Car ownership and usage trends in Germany – Response to the Commission on Travel Demand's Call for Evidence: Understanding Travel Demand

By Tobias Kuhnimhof, Institute of Transport Research at the German Aerospace Center (DLR)

May 2017

Background: Germany as a car country

With regard to most travel behavior indicators, Germany falls in line with other European countries. Figure 1 shows the modal split in various European countries between 2006 and 2011.

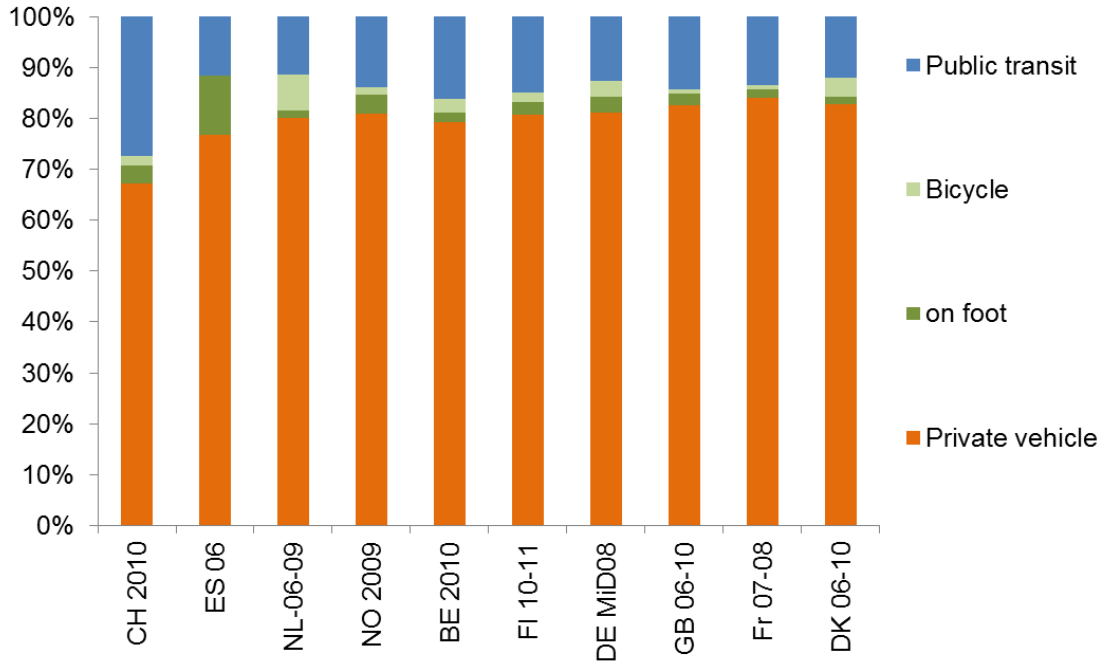

Figure 1: proportion of passenger distance travelled by mode (km based modal split) in European countries (Armoogum, 2014) [trips over 500 km excluded]

Nevertheless, Germany is a car country – not so much as regards travel behavior, but because vehicle production plays an overwhelmingly important role for the German economy. Per annum Germany produces almost 6 million cars, i.e. about 0.07 cars per capita. Relative to the population this is three times as much as the United Kingdom and more than any other large economy worldwide (only the Czech Republic and Slovakia produce more on a per capita basis). One out of fifteen vehicles sold globally are produced in Germany while one out of twenty vehicles worldwide is registered in Germany (BTS, 2017; Kraftfahrtbundesamt, 2017).

These figures exemplify that the car plays a very important role for the German economy and society. Hence, the automobile industry is a very relevant background factor for transport policy and travel demand development in Germany.

Cars on the road in Germany

As of January 1 2017, there were 63 million motor vehicles registered in Germany. Among these were almost 46 million cars. About 90% of these cars are private registrations, while 5% are commercial registration. About half of the commercial registrations are in use by private households, e.g. as company cars. Hence, overall there are about 45 million cars in use by private households in Germany.

However, in recent years there has also been substantial growth of car sharing in Germany (Figure 2). By now, there are 17,000 car sharing vehicles on the road in Germany and almost 1.8 million registered car sharing users. This development has fueled a popular debate if Germany sees a trend towards “sharing instead of owning” or “using instead of owning”.

