Available online at www.sciencedirect.com
SCIENCE DIRECT®
Journal of Transport Geography 13 (2005) 109–121
JOURNAL OF TRANSPORT GEOGRAPHY
www.elsevier.com/locate/jtrangeo

Division of labour and gender differences in metropolitan car use An empirical study in Cologne, Germany

Henning Best [a,1], Martin Lanzendorf [b,*]

[a] Research Institute for Sociology, University of Cologne, Greinstr. 2, D-50939 Köln, Germany
[b] Centre for Environmental Research Leipzig-Halle, P.O. Box 2, 04301 Leipzig, Germany

Abstract

This paper suggests the need for a broader view of 'gender and transport' by presenting a study of gender differences in car use for maintenance travel. Although many more women are now entering the labour force than a few decades ago, they still have to undertake the larger share of household-related work. The main objective of this paper is to assess the impact of these changing gender roles on travel patterns and in particular on car use for maintenance travel. We used the survey and trip diary data of 949 respondents living in two urban and two suburban neighbourhoods of the Cologne metropolitan area. The empirical findings suggest that labour market and maintenance activities influence car use in different directions. While parenthood reduces the odds of car use by women, it increases men's car use. Labour force participation on the other hand, especially when part-time, intensifies car use for both genders. In short, a levelling influence of paid work and a traditionalizing influence of parenthood regarding car use for maintenance travel was found.

Keywords: Car use; Division of labour; Gender; Maintenance; Mobility; Transport

1. Introduction

In the course of the last 20 years, the topic of 'gender and transport' has attracted increasing attention from the scientific community. Starting with a feminist critique of the gender-blind approach to transport and mobility issues (Giuliano, 1979; Rosenbloom, 1978a,b, for example), a new spate of research emerged. Scholars from different social sciences rejected the assumption of a 'neuter commuter' and began to examine gendered patterns of mobility, unequal access to resources, and differences in modal choice. Soon the new research split into two separate strands, both starting from the viewpoint of female transport disadvantage (see Law, 1999, 569ff), but with one concentrating on the constraints of female mobility by 'women's fear' of male sexual violence (for examples, see Pain, 1991; Valentine, 1989; Trench and Tiesdel, 1992), and the other analysing gender differences in the journey to work (see Madden, 1981; Hanson and Johnston, 1985; Pickup, 1989). While this emphasis on two important aspects of gendered transport behaviour facilitated fruitful and efficient research, it also narrowed the researchers' view and overshadowed other mobility issues (see for example Kloas and Kunert, 1994a,b and Buhr, 1999 for the national travel survey KONTIV in Germany or Hamilton and Jenkins, 2000 and DETR, 1998 for the National Travel Survey in Great Britain). Although the gendered division of labour is identified as an important factor influencing mobility, the usual approach is to view domestic work merely as a constraint of labour-force participation and the related transport. Consequently, gendered household arrangements are related to the journey-to-work in an oversimplified way instead of including travel for household related work in a more detailed analysis (for an exception see Hanson and Pratt, 1995).

In recent years, however, researchers have paid attention to the increasing motorization of women and have therefore asked whether the concept of 'transport disadvantage' is still appropriate for describing and

* Corresponding author. Tel.: +49-341-235-2733; fax: +49-341-235-2534.
E-mail addresses: best@wiso.uni-koeln.de (H. Best), martin.lanzendorf@ufz.de (M. Lanzendorf).
[1] Tel.: +49-221-470-4398.

0966-6923/$ - see front matter © 2004 Elsevier Ltd. All rights reserved.
doi:10.1016/j.jtrangeo.2004.04.007

analysing female mobility (Dowling, 2000; Hjorthol, 2000; Root and Schintler, 1999; for example). This paper seeks to contribute to this field of research by presenting a quantitative study of maintenance mobility in Cologne, Germany. The main aim of the study was to show how the gendered division of labour affects travel for maintenance purposes. In addition to a descriptive analysis of the most relevant patterns of maintenance mobility, we investigated more specifically the impact of gender and household attributes on car use for maintenance travel. We focused the analysis on car use since this is probably the most important indicator for travel related environmental impacts. Two observations broach the question whether the new division of labour leads ultimately to increased car usage by women for maintenance. First, the diminishing differences between men and women with respect to available financial resources and to travel needs, because of the increasing participation and equivalent position of women in the labour market. We may therefore expect women's car usage to adjust to men's: that is, it will increase. Second, although women, like men, participate frequently in the labour market, in most families housework remains unequally distributed between the genders. Women therefore experience onerous time pressure in seeking to fulfil their employment and maintenance tasks. One strategy of coping with the severe time pressure can be the use of travel modes usually considered faster or more convenient, such as a private car. In particular, we ask whether car use by men and women differs with respect to maintenance tasks and how the division of labour within the household affects car use.

The paper is organized as follows. First, a theoretical framework for the impact of the division of labour on mobility is presented. We discuss recent changes in the division of household responsibilities by an increasing share of women in paid employment and the impact on maintenance mobility (Section 2). In Section 3, methodical issues and the data to be analysed are described. In Section 4, we present empirical data on the division of labour and travel behaviour. The core of the study, Section 5, documents our analyses of car use for maintenance tasks. Gender differences in car use for the journey to work are revealed; finally, gender differences and the influence of the division of labour on car use for maintenance purposes are considered. The paper ends with some conclusions.

2. Maintenance and mobility

Earlier research has shown that there are significant differences between the genders in Western societies regarding the journey to work. Women usually have shorter work-trips, use public transport more frequently, and tend to trip-chain more often than men (for example the Household Activity-Travel Simulator, Jones et al., 1983; more recently, see Hjorthol, 2000 for Norway; Rosenbloom, 1998 and McGuckin and Murakami, 1999 for USA; Root and Schintler, 1999 for UK and USA). A major reason for these differences is the uneven distribution of domestic responsibilities, usually part of the female gender role (see Hjorthol, 2000; Pickup, 1989; Sarmiento, 1996; Turner and Niemeier, 1997). However, there is another, direct outcome of household related work and its division: the gender differences in maintenance travel (see for example Kutter, 1973, Hanson and Hanson, 1980, 1981, Pas, 1984).

The term 'maintenance' refers here to the work and travel related to the physical and emotional reproduction of labour power and, in general terms, the society. Maintenance does not include such activities as eating, sleeping, or pure leisure, which are undoubtedly necessary for reproduction, but cannot be regarded as work. In contrast with all kinds of work in the sphere of production and wage labour, maintenance activities are not remunerated. Furthermore, unlike classic nine-to-five wage-labour, which typically has a somewhat monolithic structure, maintenance is a complex arrangement of different activities and functions.

The division of labour between the genders influences the mobility needs and constraints of people in at least two respects: first, the available time budgets for activities are affected. The more household related work one has to do, the less time is left for leisure, recreation, or paid employment. And, for a person who has to combine maintenance and paid labour, the time constraints add up; this is usually the case for women, as indicated below. Second, maintenance produces special transport demands: children have to be escorted, shopping has to be done, and so forth. For the analysis of gender differences in car use, we review in this section the changes in the gendered division of labour in the last few decades and its impact on travel.

