International Transport Forum

New Drivers in Mobility: What Moves the Dutch in 2012 and Beyond?

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1. INTRODUCTION

In early 2011, the Netherlands Institute for Transport Policy Analysis performed a mobility analysis, focussing on recent trends. This analysis showed that, following the remarkable growth in the 1980s and 1990s, the total national mobility of people in the Netherlands has not increased since 2005. This particularly appears to apply to car use. Except for the economic crisis around 2008/2009, the reasons for this development remained unclear at the time. Based on further analyses of the developments in mobility over the last 10 years and some findings from other countries, the following four hypotheses related to the apparent stabilisation of car use were formulated and investigated in further research:

- The mobility system starts to show signs of "saturation", for instance saturation of car ownership levels, reduced need for physical mobility to perform activities, structural frictions in housing and labour markets, et cetera.
- The mobility of young adults is decreasing as a result of changes in socio-economic, spatial, and cultural factors.
- The broad implementation of (mobile) Internet in society (e-working, e-shopping, e-commerce, use of social networks) is leading to a reduction in physical (car) mobility.
- National mobility is being 'substituted' by international mobility.

In the first part of this contribution, a more detailed description of mobility developments between 2000 and 2011 is presented, with emphasis on specific trends for various user categories (by travel mode, by travel purpose, by age group, by gender).
In the second part, the findings of recent research related to the four hypotheses mentioned above are presented. As some of these findings differ somewhat from research results in other Western European countries, attention is given to these differences and their possible explanation.

The last part of the contribution focuses on possible implications of the findings for transport policymaking.

2. DEVELOPMENTS IN DUTCH MOBILITY OVER RECENT YEARS

The total number of kilometres travelled in the Netherlands by Dutch inhabitants of 12 years and older has increased over the last 25 years by about 40%. This strong increase took place primarily in the 1980s and 1990s. Between 2000 and 2011 the number of kilometres travelled showed a rather more modest growth of around 4%. Since 2005 there even appears to be a stabilisation in total mobility. Over these same last 25 years there has been very little change in the number of trips each person makes and the time persons spend travelling. The Dutch keep making about 3 trips a day on average, which takes them around 1 hour a day. Between 2000 and 2011, the population of the Netherlands increased by 4.7%. Figure 1 shows the development in passenger kilometres in the various modes from 1985. For bus/tram/metro, reliable data are available only from 1993 onward.

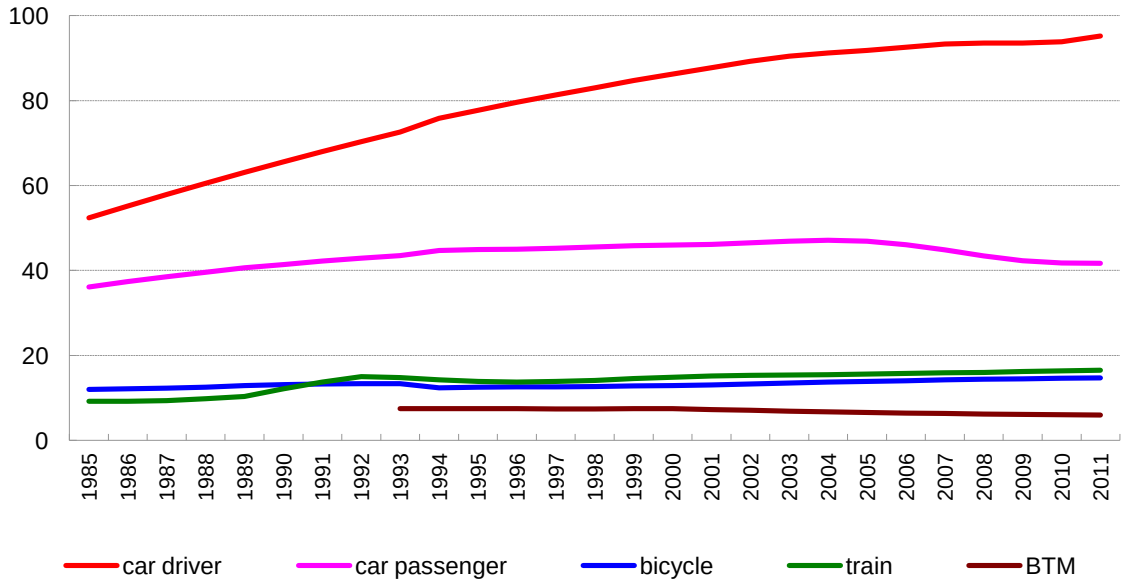

Figure 1. **Traveller kilometres by mode 1985-2011 in billion kilometres**
Source: OVG/MON/OViN

