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Are Women Taking the Fast Lane?**

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Ageing and Mobility in Germany: Are Women Taking the Fast Lane?

Dominika Kalinowska and Uwe Kunert

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ABSTRACT

Results from travel demand research in many countries show that – on average – women are less mobile and have different mobility patterns than men. Recent longitudinal studies of gender specific travel demand reveal converging mobility of males and females. Moreover, in some countries results show convergence between cohort and gender specific travel demand: women and men display more and more similar travel behaviour while older individuals today have higher mobility demands than ever before. Do these developments hold also for Germany? Based on socio-economic and demographic analysis of gender specific travel behaviour using the German mobility survey data from 2002, we ask what individual travel patterns can be expected for the future in the year 2025. We place emphasis on the importance of educational attainment and labour force participation for the assessment of future personal mobility.

Keywords: travel demand, cohort effects, gender, households, ageing population

JEL classification: R41, J11, J14, J16

INTRODUCTION

Insights from the analysis of individual mobility based on currently available data are often used for projections of future travel demand. This study uses German National Travel Survey data to analyse socio-economic and demographic effects on individual travel demand, emphasising cohort effects by sex and age (1). The estimation results for individual mobility profiles (a profile is a number of mobility indicators as trips, distances, modes used, etc.) were aggregated to the household level. Additional data on the monetary household budget for travel purposes was added from the German Household Budget and Expenditure Survey. The estimation results at the cross-section were then combined with population growth projections from the German Microcensus (2) in order to forecast the expected mobility demand for different socio-economic and demographic groups as well as their aggregates within the German population in 2025. An implicit objective of this study was to quantify anticipated sex and age related travel behaviour as well as cohort effects in the next 20 years. The results obtained can be used to identify potential impacts on travel demand over the next two decades and point to additional research needs.

The projection is based on an analysis of the past as well as on empirical assumptions about future developments. The paper analyzes the current and future connection of mobility demand with household income, motorisation, and driving licence tenure. Projections for mobility in the future also take other factors into account, such as economic growth, the intensification of the division of labour and population shrinkage, which will increase employment within groups which are currently underrepresented in the labour market. This is particularly true for females and the “young” elderly. This trend will lead to an increase in travel demand of certain population (sub) groups.

Moreover, expected increases in fuel prices and public transportation fares as well as the slow growth of disposable real incomes for some household categories indicate a growing pressure on individual travel choice optimisation in the future.

The paper has the following structure: the next section gives a brief description of current mobility patterns for selected socio-demographic groups with a special focus on sex and age as determinants of daily travel demand. The section to follow introduces the methodology, underlying assumptions, and potential problems of our multi-dimensional forecasting model. The subsequent section introduces the extrapolation results. Emphasis will be put on results referring to the future development of the mobility of females in the context of ageing and changing household or family formation behaviour. The paper will end with a

critical review of the results and the extrapolation assumptions, stressing potential follow up research questions.

EFFECTS OF AGE AND GENDER ON TRAVEL DEMAND IN GERMANY

The most recent representative national travel survey of the population resident in Germany is “Mobility in Germany” (Mobilität in Deutschland) conducted in 2002 (3, 4). Some of the innovative design elements of the survey were the inclusion of individuals who were not making a trip during the survey period and the addition of children’s travel behaviour. These two aspects are relevant for the overall survey results and also shed light on the travel behaviour of the topics of this paper: women, ageing, and their future travel demand.

The MiD 2002 survey allows an extensive examination of individual mobility behaviour of specific socio-economic and demographic categories. Attention can also be given to travel behaviour of individuals within a specific context: Combining the information on individual mobility with characteristics on the household context contained in the survey gives further insight into travel behaviour by household-type (see 1 and below). For a thorough interpretation of the survey results, additional data from national statistics on population, employment or economics was taken into account.

In this study the MiD 2002 data was used to better understand mobility behaviour of women. Subject of the analysis were surveyed mobility parameters – number and length of trips – together with mode choice and trip purpose. The data on mobility was broken down by available socio-economic and demographic information, such as age, educational attainment, employment or professional status, having a driver’s license, car availability, and household equivalent income. Our previous regression analyses of the correlation between travel behaviour and selected socio-economic and demographic explanatory variables based on the MiD 2002 data have shown the significant impact sex and age have on the number of trips per day and the trip distance of a trip maker. These results hold true even when controlling for other significant explanatory variables of individual travel behaviour (5).

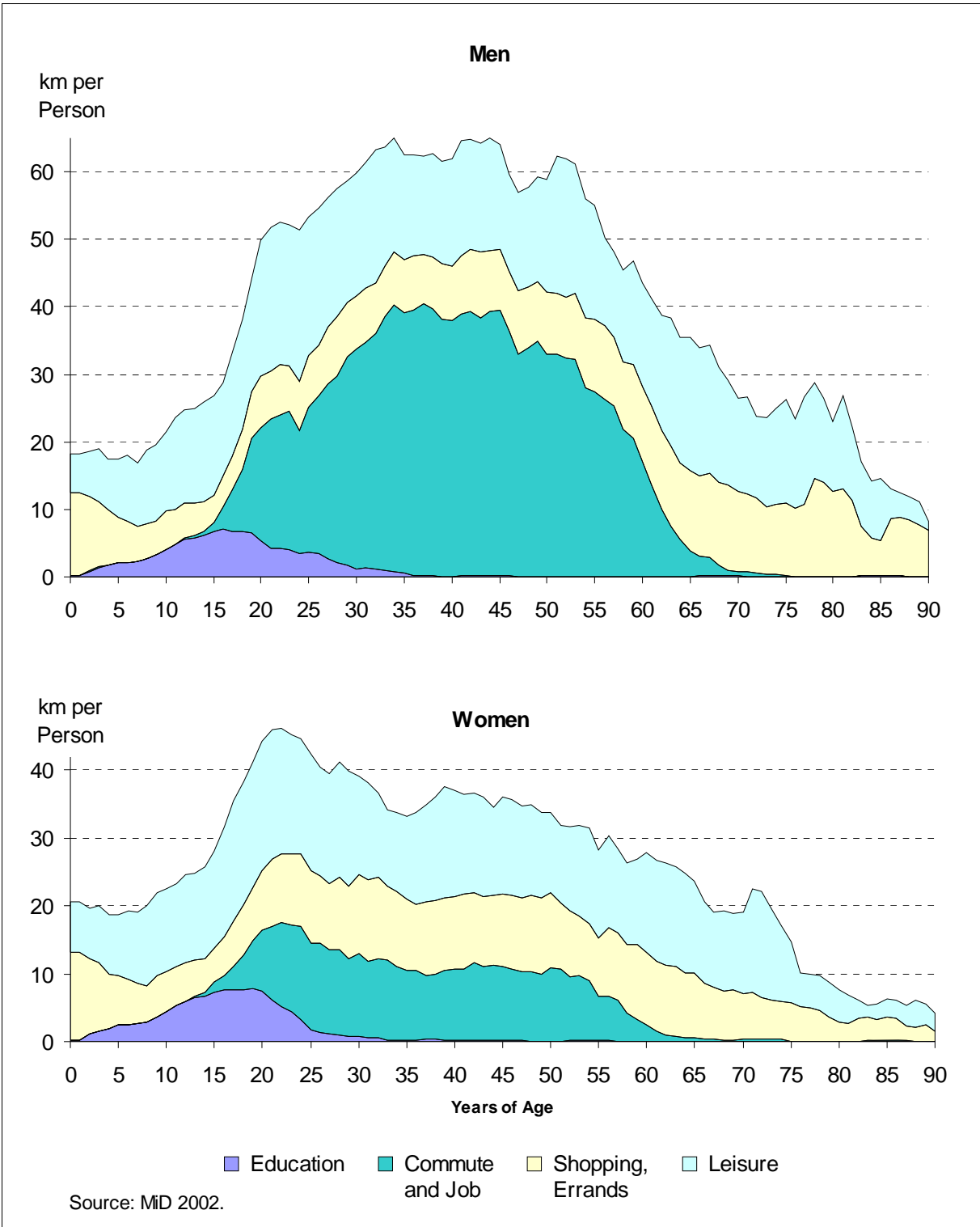
Descriptive statistics of male and female mobility show that women travel fewer kilometres per day than men.¹ Males travel on average 45.5 km per day and per person and hence over 50 % longer distances than women with 28.7 km. However, controlling for other

¹ In the present study, overall travel parameters are mainly taken into account, without the differentiation for travel modes. The trip and distance indicators are computed including the non-mobile persons.

factors, such as age, income category, educational attainment, or professional status modifies these findings.