In the 1950s, Talcott Parsons was still able to speak of the 'well-structured' patriarchal family in Western societies. The modern family had adapted to the Fordist mode of production and developed a new and dominant regime for the gendered division of labour: men took care of the bread-winning while women were solely responsible for care-giving (see Parsons, 1956; Beck and Beck-Gernsheim, 1990). Our further usage of the term "traditional" division of labour refers to this binary model of gender roles. In the last few decades, however, women have been joining the labour force in Western countries and have been incorporating paid labour into their life plans. For example in Western Germany, mothers' labour force participation increased from 41% in 1975 to 64% in 2002, while men's employment remained more or less constant, with around 80% of men aged between 15 and 65 years in paid work (see Statis-

tisches Bundesamt, 1976, 2003). [2] On the other hand, corresponding changes in household responsibility are hard to detect. According to Künzler (1994), the time men spent on domestic work has remained constant at about 10 h per week in Germany over the last decades. Male domestic work has changed neither over time, nor in relation to women's work force participation. Women, on the other hand, reduce their domestic work significantly when they enter a paid job. An increase in paid labour by one hour means the reduction of domestic work by half an hour on average (see Künzler, 1994).

Although women reduce the hours spent on housework when they engage in the labour market, their time budget is under pressure. Particularly in families with children, much of the domestic work has to be done and just cannot be reduced. Additionally, the birth of children is frequently correlated with a more traditional division of labour (see Hoffman and Manis, 1978 for the US; more recently, Hartmann, 1998 for Germany). But even if women remain in the labour force after the birth of a child, male participation in household-related work stagnates or decreases relative to the prior situation. Empirical evidence from the US shows that, while at least a slight absolute increase in male participation can be observed if the woman partner works full-time, the situation is especially hard for mothers working part-time who usually are responsible for most household chores (Sarmiento, 1996). The latest German time-budget survey from 1991/1992 shows that mothers employed full-time who have children aged under six spend 5.13 h per day on maintenance in comparison with 2 h by fathers employed full-time. Mothers working part-time spend 8.01 h on weekdays for maintenance; non-working mothers spend 8.58 h (Blanke et al., 1996, p. 84).

The differences between men and women in the division of paid and household-related work are reflected in the travel patterns for maintenance. Maintenance activities can be subdivided into in-home and out-of-home activities. While activities at home such as domestic work, emotional stabilization or some child care tasks are only of indirect relevance to mobility by generating travel demands and time constraints for other activities, out-of-home activities are per definition linked with mobility: the actor has to leave the house to act. Just as for maintenance, the corresponding traffic is heterogeneous, a conglomerate of many different mobility actions. A major share of this traffic is besides shopping for groceries child serving traffic: from Germany, Flade (1999) reports that children aged between three and five years are escorted on 88% of their trips, and children between six and nine on 65%. Women perform most of these escort trips; in a US survey 2.88 escort trips for every escort trip by men (Taylor and Mauch, 1996). A German time budget study shows that mothers with young children spend 15–20 min per day on escorting; fathers only spend about 5 min (Blanke et al., 1996). In addition to shopping and escort trips, there are service infrastructure trips (drycleaner, tailor, doctor, and so forth), visits to sick relatives, public authorities, and the like.

Activity and travel time research support the finding of an unequal division of maintenance mobility between working men and women living in the same household. In the US, Golob and McNally (1997) find that in two-person households, female's maintenance travel is influenced by both male and female labour duration, whereas male maintenance travel is independent of female employment. As expected, male employment increases women's time spent on maintenance travel. Taylor and Mauch (1996) report similar results regarding grocery shopping in the San Francisco Bay Area. Although even single women make more shopping trips than men, the gender difference increases in two-person households. Yee and Niemeier (2000) show with data from the Puget Sound transportation panel that the cohabitation effect reaches a maximum in households with young children and falls as children grow older.

If a person has to combine both maintenance and employed work, the time budget comes under severe pressure. Given the still mostly traditional division of labour and the corresponding travel, working women, especially mothers, can be expected to be confronted with the need to save time by any available means. Since many activities cannot be neglected, at least if the mother wishes to conform with the received view of 'good mothering' (see Dowling, 2000), the most obvious way to save time is to speed up transport by using a car. With regard to transport, because of their timely and discoursal constraints mothers are in the situation Diekmann and Preisendörfer (1998) refer to as 'high-cost'. In such a situation, primary factors influencing behaviour (that is, modal choice) are likely to be speed, flexibility and convenience regarding the transport of children: the features a car is usually believed to have. On the other hand, willingness to protect the environment and to use public transport is then expected to be particularly low. Hamilton and Jenkins (2000) note that in the UK public transport infrastructure is often inappropriate for women's transport needs. Additional evidence can be drawn from qualitative studies that describe the travel needs produced by having to cope simultaneously with household and labour market work and the

[2] Due to incomplete data provided by the federal statistics office, we cannot give adequate information on historical changes regarding full/part time employment by parenthood. In 1975, 18% of all employed women worked less than 21 h per week, another 18% worked from 21 to 39 h. In 2002 the share changed to 28% working less than 21 h and 18% working from 21 to 35 (!) h (see Statistisches Bundesamt, 1976, 2003).

usual means of resolving the situation: the car (for example Heine and Mautz, 2000 and Buhr, 1999 for Germany; Dowling, 2000 for Australia).

On the basis of the literature review, we formulated the following three hypotheses: first, the gendered division of labour becomes evident in gendered patterns of mobility; second, diminishing gender differences in the labour force and, simultaneously, in the availability of transport resources lead to diminishing differences in car use; finally, as a result of the unequal division of household related work, women's (especially mothers') time budgets are under pressure and their car use is likely to increase. The paper documents our testing of these hypotheses with quantitative data.

3. Data and methods

For the empirical analysis, we used a data set collected with reference to several aspects of mobility in four residential neighbourhoods of Cologne between April and July 1997 (Fig. 1). To collect the data, face-to-face interviews were carried out with 949 residents with German citizenship, aged 18 or older. For the purposes of the survey, the city council provided a register-based random sample of 2216 people living in the four neighbourhoods. At 46%, the net response rate is satisfactorily high compared with other German register-based surveys (e.g., 43.1% for a survey in Cologne by Wolf, 2003; 46.9% for the German national ALLBUS, 2000, see Koch et al., 2001; and 40.9% for the German Socio-Economic Panel SOEP F 2000 in cities with more than 500 000 inhabitants, see Rosenbladt, 2001). For details of the methodology, see Lanzendorf (2001).

