or even decrease. This results in a considerable reduction in ratios, i.e. the trip distances of women and men within a given age group converge from one cohort to the next. In the young and middle age groups up to about 50 years, women even make somewhat longer maintenance trips than men (R<1.0).

2. Age effects (table rows)

- At a given point in time job trip distances decrease as age increases. The maximum is among men aged about 30-45 years, with the exception

Tab. 5: Mean trip distances (km) for various purposes by municipality size category

	< 20,000 inh			20,000 - < 100,000 inh			100,000+ inh		
	Men	Women	Ratio	Men	Women	Ratio	Men	Women	Ratio
	Job								
1976	11.5	7.6	1.51	8.1	4.7	1.72	8.3	6.3	1.32
1982	11.7	8.0	1.47	8.9	7.1	1.26	9.3	6.7	1.39
1989	11.9	8.7	1.37	10.0	7.1	1.41	9.5	6.4	1.48
1995									
2002	15.8	11.9	1.32	13.1	9.4	1.40	11.7	9.2	1.28
2008	15.5	11.8	1.32	14.1	10.4	1.36	11.6	10.0	1.16
	Maintenance*								
1976	2.6	1.8	1.45	2.8	1.9	1.48	2.8	2.1	1.34
1982	2.7	2.0	1.35	2.7	2.1	1.29	2.7	2.2	1.26
1989	2.6	2.2	1.21	2.5	2.0	1.22	2.7	2.3	1.17
1995									
2002	3.1	2.9	1.07	2.8	2.6	1.08	2.6	2.2	1.19
2008	2.8	2.7	1.05	2.6	2.6	0.99	2.3	2.1	1.09
	Escort								
1976	4.3	3.0	1.46	3.8	2.6	1.43	4.6	2.9	1.59
1982	4.4	3.4	1.31	4.2	2.9	1.44	5.5	3.5	1.56
1989	5.7	3.1	1.87	5.5	3.2	1.74	5.3	3.1	1.69
2002	4.8	4.0	1.20	3.9	3.4	1.15	4.6	3.1	1.49
2008	4.2	4.4	0.94	4.9	3.8	1.30	4.7	3.1	1.54
	Leisure								
1976	6.0	5.1	1.18	5.5	5.0	1.10	6.1	5.9	1.03
1982	6.0	5.2	1.17	6.0	5.0	1.19	6.3	5.9	1.07
1989	5.6	5.1	1.11	5.3	5.1	1.05	5.5	5.5	1.01
1995									
2002	7.2	6.7	1.07	6.6	5.9	1.12	6.8	6.2	1.09
2008	6.5	6.3	1.04	6.3	5.7	1.11	6.1	5.6	1.08

See notes below Tab. 2 and Tab. 4

of the year 1976, when the youngest men made the longest trips to work. For women the maximum is in the younger age groups (up to about 30 years) over the whole study period. These observations are cross-sectional comparisons between age groups. The decrease in women's distances from 30 years of age therefore does not reflect the 'traditionalisation' of intra-household worksharing arrangements after child-bearing that is well-known in the sociology of the family (Grunow et al. 2007), or the career break women often face as a consequence, while men tend to achieve increasingly qualified jobs that are associated with longer trips.

- With reference to maintenance trips, there are no clear structures detectable for men in cross-sectional comparisons between age groups. Age differences are minor except that those of very advanced age make the shortest trips. For women maintenance trips are typically longest between 24 and 37 years of age.

3. Life-course effects (table columns)

- Over the life-course of a given cohort, i.e. with increasing age, the ratios of job trip distances do not change systematically. Rather there are irregular 'jumps'. These are due to increasing job trip distances over the life-course for men and women likewise. The irregularities in trends among women are considerably smaller when the 1989 survey is excluded[6].
- As opposed to job trips, the ratios of maintenance trip distances considerably decrease over the life-course of any cohort. This is mainly due to women's

[6] Women's relatively short commutes in 1989 are probably due to shortcomings in the survey. In Section 3 we noted that individuals with low mobility levels are overrepresented in 1989.

Tab. 6: Mean trip distances (km) for job trips by cohort

	Cohort 1912/13 - 1919				Cohort 1919 - 1925/26				Cohort 1925/26 - 1932				Cohort 1932 - 1938/39			
	Age	**M**	**F**	**R**	**Age**	**M**	**F**	**R**	**Age**	**M**	**F**	**R**	**Age**	**M**	**F**	**R**
1976	57-63	7.9	6.0	1.32	50-57	8.4	5.3	1.57	44-50	9.2	5.0	1.84	37-44	9.9	6.1	1.61
1982	63-70	7.9	*6.9*	*1.14*	57-63	8.4	6.0	1.40	50-57	10.0	5.7	1.77	44-50	10.9	6.3	1.74
1989					63-70	*4.8*	*3.1*	*1.55*	57-63	9.6	6.8	1.40	50-57	10.8	6.4	1.68
1995													57-63			
2002													63-70	*8.4*	*6.9*	1.22
2008																
Cohort mean		**7.9**	**6.3**	**1.25**		**8.2**	**5.4**	**1.51**		**9.6**	**5.7**	**1.68**		**10.5**	**6.4**	**1.64**