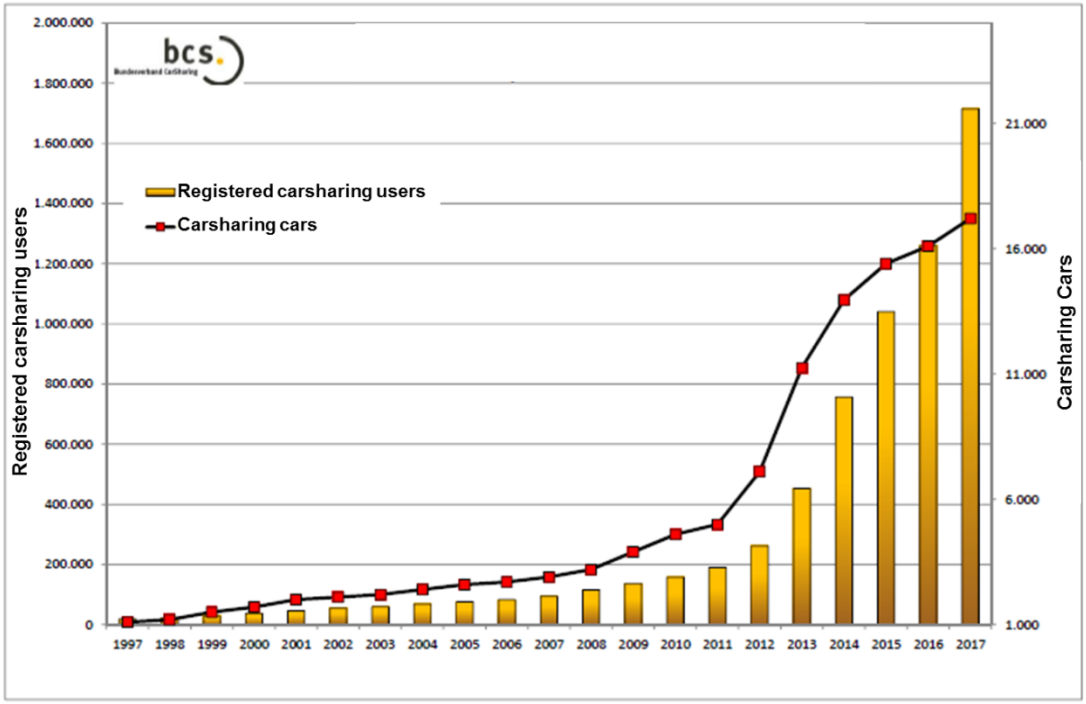

Figure 2: Evolution of car sharing in Germany (bcs, 2017)

However, looking at car ownership trends from a wider perspective, there seems to be little evidence that there is a general trend towards sharing: In the last two decades, the car fleet in use by private households in Germany grew continuously by about half a million every year while the total population almost stagnated. In 1993, the year when the eastern and western German motor vehicle registers were combined, there were 400 cars per 1,000 population in Germany. By 2015 this car ownership rate had grown to 520 cars per 1,000 population (Kraftfahrtbundesamt, 2017).

Hence, the growth of car sharing in the last two decades appears to be completely dwarfed by the continued growth of private car ownership as regards absolute numbers of vehicles. Also the numbers of registered car sharing users must be interpreted with care. First, it is unclear how many double registrations are included; second, it is unclear how many registered persons never really make use of car sharing.

Car ownership trends by age class

This section shows car ownership trends by age class in order to identify the trends which brought 10 million more cars on the German roads from 1993 to 2015. Differentiating by age class and year, Figure 3 shows the proportion of population that

a) lives in a household with car

b) disposes of an own car, i.e. lives in a household with at least as many cars as adults.

As regards a) the proportion of population that lives in a household with car, there has been a diverging trend for different age classes: While an increasing share of young adults lives in a household without car, the proportion of seniors with car has risen continuously and substantially. The cohort processes which cause the increased car ownership of seniors are obvious and well known. On the contrary, the decrease of car ownership among young adults represented an unexpected break in trend and spurred much research into the reasons for this development from 2010 onward. On the one hand, psychological factors were never empirically proven to be influential; nevertheless they often dominated the media coverage of this phenomenon. On the other hand, changes in the socio-economic situation of young adults proved to explain large parts of this decrease in car ownership. (ifmo, 2011) were able to show that about two-thirds of the decline of car ownership for young adults from 1998-2008 were caused by socio-economic factors. Interestingly, changes in the transport system were hardly discussed in the popular debate. Among them were measures such as substantial discounts for using public transport which were introduced for students in most of Germany from 2000 onwards. Unlike in other countries, driver licensing rates among young adults also never decreased in Germany[1].