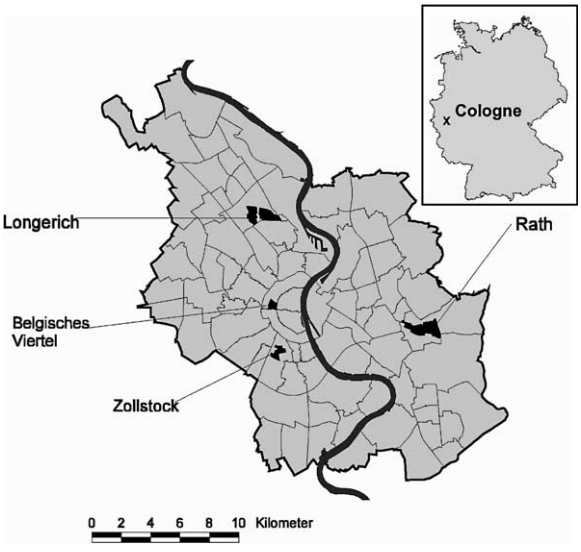

Fig. 1. Location of neighbourhoods surveyed in Cologne 1997.

The survey included a questionnaire and a trip diary. The questionnaire comprised items asking about personal and household characteristics, including the availability of transport modes (car ownership, season ticket). With the trip diaries, the respondents were asked to report all the trips they had made on one regular workday (we excluded Fridays and holidays) and over one complete weekend. The diaries included place and time of departure and arrival, the transport modes, the distance covered, the purpose of each trip, and any accompanying person. Although a journey-based file was generated from the trip diaries to assess the effects of trip-chaining, most of the analyses presented in this paper are limited to trips (for a more detailed analysis of the trip chains see Lanzendorf, 2001). Furthermore, we restricted ourselves to workday trips. One limitation of the available data is that it does not include variables directly referring to the gendered division of labour. However, this is partly compensated by items on family structure, gender and labour force participation. Additionally the trip diaries provide detailed information on the respondents out-of-home activities.

Two of the neighbourhoods surveyed, Belgisches Viertel and Zollstock, are located within easy reach of Cologne's inner city. Belgisches Viertel consists mainly of apartment blocks dating from the beginning of the 20th century (Gründerzeit). It is a gentrified area, providing an attractive living environment for a young and dynamic population. In Zollstock, housing associations own the majority of the dwellings, which were mainly built between 1920 and 1960. Formerly, Zollstock was a working-class neighbourhood, but an ongoing gentrification process has recently started to change its character. The other two neighbourhoods in our survey, Longerich and Rath, are of a more suburban type and further away from the city centre. Longerich consists of a mixture of detached single-family houses and apartment blocks. It was mainly built in the 1950s. Rath, the neighbourhood located the furthest away from the inner city, borders on an attractive recreational area, the Königsforst. Rath can be divided into two parts: first, a former village with detached and semidetached houses; second, the Göttersiedlung, built in the 1920s, with detached single-family houses surrounded by large gardens.

The four neighbourhoods have several similarities and some differences: all of them have access to the public transport system by at least one tram line, the population density decreases with increasing distance from the inner city, and the number of cars per household increases with the distance. In Belgisches Viertel more than two-thirds of all households are single person and three-quarters of the population are between 18 and 59 years old. Rath and Longerich have fewer single-person households (38%), but more children and elderly

people. In Zollstock, both age and household size are average.

In the subsequent analysis, we included only those 915 respondents who completed the workday travel diary. As expected, fewer women in the sample were university graduates (17% compared with 27% of the men) and the professional status of the women was also lower than that of the men. Furthermore, women work less frequently full-time (32%) and more frequently part-time (20%) than men (54% full-time and 4% part-time). In our sample, various gender differences regarding the availability of transport modes can be traced. We found that 91% of all men own a driving licence, compared to 75% of all women. Additionally, men own a car more often than women (62% compared to 37%). Consequently, men have a higher subjective car availability: 74% of all men claim to have (almost) always access to a car always (55% of all women), and 17% can use a car sometimes (20% of all women) When speaking of car availability, we always refer to this subjective measure throughout the paper.

4. Travel patterns for maintenance

In this section, we consider the differences in people's daily travel patterns in relation to an unequal division of labour between the genders. We proceed here in three steps: first, we compare the overall trip frequency of men and women by trip purpose. Second, we consider the impact of parenthood on trip frequencies; finally, we describe how the number of trips undertaken in the company of children is affected by gender and labour force participation. We refer throughout this section to the primary trip purpose as stated in the trip diaries. We limit our analysis in this and in the subsequent sections to trip frequencies and do no present results on trip distances. Frequencies are directly linked with the number and type of outdoor activities and, hence, with the core of our analysis, the gendered division of labour.

On the aggregate level, no differences in the overall trip frequency between the genders can be observed: both genders average around 4.2 trips per day. However, consistent with the findings from a growing body of studies, as soon as we distinguish trips according to purpose, various gender differences show up. Women, on average, cover fewer trips for employed work than men (0.6 compared with 0.9), but more for non-employed maintenance work (1.2 compared with 0.9). These differences are fairly stable with respect to the different kinds of maintenance mobility: women undertake more trips for both shopping and child care. No difference could be observed for 'miscellaneous maintenance travel', a category containing service activities such as trips to the petrol station, to the doctor, or to local authorities. In the sample, the number of shopping trips for provisional purposes was too low for a detailed analysis.

As expected, parenthood affects the travel patterns of men and women (Table 1). Parents are significantly more traditional in their task division than the childless. For them, the differences found between the genders are only minor, although statistically significant: women undertake fewer commuting trips, but more shopping and other maintenance trips. However, the total number of trips and the frequency of recreation and leisure trips do not differ between childless women and men. As soon as there are children in the family, the daily maintenance mobility is raised and a massive retraditionalization of the travel patterns takes place: mothers commute significantly less and shop more frequently than fathers. The low frequency of mothers' commuting is caused by their lower labour force participation, while fathers undertake more than one work-related trip per day. This difference is not surprising given the fact that we are only discussing workdays: almost all fathers were working (94%), and trips during the lunchbreak result in

Table 1
Trip frequency by gender and parenthood per workday

Purpose	Total	Without child			With child		
		Male	Female	η	Male	Female	η
Child care	0.09	–	–		0.20	0.51	0.202***
Shopping, small	0.45	0.39	0.49	0.076**	0.27	0.68	0.278***
Shopping, provision	0.07	0.06	0.07		0.02	0.13	0.148**
Total shopping	0.52	0.45	0.56	0.075**	0.29	0.81	0.315***
Misc. maintenance	0.43	0.42	0.45	–	0.42	0.33	–
Total maintenance	1.05	0.89	1.03	0.059***	1.02	1.65	0.196***
Commuting/education	0.86	0.96	0.74	0.077**	1.39	0.54	0.372***
Recreation/leisure	0.79	0.83	0.82	–	0.54	0.71	–
Back home	1.53	1.45	1.48	–	1.69	1.85	–
Misc.	0.01	0.01	0.00	–	0.01	0.00	–
Total	4.21	4.10	4.05	–	4.64	4.75	–

$N = 915$ persons (189 with child, 726 without child). ANOVA: $^{***}p = 0.01$, $^{**}p = 0.05$, $^{*}p = 0.1$.

an extra work-trip when returning to work. Unsurprisingly, most of the shopping and childcare is left to the mothers, who travel more than twice as often as the fathers for these purposes.