Figure 1 shows the gender specific distribution of average daily trip distance per person for different ages. In line with common expectations, mobility rises abruptly with entrance into the labour market and higher education at the age of around 20. Up to that age daily distances of males and females by purpose are very similar. Females under 20 tend to travel further for educational, shopping and leisure purposes than young males. This is true for the very young, who are mostly accompanied by their parents. Between the age of the mid-twenties and mid-fifties the difference in daily travel distance between men and women is greatest. This is almost solely due to a higher share of males in the workforce and the commuting distance to access a job. In the life-cycle phase of occupational commitment and family formation the clear distinction in the roles of the sexes in Germany becomes apparent in the motives and ranges of daily mobility. Shopping related travel distances of women are one-third longer, while men travel more for leisure purposes. Men travel daily distances of about 60 kilometres (more than half of this being job-related) in the age bracket from 25 to 55. For older individuals total average travel distances declines in line with reduced labour force participation, to some extent compensated by more shopping and leisure travel. Women however exhibit declining average daily travel once they reach their mid-twenties. The data also show that strolls and visits of doctors and churchyards increase for both genders after the age of 70.

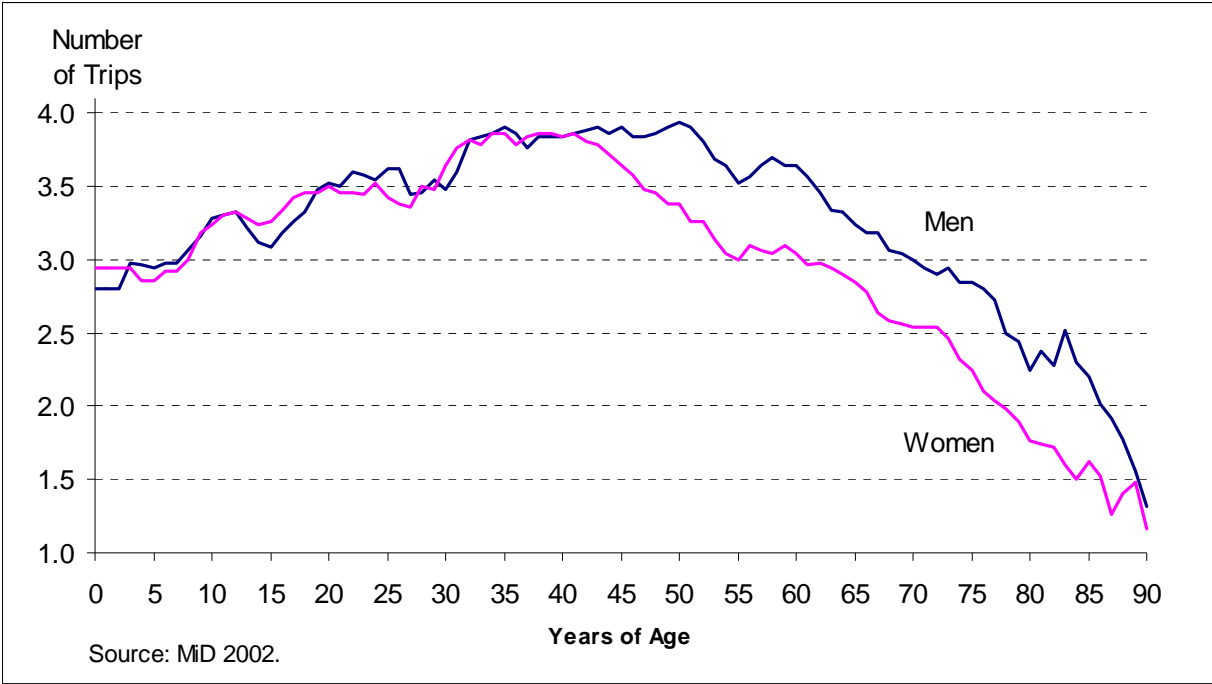
Figure 1 Daily distance travelled by males and females by age and purpose, Germany 2002



Women make on average almost the same number of trips as men (3.2 vs. 3.5). This is the result of a fairly similar demand for trips of men and women up to the age of 45 years, as shown in Figure 2.

For the younger cohorts in the age bracket from 25 to 45 there is a considerable difference in daily distance travelled by men and women, but no difference in trip frequency. This reflects a smaller activity radius of women. They tend to be more often than men engaged in child caring tasks and lower skilled (part time) work, which is often chosen to be located in the vicinity of the home.

Figure 2 Number of trips per day and per person for males and females and by years of age, Germany 2002



Another factor contributing to shorter daily distances travelled by females is car availability, which is apparently lower for women than for man, as illustrated in Figure 3. It is remarkable that in 2002 still twice as many women as men report to never have a car at their disposal.

For the elderly cohorts one explanation for the gap in daily number of trips made by men and women is the lower driving licensure rate of females. Within younger cohorts this difference in the driver’s licensing rate has disappeared over the last decades (see Figure 4).

Figure 3 Car-availability by gender, Germany 2002

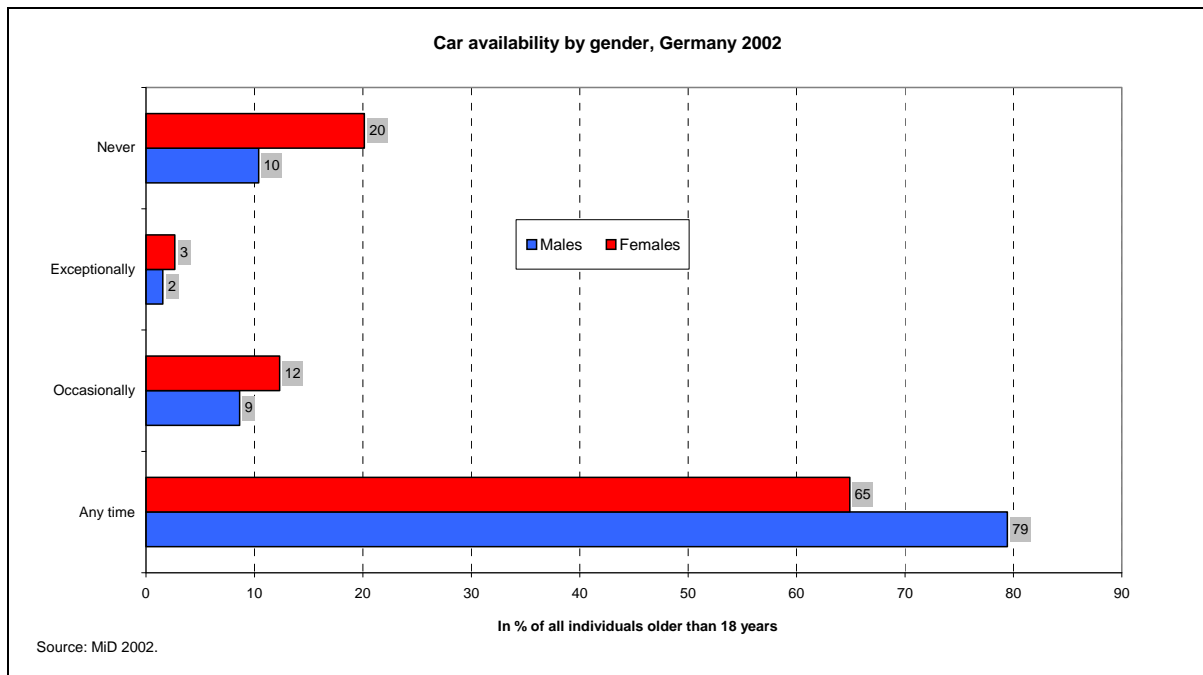
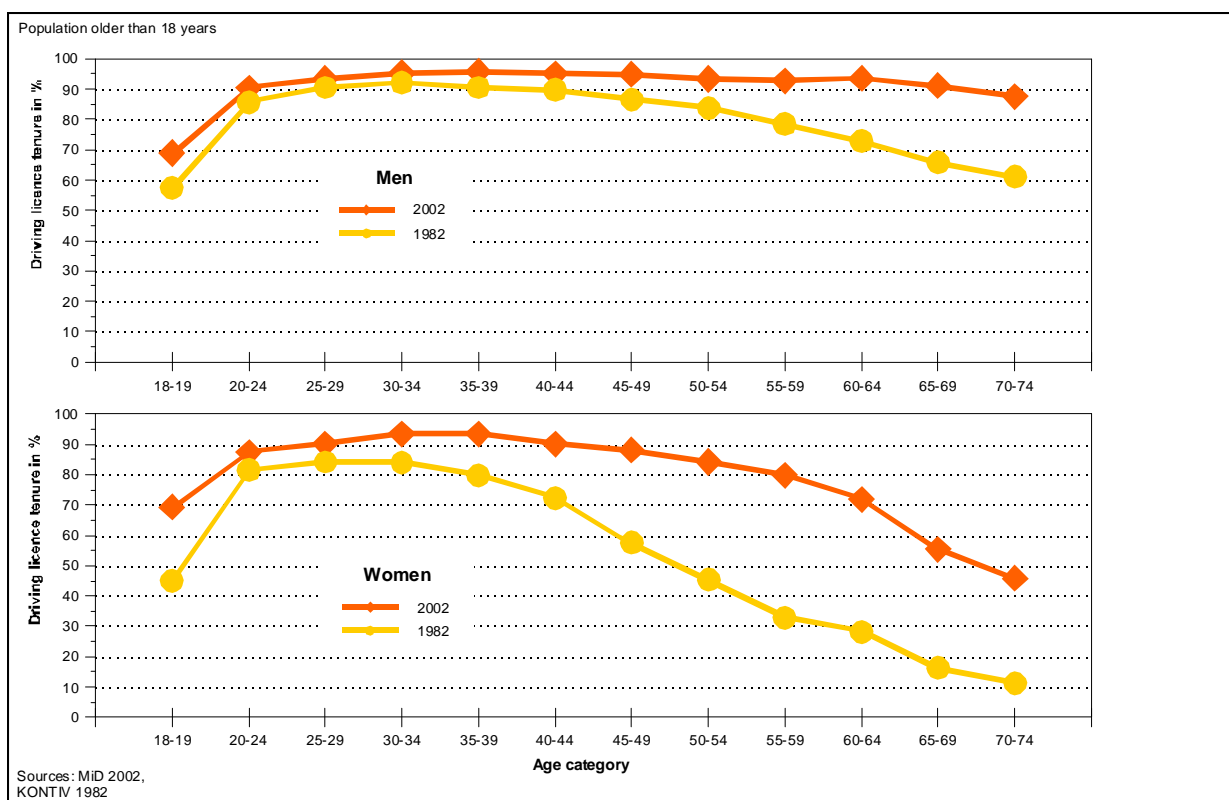