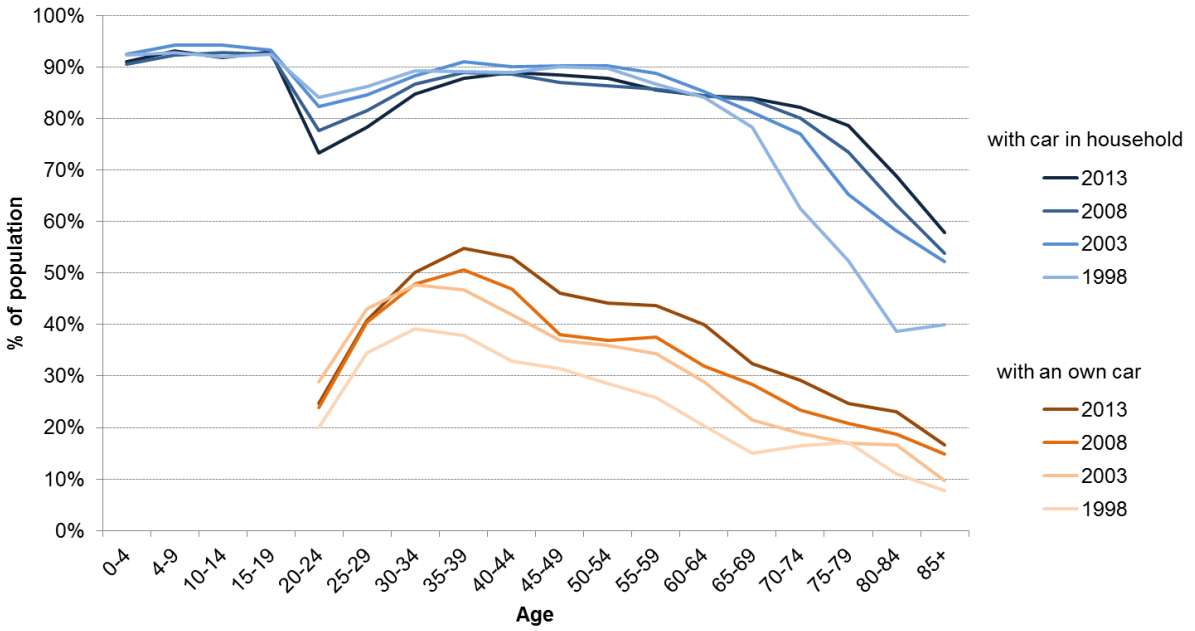

Figure 3: German population by age and car availability 1998 – 2013; analyses of the Germany Income and Expenditure Surveys (Destatis, 2017)

[1] From 2015 to 2016 there was a slight decrease among young men. This was not caused by a decrease in the number of licenses but by an increase by the number of young men in the respective age class. It is likely that this increase was caused by the strong immigration which Germany experienced regarding young men.

As regards the proportion of adults with an own vehicle, the trend across age groups is much more uniform: for all age groups, expect those in their early 20s, there was a substantial increase of drivers with an own vehicle. This trend even existed for those around the age of 30.

Taking these trends together, we can establish that the surge in private vehicle registrations was caused by two important developments: a) the increase of car availability of seniors and b) the trend towards an own vehicle for each driver among (almost) all age classes.

Shifting roles of cars within households

Along with the car ownership trends by age class, the role and use of cars changed in the last two decades. First, the proportion of cars belonging to senior household increased while the proportion of cars belonging to young households and family households decreased. Second, fewer and fewer cars are shared by different household members: while in 1998 38% of cars were shared by different adults within the same household, in 2013 this figure had shrunk to 25%. This shift also affects car use. Cars in senior households have lower mileages than cars in other households. In addition, cars shared among household member have other usage patterns than cars used only by a single driver.