In all subcategories in the sample, the number of childcare trips is low in comparison with other trip purposes: mothers average 0.5 childcare trips per day, fathers only 0.2. Interestingly, the relationship between male and female child-serving trips closely matches the relationship found by Taylor and Mauch (1996, see also Section 2). However, childcare tasks are not limited to trips with that primary trip purpose. Parents frequently take their children along on trips for other purposes such as shopping or recreation, so they therefore have some childcare responsibilities on these trips, too.

Our data show that the genders differ significantly in their number of child-accompanied trips. While fathers are accompanied by a child on only 10% of their trips, the share rises to 33% for mothers ($\eta = 0.299^{***}$). Non-working mothers take a child along on nearly half their trips (46%); for working mothers, this share is still 20%. The need to take a child along on their trips is a major constraint on female mobility, which is frequently hidden in the travel diaries behind the primary activity.

To summarize, women undertake the larger share of maintenance and thus have a higher number of maintenance trips than men. Men, on the other hand, commute more frequently. As expected, the gendered division of labour becomes evident in completely different patterns of mobility. While the gender difference in the overall sample is rather low, differences in families with children are striking. Furthermore, mothers have to undertake a large share of their mobility accompanied by children, which is a major constraint on female mobility.

5. Car use for maintenance and paid work

The private car is, as expected, the dominant mode of transport for duties, the term encapsulating travel for commuting and for maintenance: of all duty trips, 46% are covered by car, 10% by public transport, and 43% by walking or cycling. When type of duty is distinguished, 57% of the commuting trips, but only 36% of the maintenance trips are covered by car. Besides travel habits and the bondage of matutinal punctuality, the trip length can explain some of these differences in car use: work trips are on average 17 km longer than trips for other duties. With regard to maintenance, the car is used most frequently for the weekly grocery shopping (60%)—a result that is only to be expected, bearing in mind how difficult it is to transport large quantities of food and other goods without a car. Cars are used significantly less frequently for minor shopping (23%) and childcare trips (37%).

We discuss the impact of gender, role performance, and time constraints on car use for maintenance in three subsections: first, we compare the car use by individual, household and urban form attributes; second, we analyse gender differences in car use in detail by controlling car availability, participation in labour force, and children in the household; third, the previously discussed factors are included in two distinct logistic regression models for maintenance and commuting, respectively.

5.1. Car use by personal and household attributes

Given the greater time constraints and the complexity of tasks in families with children, we expected parents to use a car more often than the childless. The behavioural differences were expected to be even higher if both parents were working (see Section 5.2 for a detailed analysis). Although the presence of children in the household and a double income affect car use in the expected direction, the impact is lowest when compared with the other household attributes in the analysis (see Table 2). Parents use a car for 41% of all maintenance and 63% of all commute trips, while for the childless these figures for car use are only 34% and 56%, respectively. Similarly, double income households use the car more often for commuting and maintenance travel than single income households.

Personal car availability has the strongest bivariate effect on car use for maintenance and commute trips, an effect which does not require further explanation. Other important factors for car use are net household income, the residential neighbourhood, and labour force participation.

As income increases, the money available for transport and hence car use increases. For households with a monthly income below €1250, the average car use for duties is 18–19%; however, the share rises to 60–71% in households with an income greater than €3250. This rather strong effect may be confounded with higher car availability and differences in labour force participation.

Between the residential neighbourhoods surveyed, car use rises with distance to the city centre. In Belgisches Viertel and Zollstock, the two more central, urban neighbourhoods in the survey, less than 24% of all maintenance and less than 44% of all commute trips are undertaken by car, while in the two more suburban neighbourhoods Longerich and Rath, the share of car use rises to more than 41% for maintenance and more than 61% for commuting.

The impact of labour force participation is unambiguous. Respondents working full-time use the car for 52% of all maintenance trips, part-time workers for 46%. The averages for people who are not part of the labour force are substantially lower: between 20% and 29%. The lowest car use, below 20%, can be observed among homemakers. For commuting, obviously only an

Table 2
Car use for maintenance and commuting trips by several factors (all respondents)

	Maintenance			Commuting		
	Trips	Car use (%)	η	Trips	Car use (%)	η
Total	959	35.6		696	57.4	
Gender						
Male	403	46.9	0.201***	404	60.8	0.083**
Female	550	27.4		287	52.6	
Child in household						
No	694	33.8	0.062*	527	55.6	0.067*
Yes	259	40.5		164	63.4	
Workforce participation						
Full time working	260	51.5	0.252***	557	62.1	0.213***
Part time working	140	45.7		91	40.6	
Student	62	25.8		28	25.0	
Retiree	281	28.4		7	–	
Jobless	49	28.5		3	–	
Homemaker	143	20.2		1	–	
Dual earner						
No	585	31.4	0.111***	362	50.8	0.141***
Yes	368	42.3		329	64.7	
Age						
18–39	365	36.9	0.137***	340	50.0	0.152***
40–59	286	43.3		323	65.3	
60 or older	302	26.8		28	57.1	
Net household income						
Below €1250	183	19.1	0.279***	77	18.1	0.316***
€1250–2249	351	30.2		232	56.4	
€2250–3249	193	45.0		162	63.5	
€3250 or more	127	59.8		155	70.9	
Car availability						
Never	159	–	0.468***	39	–	0.495***
Sometimes	175	9.7		85	8.2	
Always	619	52.0		564	69.1	
Residential neighbourhood						
Belgisches Viertel	189	18.5	0.285***	175	44.0	0.283***
Zollstock	233	23.6		117	40.1	
Longerich	267	41.2		186	60.7	
Rath	264	53.0		213	75.1	

ANOVA: $^{***}p = 0.001$, $^{**}p = 0.05$, $^{*}p = 0.1$.

activity of the employed, car use ranges between 62% for full-time workers, 41% for part-timers and 25% for students, many of whom are also part-time workers. The strength of the impact of wage labour can have multiple reasons: first, employees have less time to coordinate their activities; second, they usually have access to a car because they can afford it; finally, they make use of it to cover the long distances between home and workplace and, therefore, become habitual car drivers, taking car use for granted. Interestingly, part-timers are one of the only groups considered in the bivariate analyses who have a higher share of car use for maintenance than for commuting. We hypothesised that part-timers used a car frequently for organizing their maintenance trips in order to fulfil them in a more time-efficient way.

While the impact of the gender differences, measured by the η-coefficient, is one of the lowest for commuting, it is much higher for maintenance. Males use a car for almost half of their maintenance trips and for 61% of their commute trips, whereas women only do so for 27% of their maintenance and 53% of their commute trips. Gender differences and the reasons for them are discussed in more detail in the next Section.