From Figure 1, the important role of the car in the total mobility system becomes apparent. Around half of all trips in the Netherlands are made by car, 25% by bicycle, 20% walking, and 5% by public transport. Since 2000, this distribution has hardly changed. As was already visible in Figure 1, the distribution in terms of passenger kilometres is quite different. Around 75% of all kilometres are made by car, 13% by

public transport, and 8% by bicycle. Cycling is done mainly over short distances, while the train primarily serves the long distance market.

Most of the trips people make are over relatively short distances. 40% of all Dutch trips are less than 2.5 kilometres, and 70% are less than 7.5 kilometres. Around a quarter of all trips are longer than 10 kilometres, but this category represents around 80% of all kilometres. On distances up to 7.5 kilometres, cars and bicycles compete. In this market segment, both have a share of about 35%. Public transport plays a minor role for short distance travel, but has a strong market share on longer distances. Given the position of the bicycle in the Dutch mobility system, environmentally friendly modes have a high share in the Netherlands when compared to other countries (see Figure 2).

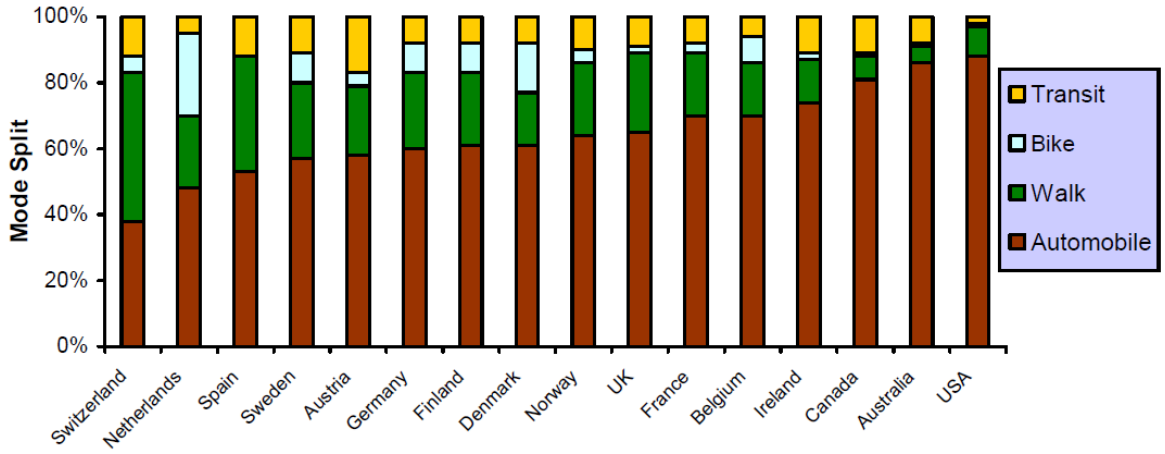

Figure 2. **Modal split (based on trips) personal travel in several countries**
Source: Bassett, et al., 2008

People travel for various reasons. Daily work, doing your shopping, visiting friends and relations or a leisure centre, are all activities that require mobility. Looking at the distribution by trip purpose of the total number of kilometres travelled in the Netherlands, two things are remarkable. The first is that roughly half of all kilometres are associated with leisure travel. The second is that growth over the last decade has mainly been in work-related mobility. From 2000, this has increased by around 18%. In the past 20 years, work related mobility has even doubled in size (see Figure 3).