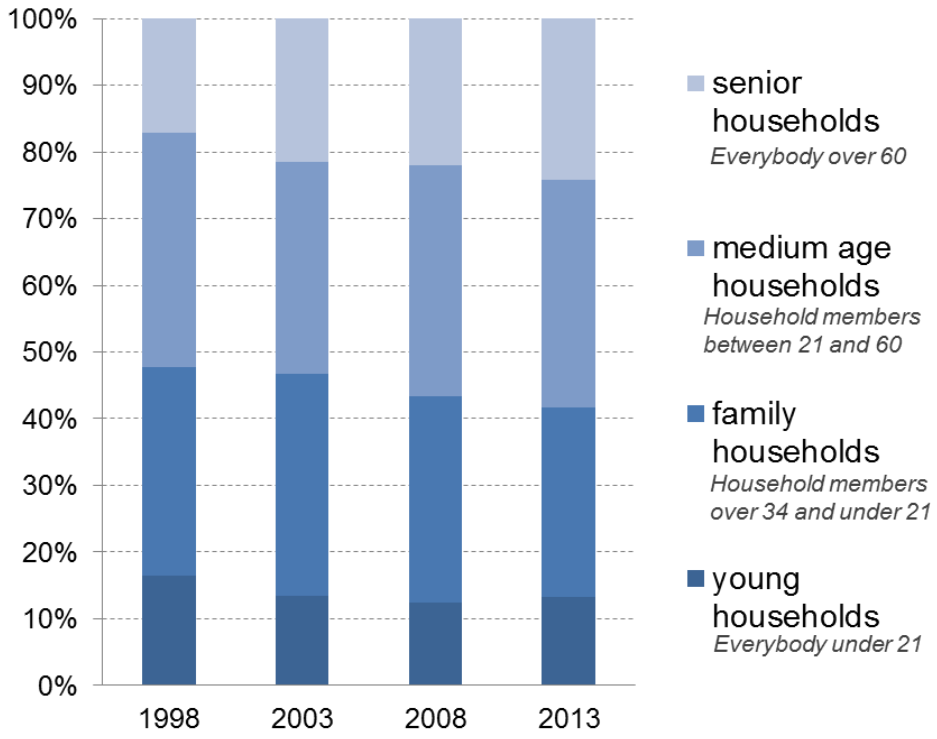

Figure 4: Proportion of cars by type of household

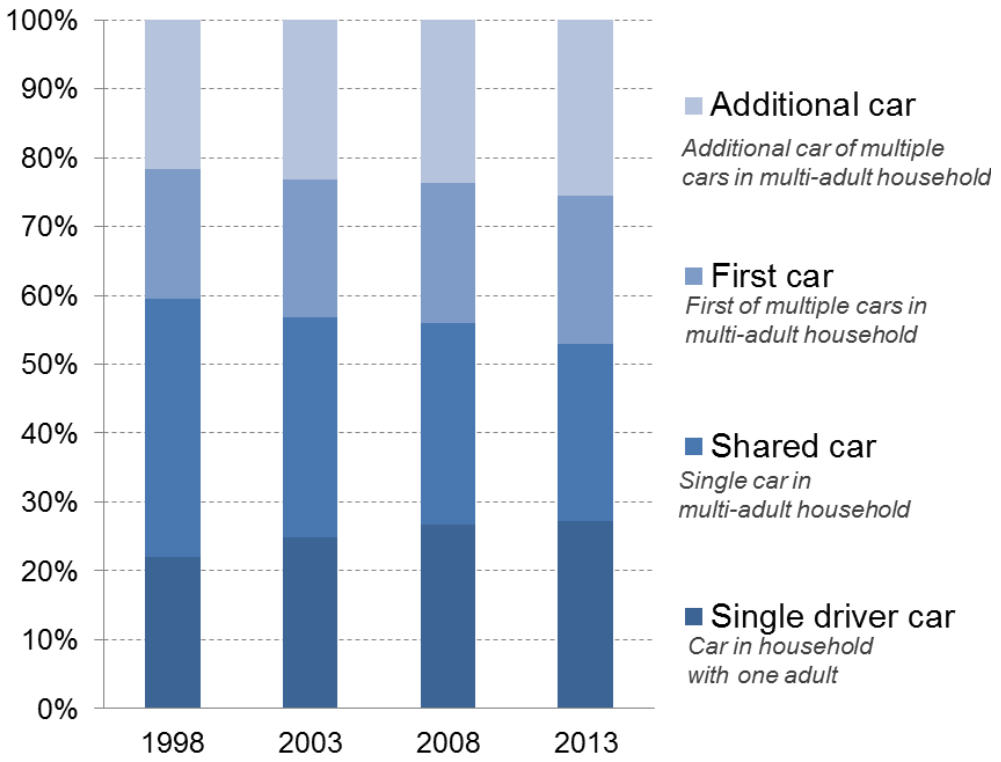

Figure 5: Proportion of cars by role of vehicle within households

Mode use trends

Except a slight increase in the public transport mode share there was hardly any shift in overall mode choice in Germany in the last two decades (Figure 6). Given the substantial increase in car ownership, particularly among seniors, an increase of car use would have been more intuitive. This, however, did not occur. The reason for this can be found in the mode choice of drivers (individuals with car availability, i.e. with driver's license and car in the household) by age (Figure 7): While the mode share of middle aged and senior drivers hardly changed in