5.2. Car use by gender differences

Without controlling for any confounding factors, the data indicate substantially higher car use by men. Below, before proceeding to a discussion of the multivariate modelling of car use, we take a closer look at this gender difference and possible confounders.

Two of the most important factors affecting car use, labour force participation and car availability, show substantial gender differences—women, especially older women, own a car less often than men, and generally have a lower probability of working in a paid job—so these variables are the most obvious to control for. Control of car availability already reduces the gender

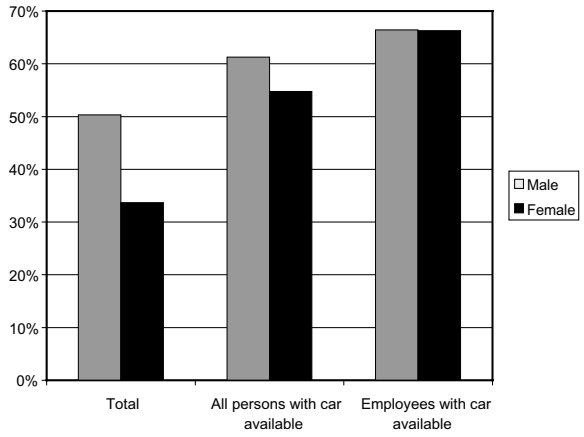

Fig. 2. Overall car use by gender, car availability and labour force participation. $N = 2710$ trips (commuting, maintenance and related trips back home).

differences dramatically. Of those people with car availability, males use a car on 61% and females on 55% of all trips ($\eta = 0.056^{**}$). By controlling additionally for labour force participation, the gender differences vanish completely: the average car use of working men and women with car availability is 66% regardless of gender (see Fig. 2). It must be noted, however, that a bivariate control for labour force participation and car availability automatically reduces the female part of the sample to young, mostly childless women (for a multivariate control of these confounders see Section 5.3).

In addition to employment, further aspects of the division of labour such as those indicated by parenthood, trip purpose and being accompanied by a child on a trip (see Section 4) can affect car use. For analysing the impact of these factors and to reduce the interaction effects with car availability, we restricted the further bivariate analyses to respondents with car availability.

Given the additional time constraints and various related demands, we expected parenthood to increase car use, especially for women. This hypothesis is not supported by our empirical observations: mothers use a car less frequently (48%) than childless women (60%), although fathers use a car more frequently (71%) than childless men (60%). Interestingly, a significant gender difference can be observed in the parents' subgroup, while car use is identical among the childless. To a certain extent, this effect can be explained by an interaction between gender and wage labour. While there is no difference in car use between the non working women with respect to parenthood, having children reduces car use within the group of working women. Thus, parenthood only affects car use under certain conditions, and then in unexpected directions (see Section 5.3 for further discussion).

As explained in Section 4, the effects of the division of labour are to be seen in different mobility patterns for each gender. Car use, on the other hand, differs according to the activity generating the travel need. Thus, it may be important to distinguish car use by activity and gender (Table 3).

The majority of all respondents with car availability use the car for the weekly shopping trip: car use for this purpose averages at 92% for men and 62% for women. However, for small grocery shopping, walking is more frequent and car use averages at around 40% for both men and women. The most striking difference, even larger than the difference regarding weekly shopping, can be observed for child serving trips. Males use the car for more than 70% of their child serving trips, while women do so only half as often (36%). There is no intuitive explanation for this difference: all respondents have permanent car access and the context of these trips does not differ between the genders. About one-third of all child serving trips are chained with commuting and 60% are singular trips, or part of a pure maintenance trip chain, regardless of gender. Additionally, the average length of a child-serving trip is lower among men (2.2 km) than among women (3.6 km). A possible explanation might be that, on average, men are more habitual car users than women and are less well acquainted with public transport, or non-motorized modes. When taking a child to some activity, men may just find it easier to use the car than study bus or tram timetables.

5.3. Multivariate test on impact factors

In this section, we describe the analysis of maintenance and labour mobility in four distinct logit models (e.g. Pampel, 2000 for an introduction to logistic regression analysis). The multivariate models include three groups of independent variables: first, variables indicating the division of labour we expected to affect car usage as stated in our hypotheses (gender, parenthood, work status, cohabitation/marital status and, if relevant, the partner's work status; see Section 2.) This set of variables is supplemented by two groups of control variables: sociodemographic and household attributes (age, income, education, car availability, possession of a season ticket and the residential neighbourhood) and trip properties (distance, purpose, whether accompanied by a child).

From the previous section, we would not expect any significant multivariate effect of gender on car use. Nevertheless, the logit model for maintenance mobility reveals a strong gender difference in car use. Women's odds of car use are about 2.5 times lower than those for men (see Table 4). The corresponding effect is insignificant in the commuting model. Therefore, gender differences in car usage for commuting can be completely explained by the variables controlled in the model,

Table 3
Car use for maintenance by gender and activity (only persons with car availability)

	Child care		Shopping, small		Shopping, provision		Misc.	
	Car use (%)	Trips	Car use (%)	Trips	Car use (%)	Trips	Car use (%)	Trips
Male	71.4	21	41.1	112	91.7	24	60.8	153
Female	35.7	42	39.2	120	61.5	26	56.2	121
Total	47.6	63	40.1	232	76.0	50	58.8	274

Table 4
Two logistic regression models for car use on maintenance and commuting trips

	Model 1: maintenance			Model 2: commuting		
	B	Sig.	e^B	*B*	Sig.	e^B
Female[a]	−0.90	0.00	0.41***	0.23	0.33	1.26
Child in household[a]	−0.11	0.66	0.89	0.21	0.43	1.23
Work force participation[b]		0.00				
Jobless	0	–	1	–	–	–
Part time working	1.01	0.00	2.74***	0		1
Full time working	0.67	0.03	1.76**	0.76	0.03	2.15**
Partner in same household[a]	0.43	0.13	1.54	−0.40	0.25	0.67
Work force participation, partner		0.78			0.56	
Jobless	0	–	1	0	–	1
Part time working	0.16	0.70	1.17	0.43	0.30	1.53
Full time working	−0.12	0.67	0.89	0.21	0.50	1.23
Age (div 10)	−0.07	0.37	0.93	0.14	0.20	1.14
Net household income (div 500)	0.00	0.96	1.00	0.11	0.13	1.12
Secondary education		0.00			0.04	
University degree	0	–	1	0	–	1
Lower (9 years)	−1.18	0.00	0.31***	0.09	0.80	1.09
Intermediary (10 years)	−0.37	0.17	0.69	0.18	0.54	1.20
Higher (13 years)	−0.60	0.03	0.55**	−0.58	0.03	0.56**
Season ticket[a]	−0.54	0.02	0.58**	−1.44	0.00	0.24***
Car availability[a]	2.34	0.00	10.35***	3.23	0.00	25.25***
Residential neighbourhood		0.00			0.00	
Belgisches Viertel	0	–	1	0	–	1
Zollstock	0.54	0.08	1.72*	0.36	0.27	1.44
Longerich	1.71	0.00	5.52***	0.59	0.03	1.81**
Rath	1.80	0.00	6.07***	1.24	0.00	3.44***
Distance	0.07	0.00	1.07***	0.00	0.28	1.00
Child accompanied[a]	0.51	0.15	1.67	–	–	–
Purpose		0.00				
Shopping, provision	0	–	1	–	–	–
Shopping, small	−1.37	0.00	0.26***	–	–	–
Child care	−1.10	0.02	0.33**	–	–	–
Misc.	−0.48	0.18	0.62			
Constant	0.40	0.57	1.49	−3.44	0.00	0.03