	Cohort 1938/39 - 1945				Cohort 1945 - 1951/52				Cohort 1951/52 - 1958				Cohort 1958 - 1964/65			
	Age	**M**	**F**	**R**	**Age**	**M**	**F**	**R**	**Age**	**M**	**F**	**R**	**Age**	**M**	**F**	**R**
1976	31-37	10.1	6.7	1.49	24-31	10.1	7.6	1.32	18-24	11.0	7.3	1.50	11-18			
1982	37-44	10.4	6.9	1.51	31-37	11.8	8.1	1.46	24-31	10.7	8.7	1.22	18-24	9.5	8.7	1.09
1989	44-50	10.2	6.7	1.53	37-44	11.5	6.6	1.74	31-37	11.2	6.9	1.63	24-31	10.8	8.8	1.22
1995	50-57				44-50				37-44				31-37			
2002	57-63	12.7	7.0	1.81	50-57	13.5	8.8	1.54	44-50	13.8	9.8	1.41	37-44	14.8	9.5	1.56
2008	63-70	*14.3*	*7.9*	*1.82*	57-63	13.3	9.1	1.46	50-57	14.9	9.9	1.50	44-50	14.6	9.8	1.50
Cohort mean		**10.5**	**6.8**	**1.55**		**11.8**	**7.9**	**1.50**		**12.2**	**8.6**	**1.42**		**12.5**	**9.2**	**1.35**

	Cohort 1964/65 - 1971				Cohort 1971 - 1977/78				Cohort 1977/78 - 1984				Cohort 1984 - 1990/91			
	Age	**M**	**F**	**R**	**Age**	**M**	**F**	**R**	**Age**	**M**	**F**	**R**	**Age**	**M**	**F**	**R**
1976																
1982																
1989	18-24	10.6	9.4	1.13												
1995	24-31				18-24											
2002	31-37	14.7	11.3	1.30	24-31	14.0	13.1	1.06	18-24	13.4	13.0	1.03				
2008	37-44	14.2	11.6	1.22	31-37	16.4	11.9	1.38	24-31	14.5	14.5	1.00	18-24	13.2	12.3	1.07
Cohort mean		**13.3**	**10.8**	**1.23**		**15.4**	**12.4**	**1.24**		**14.1**	**13.9**	**1.02**		**13.2**	**12.3**	**1.07**

Trips < 50 km. Italics: n<100. M=male, F= female, R= ratio

Tab. 7: Mean trip distances (km) for maintenance trips by cohort

	Cohort 1893 - 1899/00				Cohort 1899/00 - 1906				Cohort 1906 - 1912/13				Cohort 1912/13 - 1919				Cohort 1919 - 1925/26			
	Age	M	F	R	Age	M	F	R	Age	M	F	R	Age	M	F	R	Age	M	F	R
1976	76-83				70-76	2.3	1.8	1.30	63-70	2.5	1.7	1.46	57-63	2.5	1.7	1.46	50-57	2.7	1.8	1.52
1982	83-89	*1.5*	*1.7*	*0.90*	76-83	2.1	1.9	1.08	70-76	2.6	1.8	1.45	63-70	2.8	2.1	1.38	57-63	2.8	2.0	1.36
1989					83-89	*2.0*	1.8	*1.12*	76-83	2.3	1.7	1.38	70-76	2.2	1.8	1.28	63-70	2.6	2.0	1.28
1995									83-89				76-83				70-76			
2002													83-89	*2.4*	*1.9*	*1.22*	76-83	2.1	1.6	1.32
2008																	83-89	*2.6*	1.0	*2.72*
Cohort mean		***1.5***	***1.7***	***0.90***		**2.2**	**1.8**	**1.19**		**2.5**	**1.7**	**1.44**		**2.5**	**1.8**	**1.36**		**2.6**	**1.9**	**1.38**

	Cohort 1925/26 - 1932				Cohort 1932 - 1938/39				Cohort 1938/39 - 1945				Cohort 1945 - 1951/52				Cohort 1951/52 - 1958			
	Age	M	F	R	Age	M	F	R	Age	M	F	R	Age	M	F	R	Age	M	F	R
1976	44-50	2.9	1.9	1.57	37-44	3.1	2.1	1.44	31-37	3.3	2.2	1.51	24-31	2.9	2.4	1.21	18-24	3.0	2.1	1.40
1982	50-57	2.8	2.1	1.32	44-50	3.2	2.1	1.52	37-44	3.1	2.4	1.28	31-37	3.0	2.3	1.30	24-31	2.9	2.4	1.19
1989	57-63	2.9	2.2	1.31	50-57	2.7	2.4	1.15	44-50	2.8	2.4	1.20	37-44	2.7	2.5	1.12	31-37	2.9	2.5	1.18
1995	63-70				57-63				50-57				44-50				37-44			
2002	70-76	2.8	2.3	1.23	63-70	3.2	2.4	1.30	57-63	2.9	2.5	1.14	50-57	2.8	2.6	1.10	44-50	2.9	2.7	1.05
2008	76-83	2.4	2.4	1.01	70-76	3.0	2.3	1.31	63-70	2.9	2.6	1.11	57-63	2.9	2.6	1.14	50-57	2.7	2.8	0.99
Cohort mean		**2.8**	**2.1**	**1.29**		**3.0**	**2.3**	**1.33**		**3.0**	**2.4**	**1.23**		**2.9**	**2.5**	**1.17**		**2.9**	**2.6**	**1.13**