the last two decade, young drivers use their cars less today than 20 years ago. This indicates increased multimodality of young drivers. This increased multimodality of young drivers in conjunction with a decreasing overall share of drivers among young adults compensated for the increase in car availability among seniors. As a result, the overall modal split in Germany hardly changed.

However, also the stability of mode choice for medium aged and senior drivers is surprising: We saw above that an increasing proportion of adults in this group have an own vehicle. Despite this trend, car use did not increase.

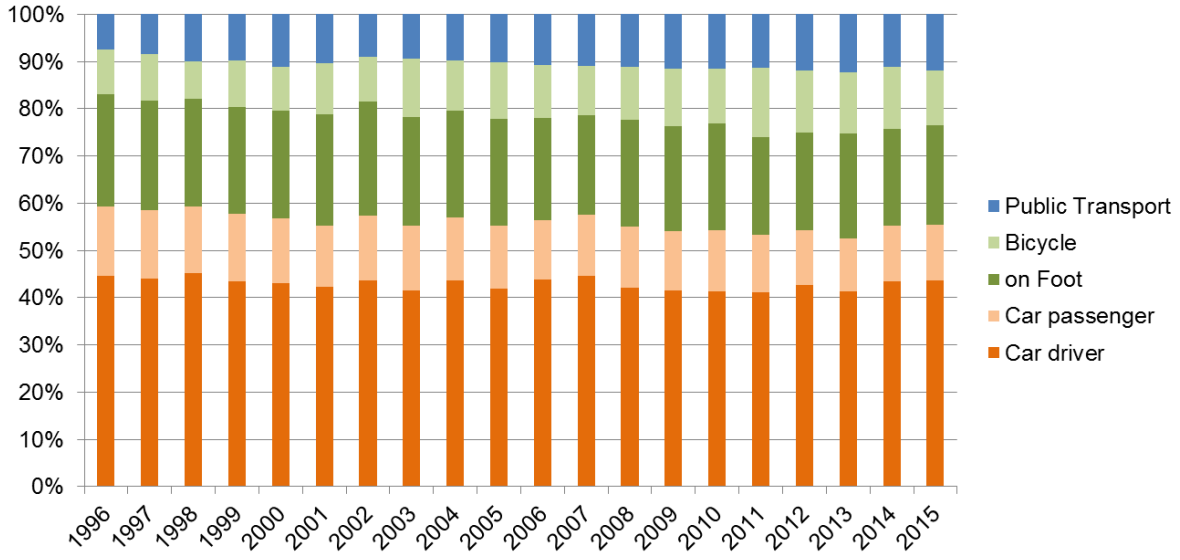

Figure 6: Total trip based mode share in Germany 1996 – 2015 [author's analyses of the German Mobility Panel (BMVI, 2016)]