Model 1: $N = 946$ trips; final − 2 LL = 784.07; $\chi^2 = 449.22$, df = 22; Nagelkerke $R^2 = 0.52$.
Model 2: $N = 666$ trips; final − 2 LL = 584.71; $\chi^2 = 252.21$, df = 17; Nagelkerke $R^2 = 0.45$.
Wald-Test: $^{***}p = 0.01$, $^{**}p = 0.05$, $^{*}p = 0.1$.

[a] Dummy variable.

[b] Work force participation refers to different variables with different reference categories in the two logit models. In model 1, the variable has three categories with 'Jobless' as reference, whereas the variable is binary in model 2, referring to part timers.

whereas gender differences persist with regard to maintenance.

Interesting differences between commuting and maintenance can also be observed with respect to labour force participation: while for commuting, in comparison with part-timers, full-time workers have far higher odds for car usage, the reverse is the case for the maintenance model. While for commuting this result is in line with

our theoretical expectations, the result for maintenance is surprising since the time pressure is highest when working part time. To lessen the time pressure, we expected part timers to use a car more likely for maintenance travel than full timers. The importance of the contrasting effects of labour force participation and gender on commuting and maintenance travel is particularly great since the impact of all other independent variables is more or less equal in the two models. The effect of gender and labour force participation on modal choice for maintenance travel and commuting therefore underlines the need for separate, differentiated analyses of the two kinds of mobility.

Regarding maintenance travel, in comparison with people who are not in the labour force, the car-use odds ratio of full-timers is 1.8–1. In contrast, the odds ratio of part-timers is 2.7–1, which is 150% of the full-time workers' odds. Although failing to reach statistical significance ($p = 0.13$), the difference in car use between part-timers and full-timers is an interesting result of this logistic regression analysis. It should be noted that part-timers are one of the few social groups with a higher car quota for maintenance travel than for the journey to work (see Table 2 in Section 5.1). Additionally, 85% of all part-time workers in the sample are female, and it is part-time working women who usually undertake the lion's share of maintenance (see Section 4). The difference found therefore supports the hypothesis that the constraints produced by combining labour market and household work are likely to increase car use for maintenance. Of course, even when choosing a high significance level, the hypothesis is supported by the difference in car use between gainfully employed people and people not in the labour force.

The remaining effect of gender in the maintenance model, on the other hand, indicates some unexplained variance in gendered car use. Although the theoretically expected impact of parenthood, cohabitation, the part-

Table 5
Logistic regression models for car use on maintenance by gender

	Model 1a: male			Model 1b: female		
	B	Sig.	e^B	*B*	Sig.	e^B
Child in household[a]	0.87	0.07	2.38*	−0.73	0.05	0.48**
Workforce participation		0.31			0.01	
Jobless	0	–	1	0	–	1
Part time working	1.06	0.13	2.88	1.12	0.00	3.06***
Full time working	0.25	0.58	1.28	0.66	0.11	1.94
Partner in same household[a]	0.46	0.32	1.58	0.53	0.23	1.70
Work force participation, partner		0.33			0.70	
Jobless	0	–	1		–	1
Part time working	−0.55	0.32	0.58	0.20	0.86	1.22
Full time working	−0.71	0.16	0.49	0.33	0.40	1.39
Age (div 10)	−0.09	0.44	0.91	0.02	0.89	1.02
Net household income (div 500)	0.14	0.22	1.15	−0.17	0.11	0.84
Secondary education		0.09			0.01	
University degree	0	–	1	0	–	1
Lower (9 years)	−1.03	0.01	0.36***	−1.64	0.00	0.19***
Intermediary (10 years)	−0.50	0.24	0.61	−0.56	0.17	0.57
Higher (13 years)	−0.58	0.20	0.56	−0.42	0.29	0.66
Season ticket[a]	−0.59	0.10	0.56*	−0.95	0.01	0.39***
Car availability[a]	2.05	0.00	7.79***	3.08	0.00	21.75***
Residential neighbourhood		0.02			0.00	
Belgisches Viertel	0	–	1	0	–	1
Zollstock	0.02	0.96	1.02	0.93	0.07	2.53*
Longerich	1.04	0.02	2.83**	2.07	0.00	7.96***
Rath	0.80	0.10	2.22*	2.31	0.00	10.12***
Distance	0.29	0.00	1.34***	0.03	0.03	1.03**
Child accompanied[a]	1.67	0.04	5.30**	0.18	0.70	1.19
Purpose		0.02			0.01	
Shopping, provision	0	–	1	0	–	1
Shopping, small	−1.61	0.09	0.20*	−0.75	0.24	0.47
Child care	−2.06	0.01	0.13***	−0.94	0.06	0.39*
Misc.	−1.36	0.07	0.26**	−0.03	0.96	0.97
Constant	−1.82	0.12	0.16	−3.92	0.00	0.02***

Model 1a: $N = 400$ trips; final − 2 LL = 328,89; $\chi^2 = 223, 94$; df = 21; Nagelkerke $R^2 = 0.57$.
Model 1b: $N = 546$ trips; final − 2 LL = 383,09; $\chi^2 = 260,83$; df = 21:; Nagelkerke $R^2 = 0.55$.
Wald-Test: $^{***}p = 0.01$, $^{**}p = 0.05$, $^{*}p = 0.1$.
[a] Dummy variable.

ner's labour force participation, and being accompanied by a child was not observed, there might be gender differences in the impact of these variables. To account for this variance, we estimated separate logit models for male and female maintenance car use (see Table 5). The separate logit models reveal numerous gender differences in the factors influencing car use. The relevant differences are the influence of parenthood, work force participation, being accompanied by a child and car availability. In the following paragraphs, we will comment on each of these differing effects.

The effect of work force participation strongly supports the hypothesis that the constraints of having to combine maintenance and paid work increases car use. While there is no significant influence of work force participation on male car use (model 1a), female work force participation raises the car use for maintenance (model 1b). As expected, part time working women's odds of car use are more than three times higher than for non-employed women. As mentioned before, part time employed women are subject to the pressure of combining maintenance and paid work, and therefore most likely solve this conflict by using a car.