Figure 4 Share of men and women holding a driver's license by age cohort, Germany 1982 and 2002



Studies show that socioeconomic factors play an important role in shaping travel behaviour. Travel demand in general rises with the income of households (6, 7, 8, 9, 10).

Figure 5 illustrates this relationship for Germany. Again, it shows the persistent gap between men and women in daily distance travelled per person. It is remarkable that this gap widens in absolute terms (km) with rising income while the relative gap remains constant. For the lowest category the difference in daily trip distance between men and women is on average 8 km. For the top income class this difference amounts up to 20 km. Comparing the number of trips per day and per person between men and women for different income categories there is hardly any income specific variation, the difference between the sexes is around 0.4 daily trips. Average number of trips rises from the lowest to the highest income group – irrespectively of gender – on average from 2.3 to 3.7 trips per person and per day.

Figure 6 shows the distribution of men and women as to educational attainment, which appears fairly equivalent except for the categories “secondary school”, i.e. graduation after 10 years of school, and the category “university entrance diploma”. While there are more women than men with a secondary education status, men dominate the category of university entrance diploma.

Table 1 shows some mobility indicators for men and women by educational attainment. The average number of trips and trip distance go up with educational attainment status, for both men and women. Women with a higher level of education make more trips per day than men in the same educational attainment category. However, the gap between male and female average daily travel distance remains high even for better educated groups.

Besides education, occupational activity has also a major impact on individual travel behaviour. Hence, the type of employment, i.e. part time or full time as well as professional status, i.e. white collar or blue collar influence the mobility indicators.

As can be seen in Table 2 the share of males working full time is 46 %, more than twice as high as for women (19 %). On the other hand women are more likely to work part time. Again, trip distances travelled by females are on average significantly shorter, regardless of type of employment. However, women not in the workforce or shortly before retirement tend to travel longer daily distances. Controlling for employment, the average number of daily trips per person does not vary between men and women.

In previous regression analyses controlling for other variables we found that sex is not a significant determinant of trip frequency per capita on weekdays. However, the sex variable reveals significantly higher number of trips men make on the weekends. The life-cycle variable is most important to explain trip-making for all days of the week (besides car-availability) and picks up sex-related role effects (See Table 2 for composite life-cycle

categories). For workdays the life-cycle variable (which includes no additional sex-specific category) indicates a somewhat lower trip making rate for house makers than for workers, but a considerable higher rate than for the unemployed or retirees. As the role-related activities are less pronounced on the weekend, it is the sex variable that points towards more trips by men, but with a small coefficient when compared with the other variables.

Our travel distance model yields different results: now sex is a significant factor for weekdays, indicating longer distances for men; since the role-related variables do not capture effects such as shorter commuting distances and short shopping trips of women. Again, the sex coefficient is small compared to the other coefficients. Modelling Saturdays' and Sundays' travel distances, the sex variable is not significant, as weekend's travel for both men and women is dominated by joint leisure trips over relatively long distances (5).

Figure 5 Distance travelled by males and females for different income groups, Germany 2002

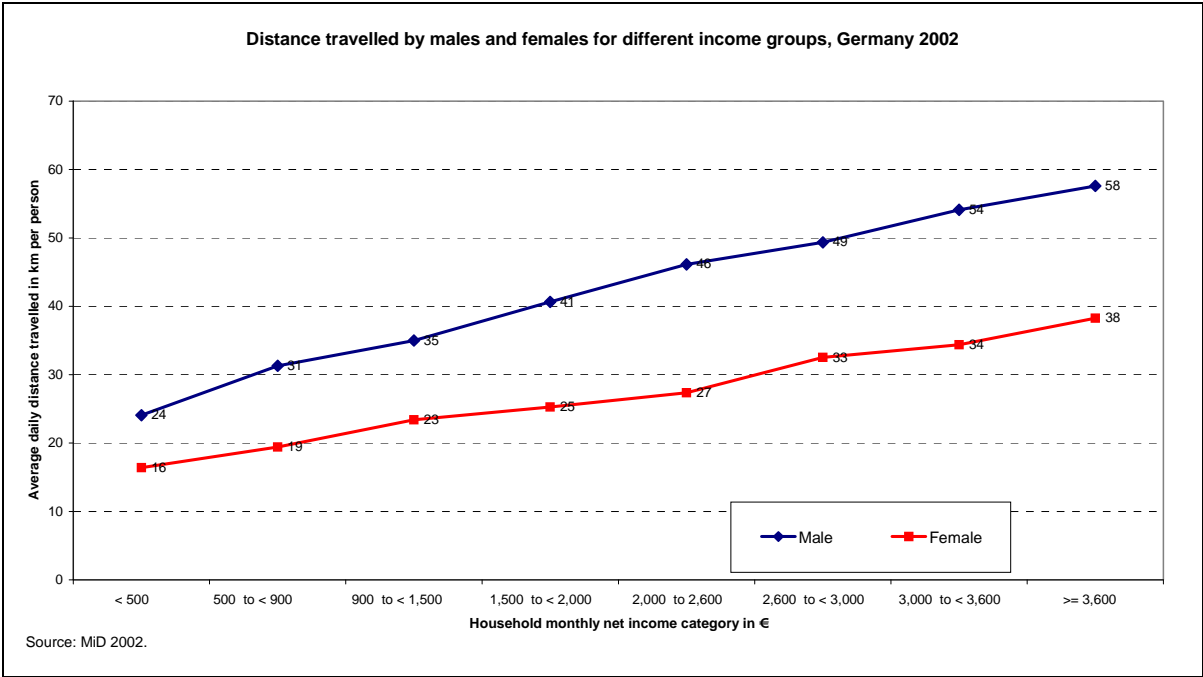


Figure 6 Population distribution by educational attainment of men and women, Germany 2002