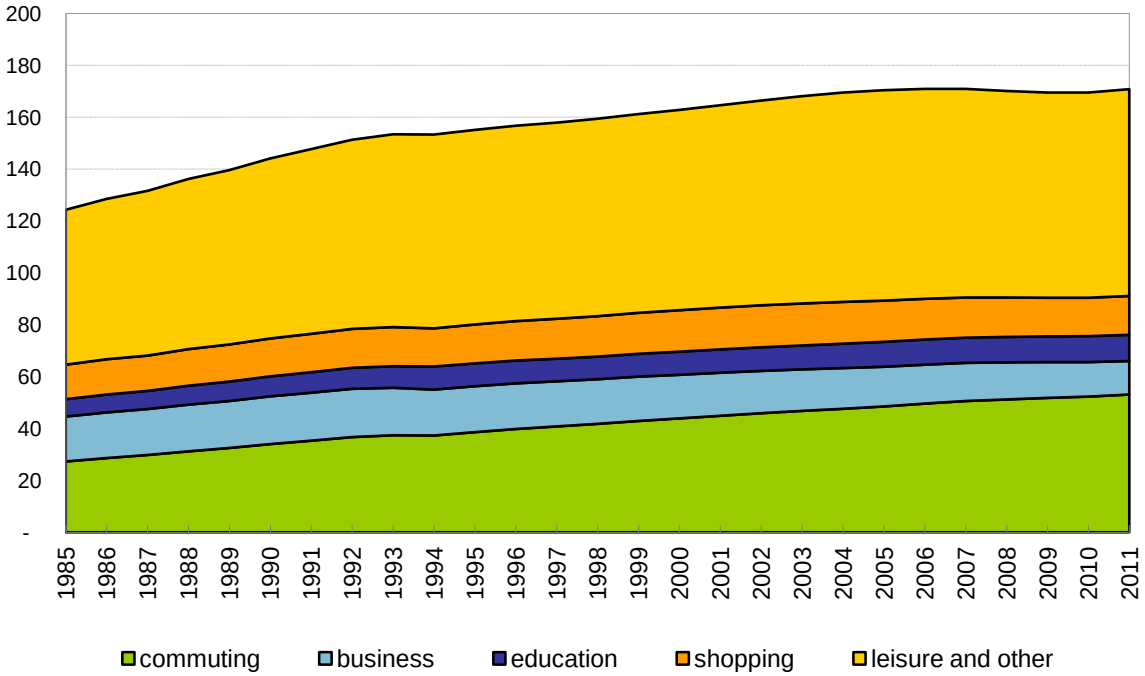

Figure 3. **Person kilometres by trip purpose 1985-2011 (persons 12 year and older)**
Source: KiM, based on OVG/MON/OViN.

The increase in passenger kilometres associated with the daily commute is mainly a result of an increase in the number of Dutch people working and an increase in the average commuting distance. In the past 25 years, this average distance (one-way) increased from nearly 12 kilometres to around 18 kilometres. Note that the average commuting *distance* varies considerably among regions, with shorter distances in the densely populated Randstad area. In contrast, travel *times* are somewhat longer than average in the Randstad area, because of more congestion in this area. The opposite can be seen in the more rural areas in the Eastern part of the country, where relatively short travel times are associated with, on average, longer commuting distances.

3. A CLOSER LOOK AT CAR MOBILITY IN RECENT YEARS

3.1 The stabilisation

Figure 1 showed that growth in mobility is predominantly a result of increased car use (both drivers and passengers). In more recent years (2000-2011), the number of kilometres travelled by car increased by only 3.5% (see Figure 4).