	Cohort 1958 - 1964/65				Cohort 1964/65 - 1971				Cohort 1971 - 1977/78				Cohort 1977/78 - 1984				Cohort 1984 - 1990/91			
	Age	M	F	R	Age	M	F	R	Age	M	F	R	Age	M	F	R	Age	M	F	R
1976																				
1982	18-24	3.0	2.5	1.23																
1989	24-31	2.6	2.3	1.10	18-24	2.7	2.4	1.13												
1995	31-37				24-31				18-24											
2002	37-44	3.0	2.8	1.06	31-37	3.2	3.1	1.03	24-31	2.8	3.0	0.93	18-24	2.9	2.8	1.03				
2008	44-50	2.7	2.8	0.97	37-44	2.9	3.0	0.98	31-37	2.8	3.0	0.93	24-31	2.1	2.7	0.79	18-24	3.1	3.1	1.00
Cohort mean		**2.8**	**2.6**	**1.08**		**2.9**	**2.9**	**1.03**		**2.8**	**3.0**	**0.93**		**2.4**	**2.7**	**0.87**		**3.1**	**3.1**	**1.00**

Trips < 10 km. Italics: n<100. M=male, F= female, R= ratio.

See also notes below Tab. 2

increasing trip distances, while men's maintenance trips tend to become shorter over the life-course. Maintenance trips thus show a marked gender convergence over individuals' life-courses.

In total, we thus observe an increase in job trip distances from one cohort to the next. At the same time, job trips of men as well as of women get longer over the life-course. In a cross-sectional perspective middle-aged men show the longest job trips. For women the maximum of job trip distances is in the youngest age groups.

The maintenance trip distances of men and women converge over time from one cohort to the next. At the same time there is convergence over the life-course within a given cohort.

5 Outlook

Over the period 1976 to 2008 there is clear evidence for gender convergence in activity-specific trip frequencies. Only for escort trips do gender differences increase, possibly because of changes in the structure of the escorted persons and the purpose of escort. In trip distances there is similar evidence for convergence. Men cover longer distances than women for all activities studied, and this is true for the whole study period. However, the gender differences strongly decline.

The distance increase is considerably less pronounced in cities than in small and medium sized towns and villages for all trip purposes studied. This supports the well-known hypothesis that transport trends in cities are more sustainable than in more rural areas, and the hypothesis of a divergence between urban and rural areas as has been described for travel mode choice (Scheiner 2006) and car ownership levels (Scheiner 2010b).

Gender differences in activity spaces were already less pronounced in cities than in rural areas in 1976 (with the exception of escort trips). Since that time, a catch up trend in terms of gender equality can be seen for rural areas, i.e. a tendency for declining urban-rural disparities towards relatively egalitarian gender relations in activity spaces.

A cohort analysis yields interesting results as well. Job trip distances increase from one cohort to the next. At the same time, men's and women's job trips get longer over the life-course. A clear trend in terms of increasingly egalitarian gender relations can be seen from one cohort to the next.

The maintenance trip distances of men and women converge from one cohort to the next as well. At the same time there is convergence over the life-course within a given cohort. This is due to increasing maintenance trip distances over the life-courses of women, while men's maintenance trips tend to become shorter with age. Thus, the two effects superimpose and reinforce each other: gender convergence from one cohort to the next, and within cohorts over the course of life.

Various consequences may be drawn from this paper for future research.

Gender relations are clearly reflected in daily travel behaviour and activity spaces. However, empirical research in the gender/travel field is relatively underdeveloped in Germany, compared to other countries. This paper is limited to consideration of a few straightforward elements of activity spaces. The approach used here could easily be extended to other simple or more complex measures of destination choice, trip chain complexity, travel mode choice, and more. Studying measures of access and participation in mobility would be worthwhile as well, as these have been found to be strongly gendered (Van Ham and Mulder 2005; Uteng 2009).

Moreover, the studies just referenced point out interactions between gender and other attributes of social stratification. This calls for multivariate analyses, which should considerably extend the degree of complexity beyond the mere descriptive comparisons presented in this paper. Spatial context is likely to play a key role in this respect as well, be it with reference to disadvantaged urban neighbourhoods or remote rural areas, or to more modern v. more traditional cultural settings, e.g. with respect to religious traditions.

Last but not least, our results show the importance of mobility biography approaches, which can separate cohort effects from life-course effects both theoretically and analytically. Such process-oriented perspectives are still in their early stages despite intensive research in some countries. They may clearly go beyond the cross-sectional perspectives that have dominated travel research for so long.

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