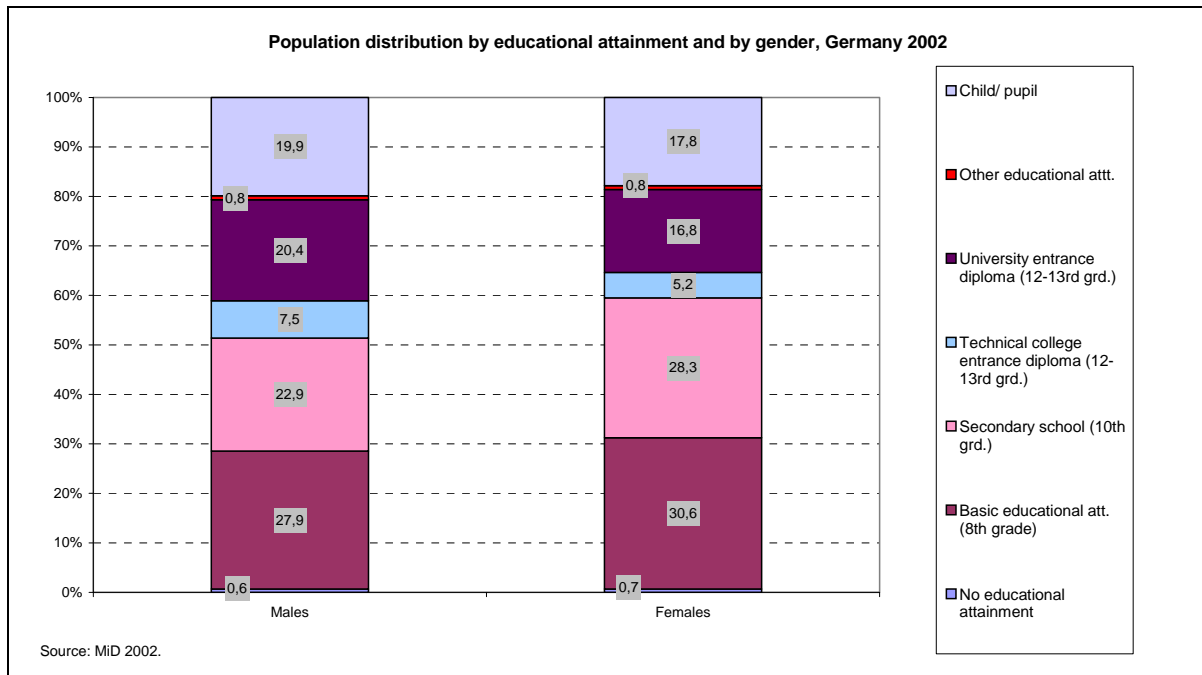


Table 1 Average daily distance and number of trips travelled by males and females, Germany 2002

Daily distance and number of trips travelled on average by males and females, Germany 2002				
	Daily trips per person		Daily distance in km per person	
	Males	Females	Males	Females
No educational attainment	3,0	2,2	27	13
Basic educational att. (8th grade)	3,2	2,7	40	21
Secondary school (10th grd.)	3,6	3,4	55	32
Technical college entrance diploma (12-13th grd.)	3,7	3,9	57	42
University entrance diploma (12-13th grd.)	3,6	3,8	55	42
Other educational att.	2,7	2,8	39	28
Child/ pupil	3,1	3,2	24	23
Total	3,4	3,2	44	29

Source: MiD 2002.

Table 2 Average daily travel distance by males and females and population distribution according to labour market status

Daily distance travelled by males and females and population distribution according to labour market status				
	Males		Females	
	Km per person	Population share in %	Km per person	Population share in %
Full time employed	63	46	44	19
Part time empl.	49	2	36	13
Less than part time empl.	37	1	34	3
Trainee	50	2	45	2
Child/ pupil	21	20	24	18
Student	41	3	45	2
Unemployed	27	4	27	3
Transitorily unemployed	26	0	27	3
Homemaker	25	0	25	11
Retired person	26	20	17	24
Civil service	41	1	/	0
Other	32	1	33	1
Total	44	100	29	100

Source: MiD 2002.

Figure 7 gives an overview of gender specific differences in number of trips and distances to reach common destinations, such as workplaces, schools, shops, sites for leisure activities, post offices, etc. Men and women make most trips and travel most kilometres for leisure activities. For men work and business travel is taking the second position. For women it is shopping, everyday organisational tasks, and escorting others – mainly children – which generate considerable shares of daily travel demand.

In Germany, men and women on average are using the car for most of their travel. Nevertheless, males cover their daily travel distances even more often by car than women, especially as drivers of the vehicle. Women are more often on the passenger seat or use public transportation when satisfying their everyday travel needs (see Figure 8). The fact that women in Germany seem less car dependent than men is most likely related to the lower motorisation rate of females and a lower share of women with driver's license, in particular elderly women (see Figure 3 and Figure 4). Hence, women in Germany use public transportation more intensively than men, and some of them do so simply because they lack an alternative such as motorised individual travel modes and thus are captive riders.

Figure 7 Distribution of daily average number and distance of trips by gender and trip purpose, Germany 2002

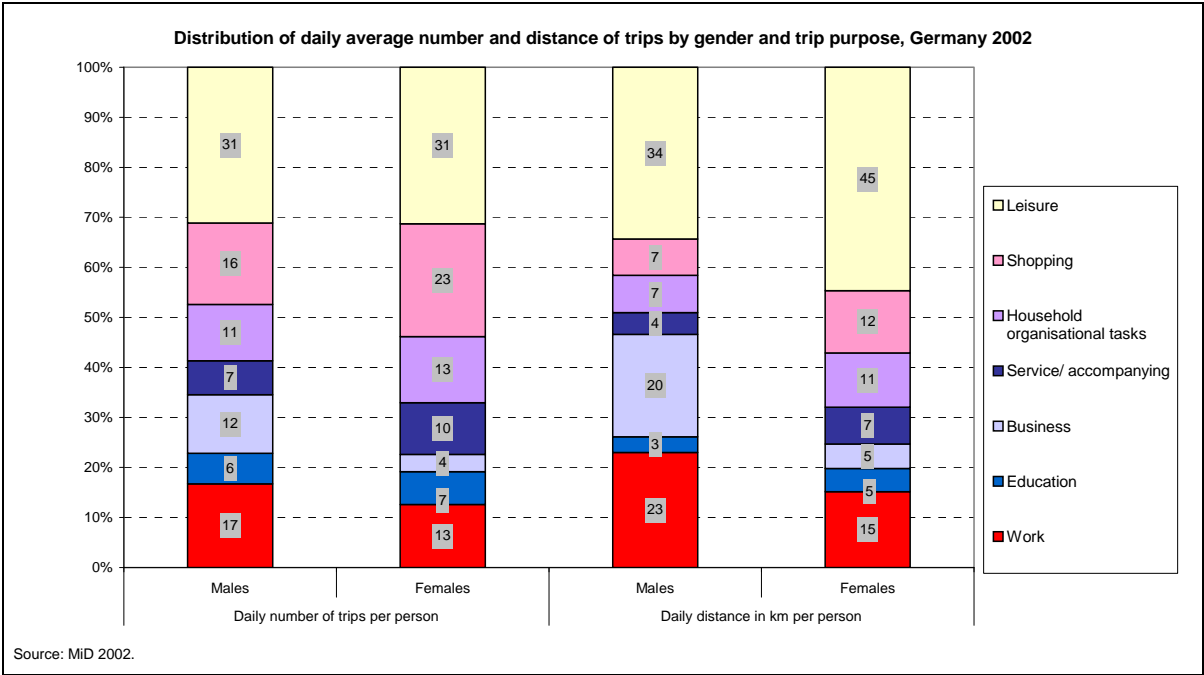
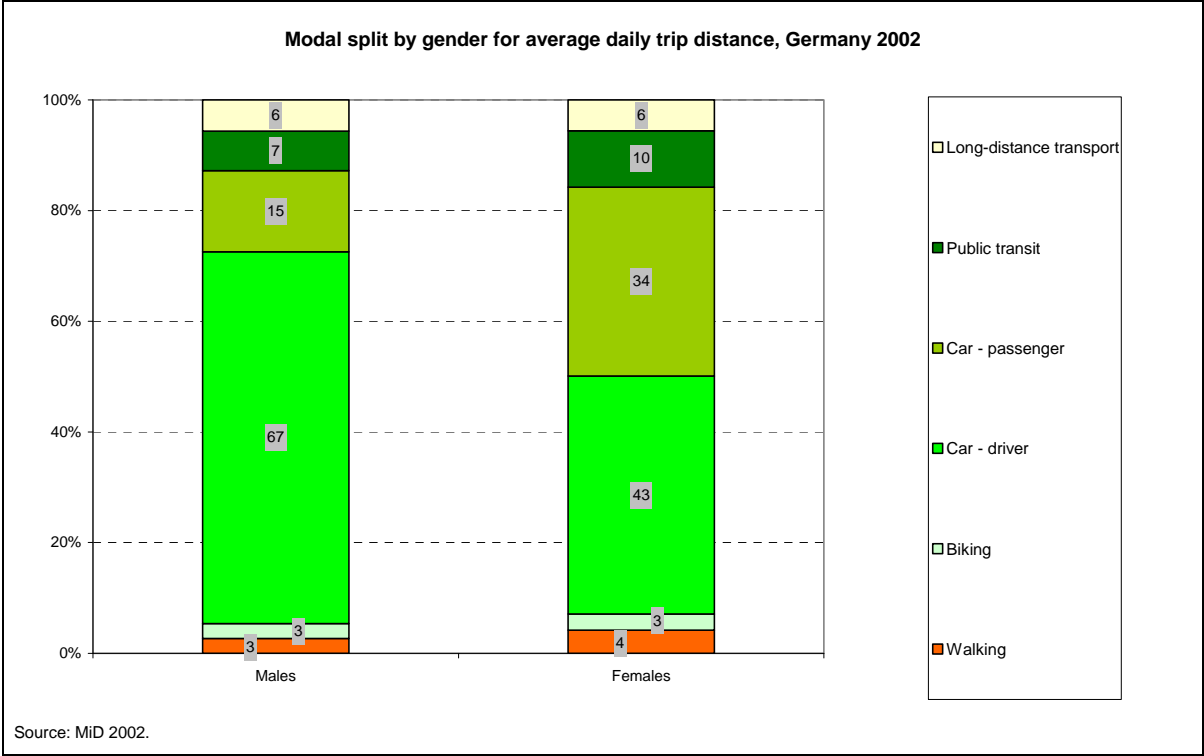