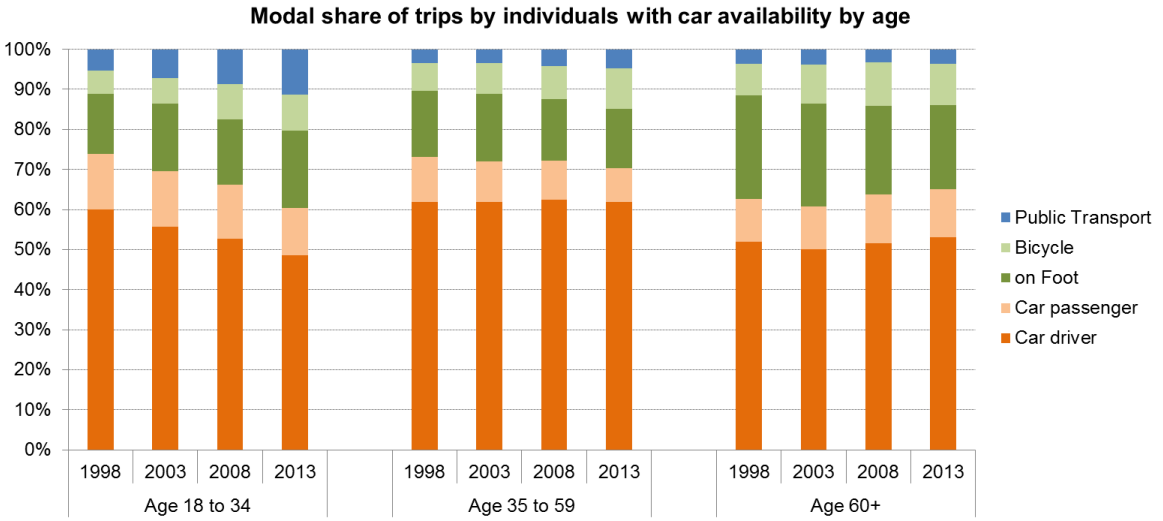

Figure 7: Development of trip based mode share for persons with car availability by age since 1990 (pooled data: 1996 to 2000 = 1998, 2001 to 2005 = 2003, 2006 to 2010 = 2008, 2011 to 2015 = 2013) [author's analyses of the German Mobility Panel (BMVI, 2016)]

Summary of Trends

Figure 8 summarizes the key trends as regards car ownership and use for different age groups in Germany as described above. Figure 9 shows the effect that these diverse trends have had on the development of the car stock and VKT in Germany. The growth of the total car stock was driven by increased car ownership of seniors and additional cars in households of all ages. This, however, has led to a shift in the role of cars within households and a shift is usage patterns. Hence, total VKT did not increase at the same rate as the number of cars on register; the average mileage per car decreased.

	Children & Teenagers	Young Adults	Medium Age Adults	Seniors
Licensing	-	→	→	↗
Car in household	→	↘	→	↗
Own car	-	↗	↗	↗
Car use	→	↘	→	↗

Figure 8: Summary of automobility trends in Germany by age class

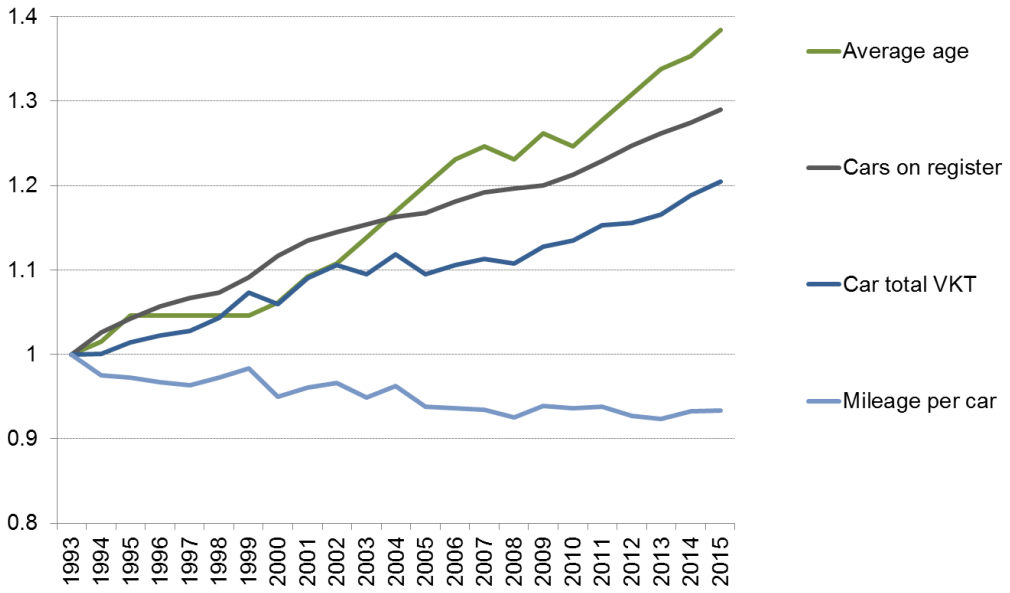

Figure 9: Key car stock and VKT trends in Germany since the early 1990s

Conclusions and consequences for travel demand forecasting

Quite contrary to the popular debate, Germany experiences two major trends as regards automobility:

1) There is a trend towards an own car for every driver; at least car sharing within households is decreasing, not growing.