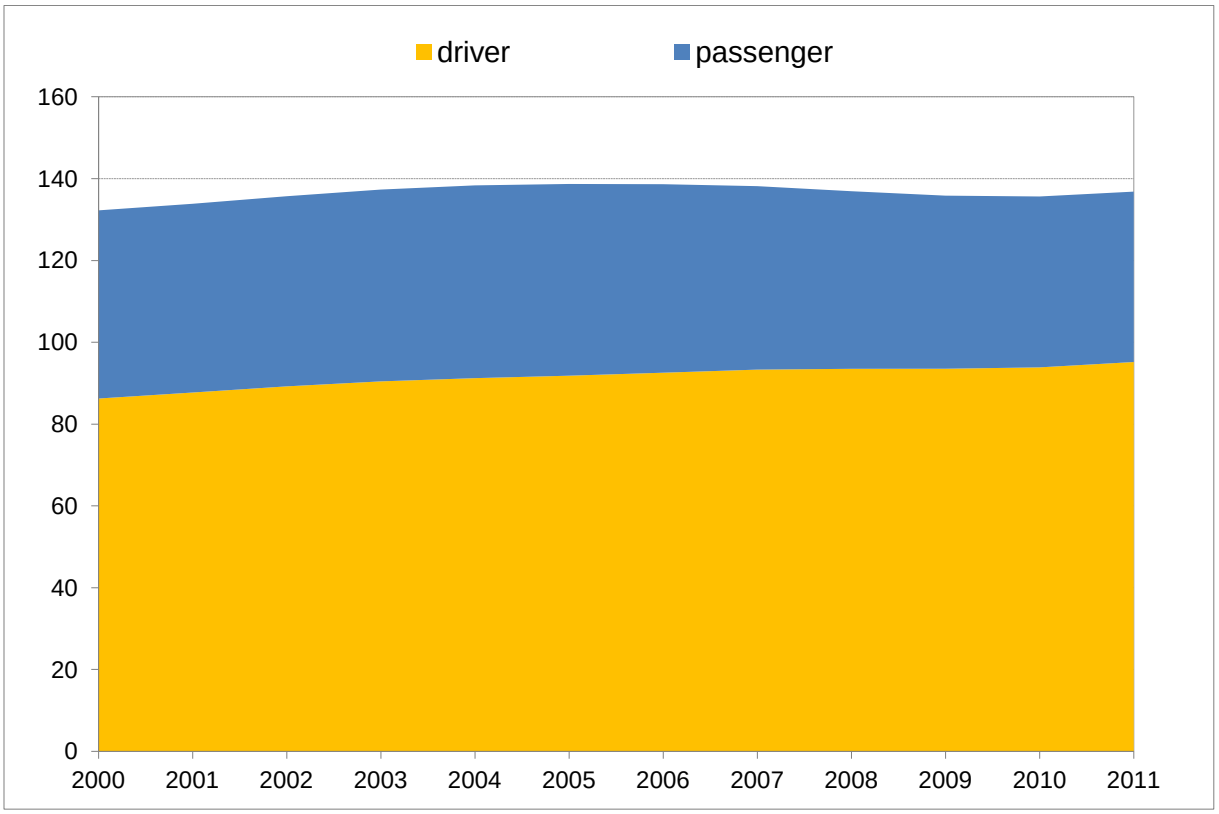

Figure 4. **Car use by persons of 12 years and older, 2000-2011, in billion km**
Source: KiM based on OVG/MON/OViN

Figure 4 illustrates that car use by drivers and by passengers show rather different developments. The number of kilometres the Dutch ride on the passenger seats of a car (around one third of the current car mobility) decreased by 9%, while the number of kilometres travelled by car drivers increased by 10% over the same period. Clearly, car occupancy has fallen significantly during the last decade.

Around 2005, car use (passengers + drivers) in the Netherlands became stabilised. This is the net effect of the actual decrease in kilometres made by car passengers and a slight increase in the number of kilometres travelled by car drivers (and therefore by cars). This growth in car driver kilometres levelled off during the economic crises, and increased again slightly in 2011.

A comparable pattern can be seen on the motorway network, where traffic levelled off from 2007, slightly decreased in 2009 and 2010, and increased again in 2011 (by around 3%). The differences in developments between the total mobility of car drivers and the developments in traffic on the motorway network are caused by developments in goods transport, in the use of vans, the use of the network by foreign vehicles, and a possible shift from the underlying network as a result of the strong decrease in congestion in 2011 on the motorway network as a result of infrastructural improvements (new roads,

extra lanes). The developments in 2011 suggest that the stabilisation trend will not "automatically" continue in future years.

3.2 Developments in other countries

The stabilisation of car use in recent years is also occurring in other developed countries. Close to the Netherlands, in Flanders (Belgium) a decrease in both car passenger and car driver kilometres was noted in 2008 (Janssens et al., 2011). In both Germany and the United Kingdom the number of car kilometres per inhabitant has not increased since the mid-1990s. In the United States, a formerly steady growth in car use also appears to be levelling off since 2005, while economic and demographic growth continued (USDOT, 2010). Figure 5 shows an overview of the growth pattern in several OECD-countries. Note that in Japan the stabilisation already began in the 1990s, followed by an actual decrease from 2003. In most other countries, the tipping point from constant growth to stabilisation is visible around 2003 and 2004. An overview of the developments in car use in 25 countries is presented in a recent report by the Australian Bureau of Infrastructure, Transport and Regional Economics (BITRE 2012).