Figure 8 Modal split by gender for average daily trip distance, Germany 2002



Obviously, there are gender specific differences in the demand for everyday travel. Women display significantly different mobility profiles than men. Nevertheless, our analysis

shows that observable differences may appear gender specific on the surface, but in fact they are rather life-cycle and role related. The social role of an individual, his or her integration into society, including labour market participation, daily sharing of family and household tasks, etc., are primary determinants of individual travel demands. Income, residential location, environmental education and the endowment with “travel tools”, such as car, bike or a seasonal commuter ticket for public transportation, are additional factors affecting trip length and frequency and the choice of travel mode.

DEMOGRAPHIC CHANGE AND MOBILITY PROSPECTS FOR GERMANY

Demographic forecasts and results from travel demand analyses are often used as the basis for projections of future developments of individual travel behaviour and aggregate travel demand. We used several data sources to draw an “empirical picture” of the future passenger travel demand in Germany for the year 2025. We analyzed the socio-economic and demographic effects on individual travel demand using the MiD 2002 survey. Here we mainly relied on cohort effects based on gender and age. We aggregated the individual mobility profiles up to the household level, to connect mobility with the monetary household travel budget as given by the German Household Budget and Expenditure Survey. The overall results were then combined with a population growth forecast based on the German Microcensus in order to project the expected mobility demand for different socio-economic and demographic groups within the German population in 2025. In addition, changes in gender and age related travel behaviour as well as cohort effects in the next 20 years were quantitatively predicted. For this we included certain assumptions about population change into the forecasting exercise. Therefore, the projection is based on a thorough analysis of the past as well as on empirically based assumptions concerning future developments.

Longitudinal studies of gender specific travel demand reveal considerable behavioural changes of gender specific individual mobility demand in the past (11, 12, 13). Existing research results show convergence between cohort and gender specific travel demand (9). Women and men display more and more similar travel behaviour; older individuals today have higher mobility demands than they used to have in the past. This results from the evolution of life-cycle patterns and socio-demographic roles of different groups. In Germany it is anticipated that in the future (1) individuals will enter the labour market at an earlier age, (2) that labour force participation will be more discontinuous, flexible, and fluctuating, and (3) that individuals will end their professional careers at a later stage in life. Moreover, full

time workforce participation of women and the involvement of men in child or – not uncommonly – parent care activities are expected to continue to grow in the future.

International cross-sectional comparisons also support those assumptions: In the U.S. women's license-, car-, and job-tenure started to increase decades earlier than in other countries. Our recent analysis of travel trends in Germany and the U.S. quantifies the effects of those path-dependent socio-economic differences on mobility indicators (14) and provides information on the gender specific prospects for mobility in Germany.

For the empirical approach factors having major influence on mobility demand such as the relationship between household income, motorisation, driving licence tenure and individual mobility in the future were analysed. Macroeconomic developments such as economic growth, the intensification of the division of labour and population shrinkage will lead to an increase in employment within groups that were underrepresented in the labour market in the past. This will additionally increase labour force participation rates of females and the elderly. Higher workforce participation will consequently lead to an increase in travel demand of specific socio-demographic groups.

Additionally, the expected increase in fuel prices and public transportation fares as well as the slow growth of disposable real incomes of selected household categories indicate a growing pressure to optimize individual travel choices.

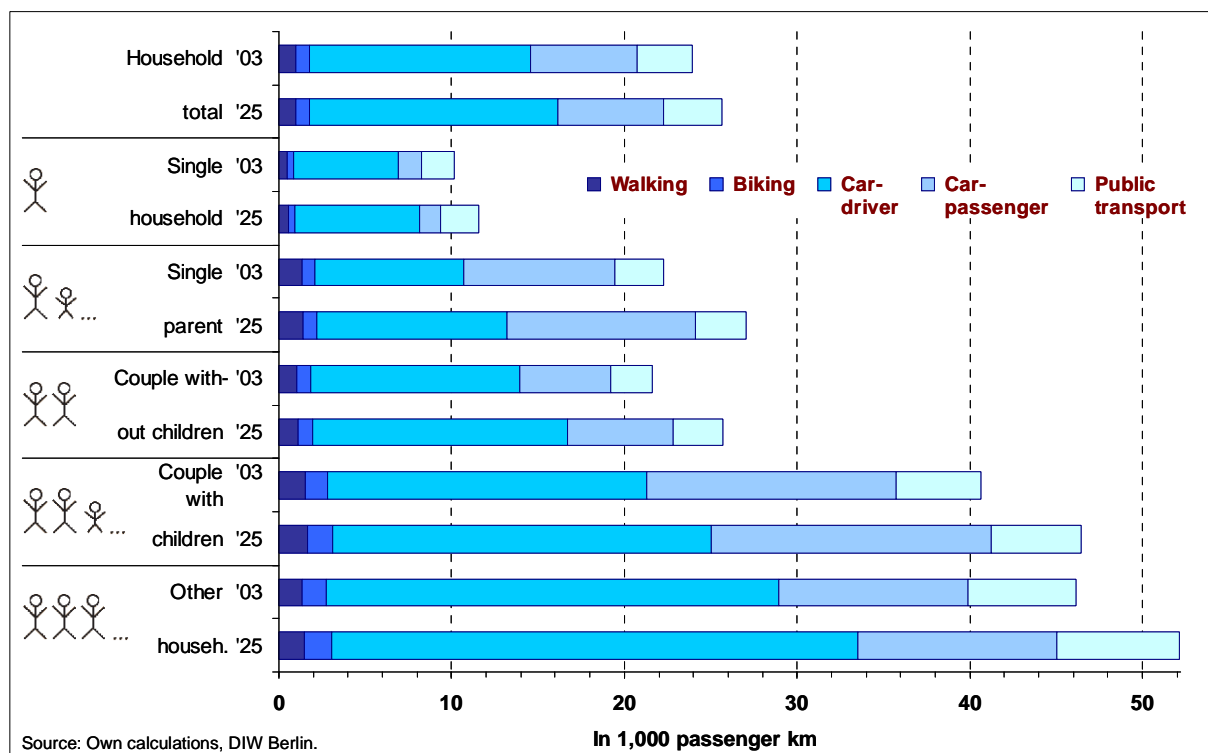
In summary, the following trends form the basis of the mobility forecast:

- The German population will slightly decrease by 1.4 million people. This is based on a positive migration balance of 200,000 people p.a.
- The ageing of the society will continue.
- The overall education level of the population will increase.
- Technological progress will continue to foster the competitiveness of the German economy.
- The growing participation of women in the labour market, the earlier entry of young people into the labour market due to shorter education and training periods as well as the increasing labour market participation of older people will lead to an overall increase in labour participation.
- Real economic growth will be 1.8 % p.a. on average.
- Income distribution will be more unequal, but all income segments will experience increases in real incomes.