2) There is a trend towards using privately owned cars less; i.e. there is a trend toward owning instead of using.

Trend 2) appears to apply to all ages and is additionally driven by the demographic shift towards older age classes. Trend 1) is more pronounced among medium age and senior adults. It is possible – or even likely given the growth of commercial car sharing - that there are niches, specifically among young adults, to which a trend towards sharing instead of owning applies. It is also likely that there are substantial differences in these trends by type of area, in particular in rural vs. urban areas. These differences need to be explored further.

However, looking at the aggregate development, the trends above apply and overshadow any counter-balancing trend in niches. Interestingly, the niche trends – often focusing on major cities - have dominated research and the popular debate in the recent years. The developments in other groups of the population and in small and medium sized cities, where the overwhelming majority of Germans live, appeared to be almost forgotten. At least in Germany, this had led to the general impression that car ownership is actually decreasing, quite contrary to what is really happening.

Against the background of the observations presented in this paper, research (and the public debate) aiming at a better understanding of future trends for travel and its consequences should be directed more to the following topics:

Growth of car ownership among seniors: This development follows such an intuitive cohort process that it appeared to be well understood and thus did not receive much research attention in recent years. Nevertheless, this development will be key for the overall car ownership development and eventually car use of the future. In the recent years this development was still dominated by a new generation of seniors with cars - mostly sharing one car within the household - replacing a previous generation without car. In the coming years, the question will be *how many* cars aging households will hold on to. Will seniors as they age maintain the habit of an own car for each driver which is currently becoming mainstream for medium age households?

Car use in multicar households: Multicar households are more and more common. It appears, however, that car use does not increase linearly with the number of cars in the household. Hence, mileage per vehicle decreases. These patterns should be well understood in order not to overestimate the VKT impact of the increase in car ownership. Moreover, the trend to multiple cars per household also holds opportunities, at least in the context of bringing alternative drive trains onto the road. EVs can enter the market more easily if there is no requirement to serve universal purposes and if there is a fallback-vehicle for long distances. Travel demand models are increasingly used in the context of emission modelling (local emissions as well as CO2 emissions) and long term emission forecasting. In this context, it will be increasingly important to model how many and which kind of vehicles household have at their disposal and how the vehicles are allocated to different

driving tasks. Thus, understanding multicar household decisions is an important step towards designing measures for efficient use of cars.

Bibliography

Armoogum, J. (2014). Survey Harmonisation with New Technologies Improvement (SHANTI) - Final Report. Marne la Vallée.

bcs. (2017). CarSharing-Jahresbilanz 2016. Retrieved 3.5., 2017, from https://carsharing.de/presse/pressemitteilungen/carsharing-jahresbilanz-2016-mehr-17-millionen-carsaring-nutzer

BMVI. (2016). *Deutsches Mobilitätspanel (MOP) 1995-2015*. BMVI (Bundesministerium für Verkehr und digitale Infrastruktur). Bonn; Berlin.

BTS. (2017). National Transportation Statistics. Retrieved 3.5., 2017, from http://www.rita.dot.gov/bts/publications/nationaltransportationstatistics/

Destatis. (2017). Einkommens- und Verbrauchsstichprobe (EVS). Retrieved 25.4.2017, 2017, from https://www.destatis.de/DE/ZahlenFakten/GesellschaftStaat/EinkommenKonsumLebensbedingungen/Methoden/Einkommens_Verbrauchsstichprobe.html

ifmo. (2011). *Mobilität junger Menschen im Wandel - multimodaler und weiblicher*. ifmo (Institut für Mobilitätsforschung). München.

Kraftfahrtbundesamt. (2017). Kraftfahrzeugstatistik. Retrieved 25.4., 2017, from http://www.kba.de/DE/Statistik/Kraftfahrer/Fahrerlaubnisse/Fahrerlaubnisbestand/fahrerlaubnisbestand_node.html