The bivariate finding that men, contrary to women, increase car use when accompanying a child is confirmed by the multivariate analyses: when accompanying a child, men's odds of car use raise by the factor 5.3. The corresponding effect is insignificant in the female model (1b). We explain this observation by two behavioural reasons: first, women take over the major share of childcare responsibilities and, therefore, tend to reorganize their daily activities in the vicinity of their residences by non-motorized modes; second, men continue working full time, most frequently commute by car and only take over minor child care responsibilities which they frequently trip chain with their daily work trips and, by their habits, most frequently cover by car (see Section 5.2).

Car availability enhances the odds of car use regardless of the gender. The main difference between the effect on men's and women's car use is the magnitude of the coefficient: the effect is far stronger for women than for men (21.8 compared to 7.8). This finding can be interpreted in a way, that women, if they have the chance to use a car, they use it and try to make up for time constraints.

The effect of parenthood, already identified in the bivariate analysis, clearly contradicts our central hypothesis for the case of mothers: the odds of mothers' car use are only about half the odds of childless women, whereas the odds of fathers' car use are more than double the odds of childless men. While the effect is in line with our hypothesis in model 1a (male), our hypothesis had implicated the opposite of the empirically found effect in model 1b (female). A possible explanation might be that the division of labour is strongly traditionalised with the birth of a child (see Table 1 in Section 4) and thus the gendered structure of maintenance activities and mobility changes. For women, especially an increase in activities with rather low car use (small shopping and child care) can be observed whereas the changes in men's maintenance activities are only minor. These changes in the activity structure might be a confounder of mothers' lower car use.

6. Conclusion

In recent years more and more women have entered the labour force and so the traditional division of labour between the genders males responsible for wage labour and women responsible for household work is no longer self-evident. Sociologists observe a detraditionalization of gender roles and household responsibilities. However, an increasing participation of women in the labour force coincides with only a relatively small reduction in women's household responsibilities. Women retain more responsibility than men for maintenance, that is to say for all the work related to the physical and emotional reproduction of labour power and, more generally, the society.

At the time when women began increasingly to enter the labour force, transportation researchers observed an increase in their motorization. Whether the concept of the 'transport disadvantage' still applies to women's travel has been called in question. We have contributed to this research by asking how the gendered division of labour affects the travel patterns of men and women. We started with the hypothesis that time pressure is high on working women, particularly in families with children, through the unequal division of labour between the genders. Fast, flexible travel modes are particularly important for women. Since we expected that these attributes were frequently associated with private cars, we expected car use by working women, particularly those with children, to be higher than for others. In particular, we expected that women's car use would be more likely to increase in the future with an unequal division of work between the genders.

In contrast with most other studies, our analysis was not of commuting trips alone. Instead, the main focus of our analysis was the travel for maintenance, which is a much more direct outcome of household-related duties so that gender differences should be more evident than for the commuting trips. Nevertheless, we also discussed differences in commuting trips.

The main outcome of the study is that, if there is still a 'transport disadvantage' for women, then it is closely linked to their participation in the labour market and to the division of household tasks. While for young and childless men and women labour tasks and, thus, the

corresponding activities and travel purposes are almost equally distributed between men and women, parents show a more traditional division of tasks and travel patterns. Mothers still have to undertake the largest share of maintenance, whereas fathers concentrate on the wage labour. Mothers therefore travel mainly for child care, grocery shopping and other maintenance duties, while fathers do so for work.

With respect to car use, the picture is more complicated. No multivariate effect of gender could be observed with respect to commuting. Similarly for maintenance, car use by young working people does not differ much by gender. Although the bivariate differences in car use for maintenance mobility between men and women are statistically significant, they are relatively low compared with other factors such as car availability, household income, residential neighbourhood, or labour force participation. Nevertheless, a more detailed examination of the interaction effects and a multivariate analysis showed that two factors produce gendered patterns of car usage: labour force participation, especially female part time employment, increases car use for maintenance purposes, while having children decreases female car use (but increases male car use). For women, our analysis therefore shows that the detraditionalization of women's role in the labour market leads to increased car use for maintenance, whereas the traditional task division between the genders for childcare leads to a more traditional mode use for that purpose, which means less car use.

The effect of labour force participation supports our initial hypothesis, that the unequal division of maintenance tasks burdens women's time budget and hence leads to increased car use. However, we expected that this effect should be especially strong among working mothers—a hypothesis which is clearly contradicted by our data. In spite of the timely and social constraints associated with parenthood, women do not in general try to make up for these constraints by using a car. On the contrary, mothers are less likely to use a car than childless women. We can not offer a theory-guided explanation of this effect, but hypothesised that an adequate point of departure for an explanation of this effect might be the traditionalising effect of parenthood and the corresponding change in travel patterns for maintenance.

While we cannot answer all questions raised, we hope that the results presented in our study are capable of stimulating further, cumulative research on the topic of car use for maintenance mobility and its connection to the division of labour. In our opinion, theoretical as well as further empirical research is needed to shed light on the question how gender, parenthood and work force participation are interconnected, and how these factors can be related to car use in a consistent theoretical model.

Acknowledgements

The authors wish to express their gratitude to the Deutsche Bundesstiftung Umwelt, Osnabrück (Germany) and the Wuppertal Institute for Climate, Environment and Energy, Wuppertal (Germany) for the financial support that made this study possible. Martin Lanzendorf was also partly supported by the Urban Research centre Utrecht at Utrecht University (The Netherlands). Earlier drafts of this paper have benefited from comments by Anke Gerhardt, Tim Schwanen, Christof Wolf, Robbert Zandvliet and two anonymous reviewers.

References

Beck, U., Beck-Gernsheim, E., 1990. Das ganz normale Chaos der Liebe. Suhrkamp, Frankfurt am Main.

Blanke, K., Ehling, M., Schwarz, N., 1996. Zeit im Blickfeld. Ergebnisse einer repräsentativen Zeitbudgeterhebung. Kohlhammer, Stuttgart, Berlin, Klön.

Buhr, R., 1999. Das Auto: Ein Mittel zur Erleichterung der Haushaltsführung? In: Flade, A., Limbourg, M. (Eds.), Frauen und Männer in der mobilen Gesellschaft. Leske und Buderich, Opladen, pp. 155–174.

DETR, 1998. Focus on Personal Travel, Including the Report on the National Travel Survey 1995–1997. Department of the Environment, Transport and the Regions, London.

Diekmann, A., Preisendörfer, P., 1998. Environmental behavior: discrepancies between aspirations and reality. Rationality and Society 10 (1), 79–102.

Dowling, R., 2000. Cultures of mothering and car use in suburban Sydney: a preliminary investigation. Geoforum 31 (3), 345–353.

Flade, A., 1999. Begleitung und Transport von Kindern. In: Flade, A., Limbourg, M. (Eds.), Frauen und Männer in der mobilen Gesellschaft. Leske und Buderich, Opladen, pp. 257–262.

Giuliano, G., 1979. Public transportation and the travel needs of women. Traffic Quarterly 33 (4), 607–615.