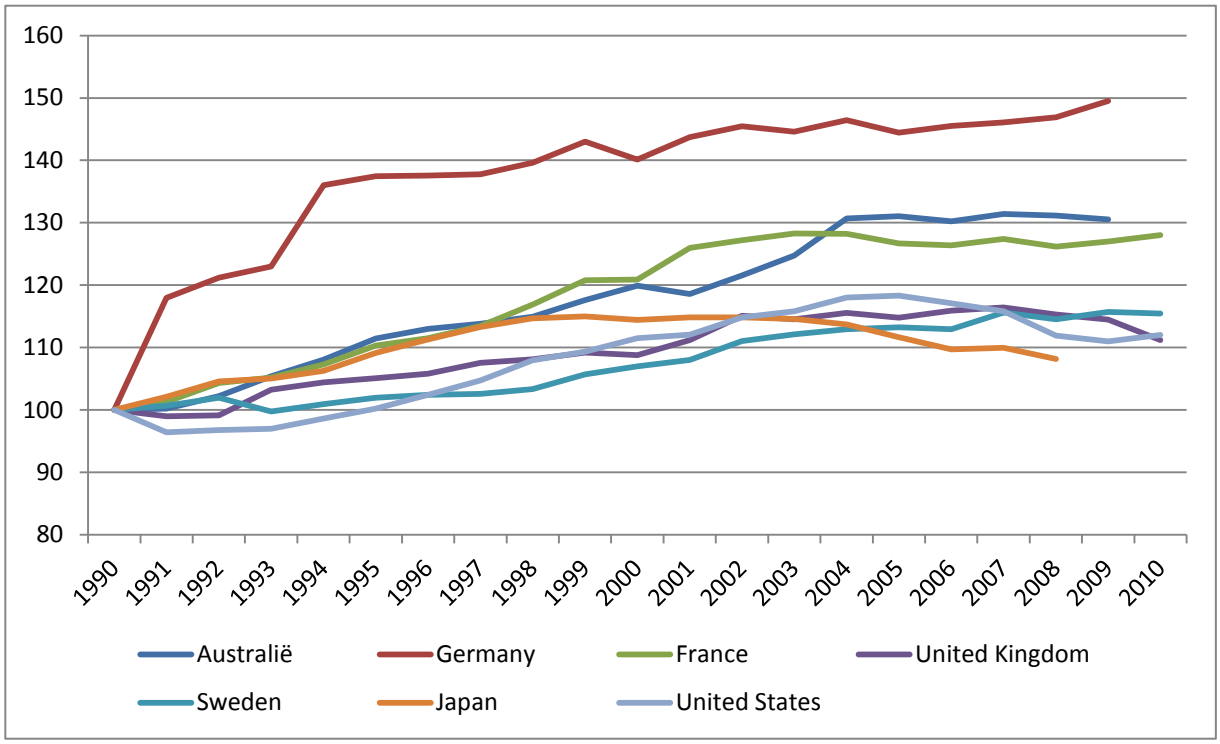

Figure 5. **Traveller kilometres for cars and light trucks, 1990–2009. Index: 1990=100**
Source: International Transport Forum (2012).

3.3. Differences in the broad picture between various mobility segments

Figure 6 shows in more detail how different groups have contributed to the development of car mobility (driver and passenger) from 1995. Note that the contributions in these graphs include the effects of changing sizes of the various segments considered.