- There will be a slight increase in the number of households, as the trend towards smaller households continues.
- Mobility costs will increase by 10 % in motorised individual transport while rates in public transportation will be 40 % higher than today in real terms due to a reduction in public subsidies.

Behind the overall picture we find relatively heterogeneous trends of travel demand at the household level disaggregated by income, household size, number of children, age, and educational level. The strong correlation between income and mobility will continue in the future. As incomes rise the positive trend towards more mobility, especially motorised individual transport, will continue. Figure 9 gives a summary overview of the positive growth trend of aggregate travel distance demand between 2003 and 2025, for different household types and for different modes of transport.

Figure 9 Household type specific distance travelled by mode, Germany 2003 and 2025



Motorisation will continue to grow not only due to the growth in real incomes, but also because future cohorts of the elderly will retain the car longer. In 2025, only one in ten people will live in a household without a car. There will also be a trend towards multi-motorisation of the households. The number of people with a driver's license will continue to increase, in

particular for females. Due to the increase in labour participation, the overall increase in educational levels and the more flexible organisation of work, the number of commuters as well as the distances travelled by commuters will increase. Again, the main driver of this effect will be the increased labour market participation of women.

The positive growth of distances travelled by private households in future decades will not be accompanied by a similar trend in the number of trips made. Therefore the overall frequency of trips undertaken by private households in Germany in 2025 will slightly decrease.

The future trends observed at the aggregate household type level are certainly driven by trends of individual mobility demand and changes in population and household structure. The focus of this paper is put on the future development of travel demand of women in the context of ageing. The predictions for future female travel demand for Germany are illustrated in the appendix. Basically, it is expected that future distances travelled by women will show an increase over all age categories and for different trip purposes. For women at working age, mobility will increase due to an increase in labour force participation compared to 2003. Moreover, in the year 2025 women are assumed to be better educated and will therefore have a higher workforce participation rate. At the same time, they will hold higher qualified professional positions, making them more selective about the choice of employment location. As a result, women will tend to accept higher travel distances for work trips. The fact that men will more intensively participate in household tasks, like childcare etc., will facilitate women's full time employment at remote locations from home. Growing participation of women in the labour market will allow them to generate higher incomes and possibly refine their preferences for leisure activities, entailing additional travel demand.

Older cohorts of females are also expected to be more mobile in the future than they were in 2003. This will reflect the cohort effect that women will habitually retain their mobility behaviour from younger days into their retirement. Besides, "tomorrow's" senior women will have a higher education, hold more driving licences, have more cars at their disposal and be in better health. This will allow them to more individually, and more flexibly satisfy a higher travel demand, which will also partly result from better education and former professional integration. Growing household incomes will further support this trend.

The results for future travel demand trends of specific socio-economic and demographic groups allow first assumptions about transportation problems policy makers may need to tackle.

One question is, in how far transportation or environmental policy objectives should have been included in the forecasting exercise. Growing female demand for flexible mobility implies growing car use. On the other hand, public transportation services have to respond to changing travel demand. Elderly individuals in general will base their mode choices on different criteria than younger individuals. For them aspects such as safety and comfort, convenience and straightforwardness of the handling – both of car technology as well as public transportation fare systems – might have a higher ranking than rapidity and flexibility. These are important questions that build on the present study and call for future research. The trends identified in this research, such as increasing mobility needs of women and the elderly, are a basis for future decisions of policy makers. The travel behaviour outcome of our forecast is not written in stone. It is up to policy makers to decide, how to accommodate increasing individual mobility needs of women and the elderly.

CONCLUDING REMARKS

The results obtained in this study can be used to identify potential changes in travel demand over the next two decades. Moreover, we identified additional research needs, such as the question of implications for the transportation supply side and transportation policy overall.

The ageing of society will result in structural changes in mobility demand. Older people will lead more active lifestyles due to improvements in health, higher incomes and higher educational levels. This will result in growing mobility demand. On the other hand declining student numbers will lead to an overall decrease in the demand for public transportation. But rising labour force participation together with leisure and shopping activities of the elderly have a positive effect on the demand for public transportation services. In total, under the assumptions made here public transportation ridership will decline by roughly 5 %, but distances travelled will increase by nearly 15 %. The increase in total travel by car in terms of kilometres is about the same, but there will also be a higher number of trips by car across most travel purposes. Regardless of the fact that the number of households with children decreases, children will continue to be a driving factor for mobility in these households. In the end, despite the population decline, passenger transport mileage will increase by 13 % in 2025. Passenger transport volume will basically remain the same with a growth of 1 % over the next 20 years. Hence transportation distances will continue to increase. The modal share will remain more or less the same, with only a slight increase in the share of motorised individual transport.

APPENDIX

Figure 10 Gender specific annual distance travelled per person for different age groups and by trip purpose, Germany 2003

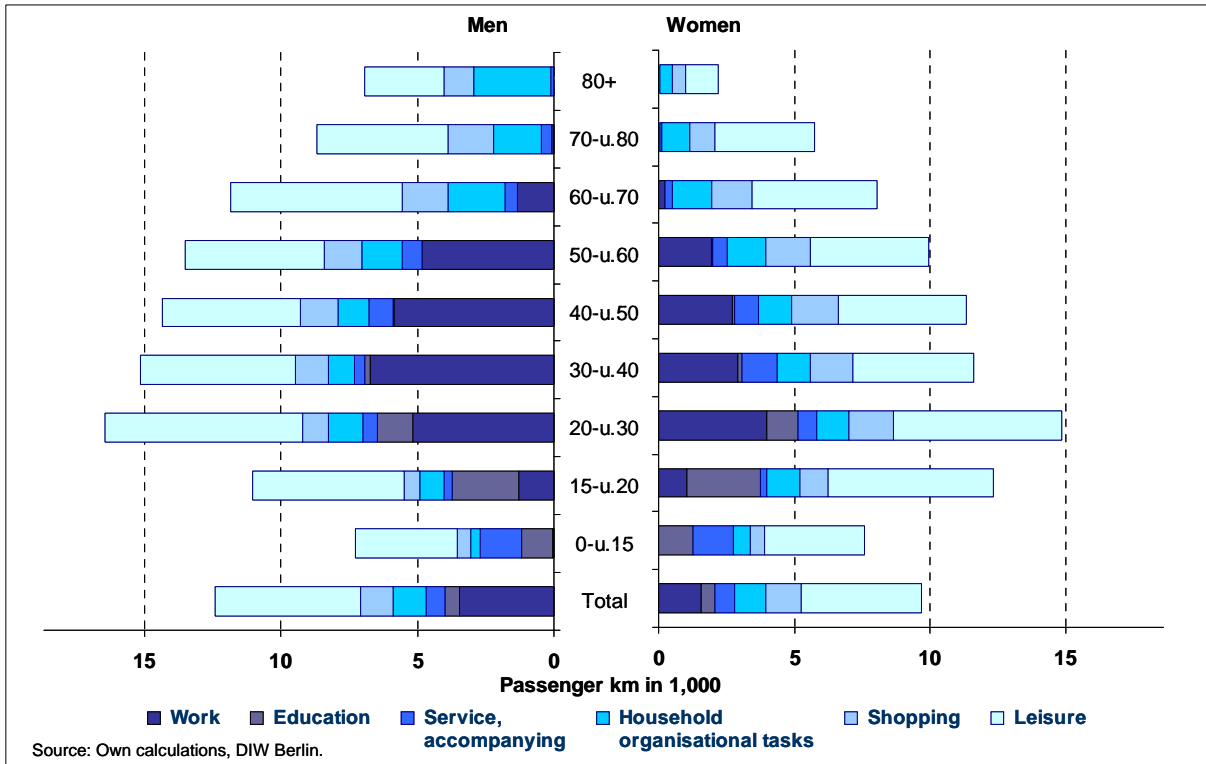


Figure 11 Gender specific annual distance travelled per person for different age groups and by trip purpose, Germany 2025