Golob, T., McNally, M., 1997. A model of activity participation and travel interactions between household heads. Transportation Research Part B 31 (3), 177–194.

Hamilton, K., Jenkins, L., 2000. A gender audit for public transport: a new policy tool in the tackling of social exclusion. Urban Studies 37 (10), 1793–1800.

Hanson, S., Hanson, P., 1980. Gender and urban activity patterns in Uppsala, Sweden. Geographical Review 70, 291–299.

Hanson, S., Hanson, P., 1981. The impact of married women's employment on household travel patterns: a Swedish example. Transportation 10 (2), 165–183.

Hanson, S., Johnston, I., 1985. Gender differences in work-trip length: explanations and implications. Urban Geography 6 (3), 193–219.

Hanson, S., Pratt, G., 1995. Gender, Work, and Space. Routledge, New York.

Hartmann, P., 1998. Arbeitsteilung im Haushalt. In: Braun, M., Mohler, P. (Eds.), Blickpunkt Gesellschaft: 4. Soziale Ungleichheit in Deutschland. Westdeutscher Verlag, Opladen, pp. 139–172.

Heine, H., Mautz, R., 2000. Die Mütter und das Auto. PKW-Nutzung im Kontext geschlechtsspezifischer Arbeitsteilung. In: Lange, H. (Ed.), Ökologisches Handeln als sozialer Konflikt: Umwelt im Alltag. Leske und Buderich, Opladen, pp. 119–142.

Hjorthol, R., 2000. Same city—different options. An analysis of work trips of married couples in the metropolitan area of Oslo. Journal of Transport Geography 8 (3), 213–220.

Hoffman, L., Manis, J., 1978. Influences of children on martial interaction and parental satisfactions and dissatisfactions. In: Lerner, R., Spanier, G. (Eds.), Child Influences on Martial and Family Interaction. A Life-Span Perspective. Academic Press, New York, San Francisco, London, pp. 165–213.

Jones, P., Dix, M., Clarke, M., Heggie, I., 1983. Understanding Travel Behaviour. Gower, Hampshire.

Kloas, J., Kunert, U., 1994a. Über die Schwierigkeit, Verkehrsverhalten zu messen. Die drei KONTIV-Erhebungen im Vergleich—Teil I. Verkehr und Technik 1994 (3), 91–100.

Kloas, J., Kunert, U., 1994b. Über die Schwierigkeit, Verkehrsverhalten zu messen. Die drei KONTIV-Erhebungen im Vergleich—Teil II. Verkehr und Technik 1994 (4), 187–197.

Koch, A., Wasmer, M., Harkness, J., Scholz, E., 2001. Konzeption und Durchführung der "Allgemeinen Bevölkerungsumfrage der Sozialwissenschaften" (ALLBUS) 2000. ZUMA-Methodenberichte 2001/5. ZUMA, Mannheim.

Künzler, J., 1994. Familiale Arbeitsteilung. Die Beteiligung von Männern an der Hausarbeit. Kleine, Bielefeld.

Kutter, E., 1973. A model for individual travel behaviour. Urban Studies 10, 259–270.

Lanzendorf, M., 2001. Freizeitmobilität. Unterwegs in Sachen sozialökologischer Mobilitätsforschung. Trier: Geographische Gesellschaft.

Law, R., 1999. Beyond 'women and transport': towards new geographies of gender and daily mobility. Progress in Human Geography 23 (4), 567–588.

Madden, J.F., 1981. Why women work closer to home. Urban Studies 18 (4), 181–194.

McGuckin, N., Murakami, E., 1999. Examining trip-chaining behavior: comparison of travel by men and women. Transportation Research Record 1693, 79–85.

Pain, R., 1991. Space, sexual violence and social control: integrating geographical and feminist analyses of women's fear of crime. Progress in Human Geography 15 (2), 415–431.

Pampel, F.C., 2000. In: Logistic Regression: A Primer Sage Series on Quantitative Applications in the Social Sciences, 132. Sage, Thousand Oaks, CA.

Parsons, T., 1956. The American family: its relations to personality and the social structure. In: Parsons, T., Bales, R., Olds, J. (Eds.), Family, Socialization and Interaction Process. Routledge and Kegan, London, pp. 3–33.

Pas, E.I., 1984. The effect of selected sociodemographic characteristics on daily travel activity behavior. Environment and Planning A 16, 571–581.

Pickup, L., 1989. Women's travel requirements: employment, with domestic constraints. In: Grieco, M., Pickup, L., Whipp, R. (Eds.), Gender, Transport and Employment. The Impact of Travel Constraints. Avebury, Aldershot, pp. 199–221.

Root, A., Schintler, L., 1999. Women, motorization and the environment. Transportation Research Part D 4 (5), 353–355.

Rosenbladt, B. von, 2001. Erstbefragung 2000 der SOEP-Stichprobe F. Methodenbericht. Infratest, München.

Rosenbloom, S., 1978a. Women's travel issues: research needs and priorities. In: Proceedings of the Conference on Women's Travel Issues. US Department of Transportation, Washington, DC.

Rosenbloom, S., 1978b. Editorial: the need for study of women's travel issues. Transportation 7, 347–350.

Rosenbloom, S., 1998. In: Women's Travel Issues: Proceedings from the Second National Conference, October 23–26, 1996. US Department of Transportation, Washington, DC.

Sarmiento, S., 1996. Household, gender, and travel. In: Rosenbloom, S. (Ed.), Women's Travel Issues. Proceedings from the Second National Conference. Department of Transportation, Washington, DC, pp. 36–52.

Statistisches Bundesamt, 1976. Statistisches Jahrbuch 1976 für die Bundesrepublik Deutschland. Kohlhammer, Stuttgart.

Statistisches Bundesamt, 2003. Statistisches Jahrbuch 2003 für die Bundesrepublik Deutschland. Metzler-Poeschel, Stuttgart.

Taylor, B.D., Mauch, M., 1996. Gender, race, and travel behavior: an analysis of household-serving travel and commuting in the San Francisco Bay Area. In: Rosenbloom, S. (Ed.), Women's Travel Issues. Proceedings from the Second National Conference. Department of Transportation, Washington, DC, pp. 373–405.

Trench, S., Tiesdel, I.S., 1992. Safer cities for women: perceived risks and planning measures. Town Planning Review 63 (3), 279–296.

Turner, T., Niemeier, D., 1997. Travel to work and household responsibility: new evidence. Transportation 24 (4), 397–419.

Valentine, G., 1989. The geography of women's fear. Area 21 (4), 385–390.

Wolf, C., 2003. Soziale Ungleichheit, Gesundheitsverhalten und Gesundheit. Eine soziologische Analyse für Personen im mittleren Erwachsenenalter. Habilitationsschrift, University of Cologne.

Yee, J., Niemeier, D., 2000. Analysis of activity duration using the Puget sound transportation panel. Transportation Research Part A 34 (4), 607–624.