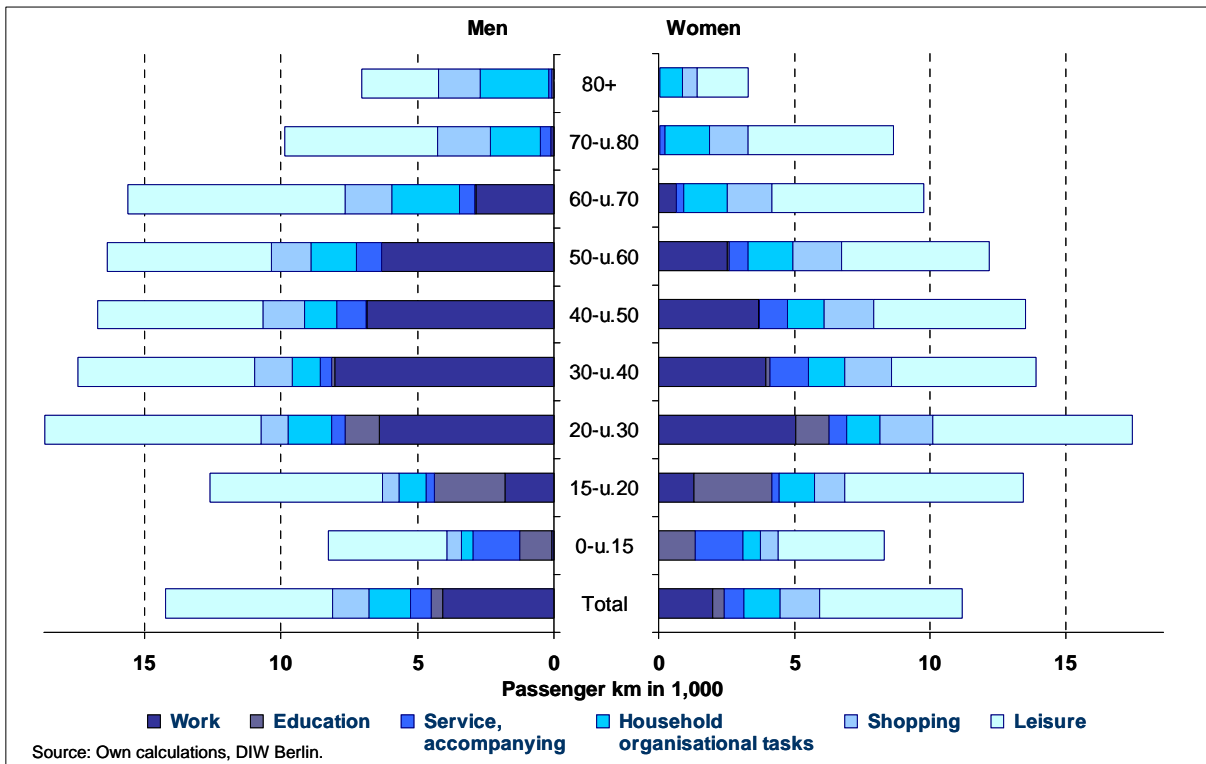


Figure 12 Gender specific annual number of trips made per person for different age groups and by trip purpose, Germany 2003

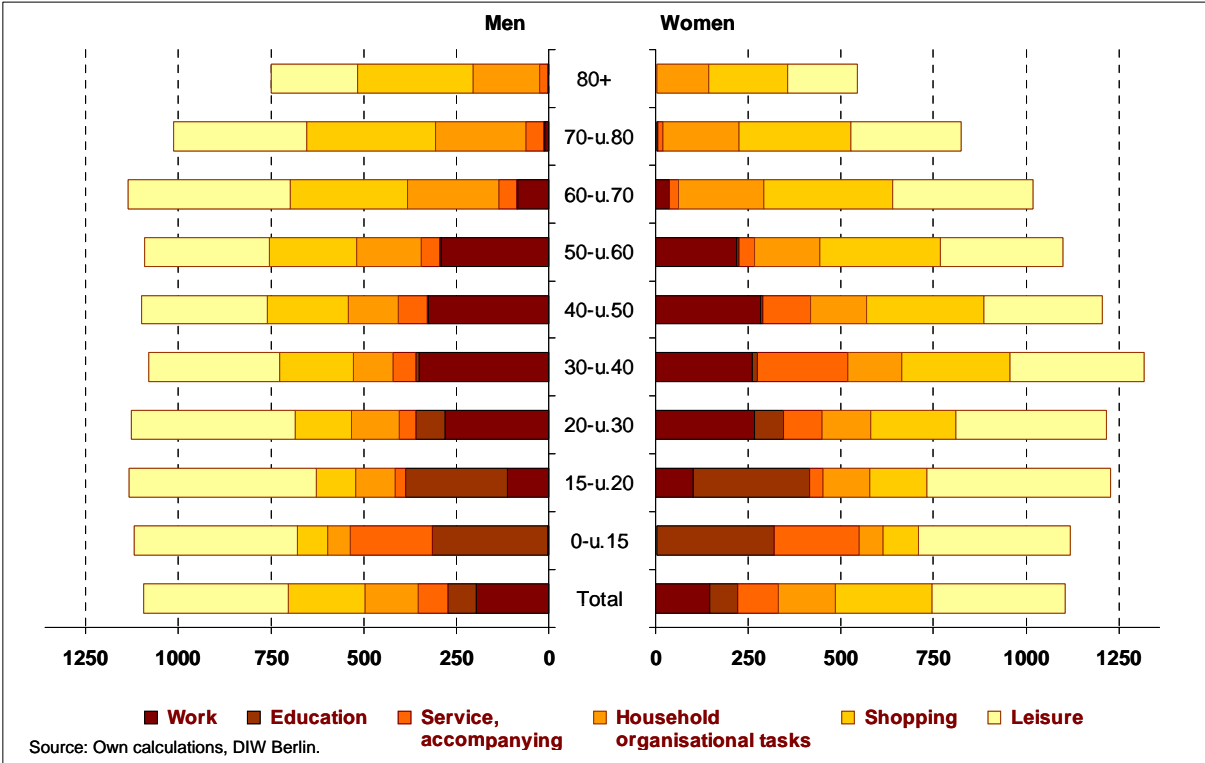


Figure 13 Gender specific annual number of trips made per person for different age groups and by trip purpose, Germany 2025

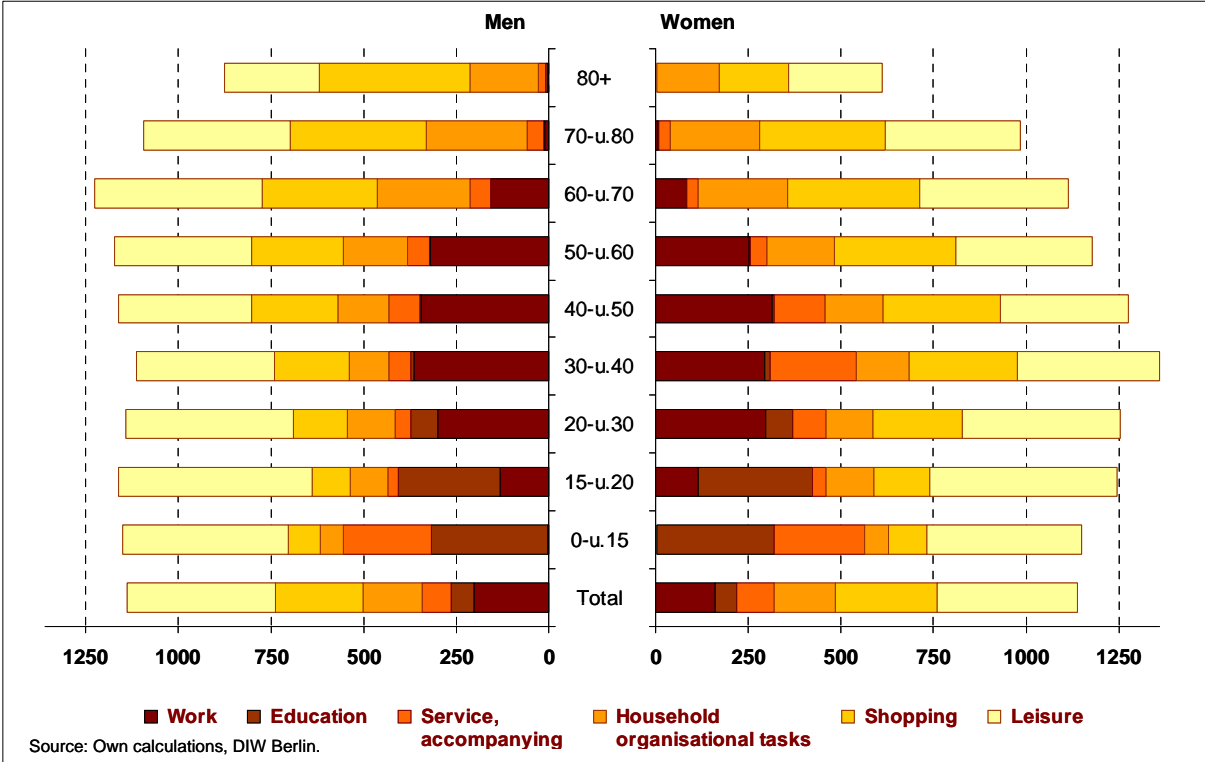


Figure 14 Gender specific annual number of trips made per person for different age groups and by mode, Germany 2003

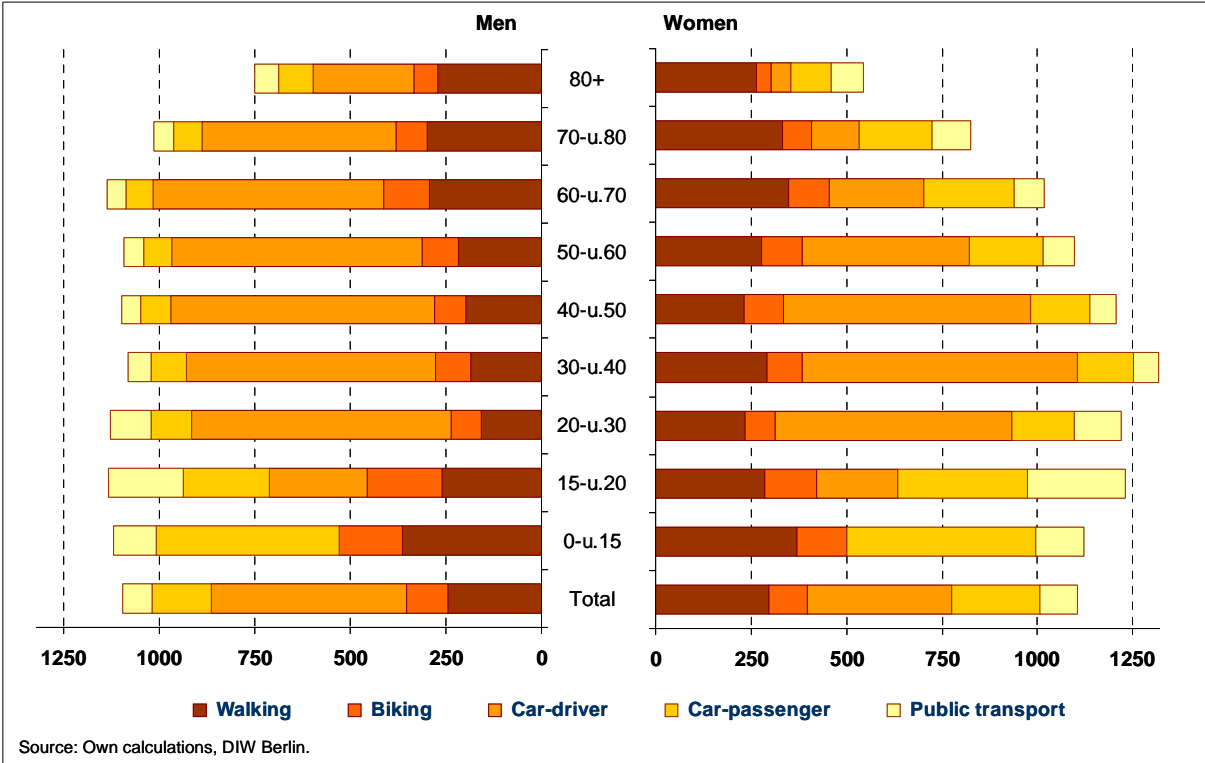
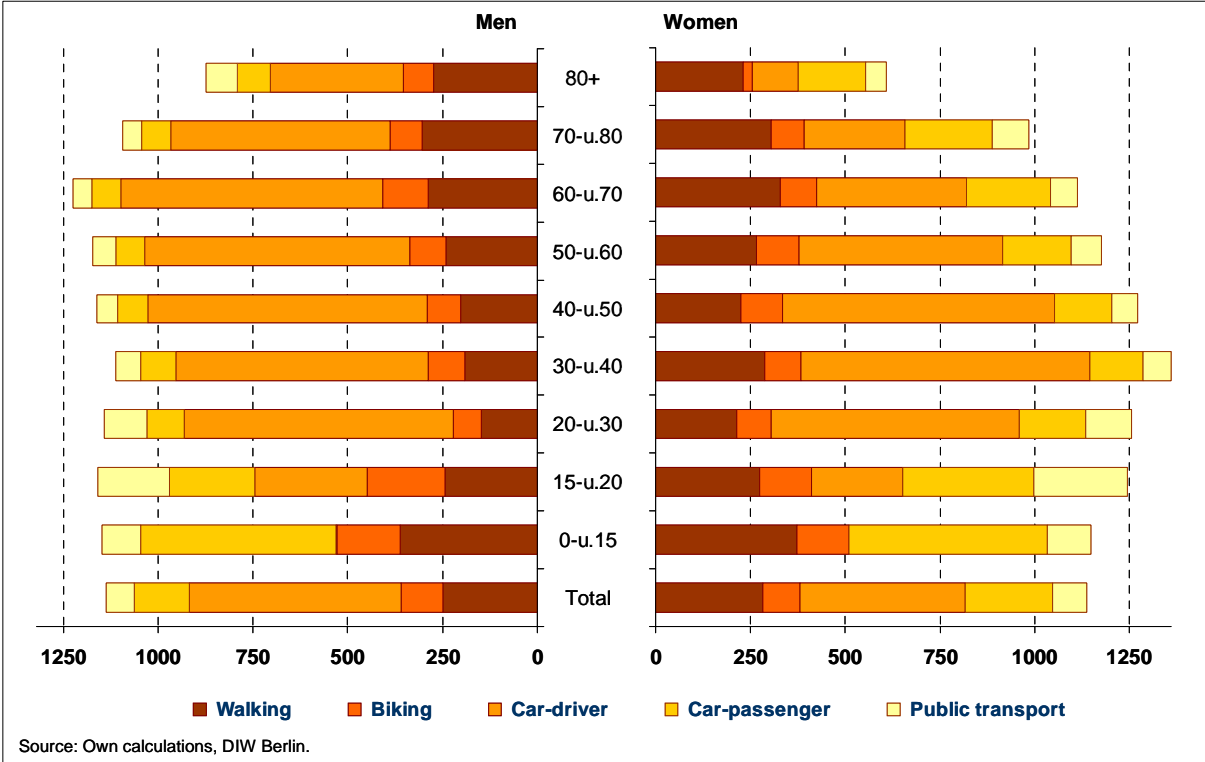


Figure 15 Gender specific annual number of trips made per person for different age groups and by mode, Germany 2025



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