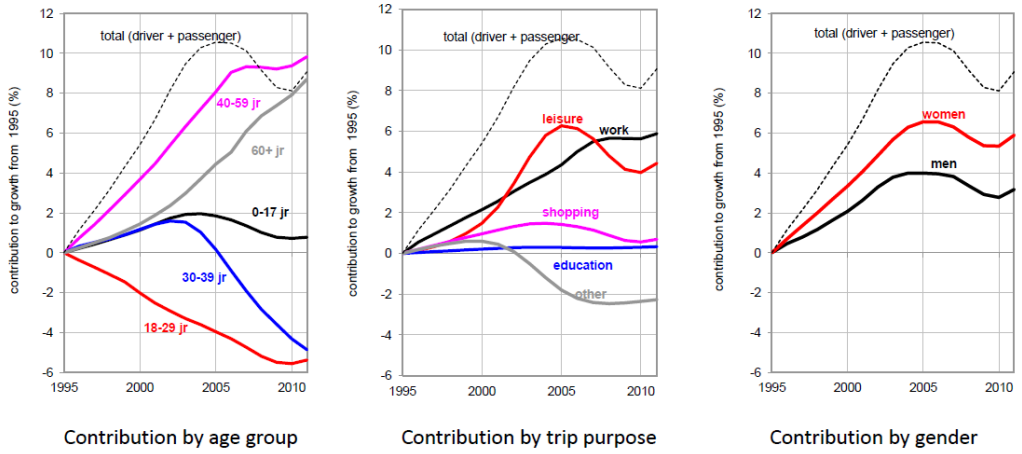

Figure 6. **Contributions by different segments to the development of car mobility between 1995 and 2011** Source: KiM, based on OVG/MON/OVIN

The graph on the left shows that the contribution to the growth in car mobility comes from the group of people over 40. The young adults group (18 – 29) has been responsible for a decrease in car mobility. The trip purpose graph (middle) clearly shows that work related car mobility made a strong contribution (around 4%) to growth until 2007. After that year, there was a stabilisation. In leisure, a strong fall in the contribution to car mobility can be seen after 2005 after a period of strong contribution to growth. The graph on the left shows that women have made a stronger contribution to the growth in car mobility than men. For both groups, a decrease in the contribution to growth after 2007 is noticeable.

Table 1 shows an overview of the volume developments in the various age groups during the period 1995-2011 and the corresponding changes in contribution to car mobility (km as driver + km as passenger).

Table 1. **Developments in population segment and corresponding car mobility (kilometres travelled as driver or passenger)**
Source: KiM, based on CBS Statline and OVG/MON/OViN

Age group	Popn. growth 1995-2001	Share in population 1995	Share in population 2011	Change in car mobility in category	Contribution to change in total car mobility	Share of car in mobility 1995	Share of car in mobility 2011
0-17	2.8%	22%	21%	7.3%	0.8%	11%	11%
18-29	-12.1%	18%	15%	-26.5%	-5.4%	20%	14%
30-39	-17.4%	16%	13%	-20.2%	-4.9%	24%	18%
40-59	22.5%	26%	29%	28.4%	9.8%	35%	41%
60+	36.4%	18%	22%	84.6%	8.7%	10%	17%
Total	7.8%	100%	100%	9.1%	9.1%	100%	100%

For young adults (18-29), it is remarkable that their car mobility dropped by 27%, while their group size decreased by only 12%. In this age group, there has clearly been a strong decrease in car mobility on an individual basis.

In the age group 60+ the image is just the other way around. Here, there is an increase in car mobility (+85 %!), which is much larger than the growth of this population segment (+37 %). This means that, on an individual basis, car mobility of people over 60 years old has increased. This is a logically explainable trend, as more and more individuals start to belong to this group, and as car ownership and car use are a common experience for them. In earlier years, there still were low levels of license holding and car ownership among elderly women. Furthermore, during this period, income levels have increased in this group. The increased car mobility in this group is mainly related to social and leisure activities. Work and education related trips hardly play a role in this segment. Analysing the development in more detail, the increase of work related car mobility after 2005 is noticeable, especially among men. This is a result of prolonged working participation.

3.4 A specific look at car drivers

To further analyse the developments in the mobility of both car drivers and car passengers, we examine three components contributing to these developments. These three components are:

1. "Changes in demographics": Changes in the composition of the population will result in changes in the number of persons participating in the various activities.

2. "Changes in frequency": Persons may change the frequency of their trips as a car driver (or a car passenger) for the various activities. This effect can appear as a result of three different changes in activity patterns.
    a. Because of changes in the %age of the population that participates in the activity
    b. Because, on an individual level, people change their activities
    c. Because people more or less often choose car driver (or car passenger) as a mode to travel for a specific activity

3. "Changes in trip length": The average trip length for a specific type of trip changes.

In the analyses, a distinction was made between various trip purposes.

As mentioned before, the total kilometres travelled by car drivers increased by 10% between 2000 and 2011. The result of the decomposition among the three components mentioned above is presented in Figure 7.

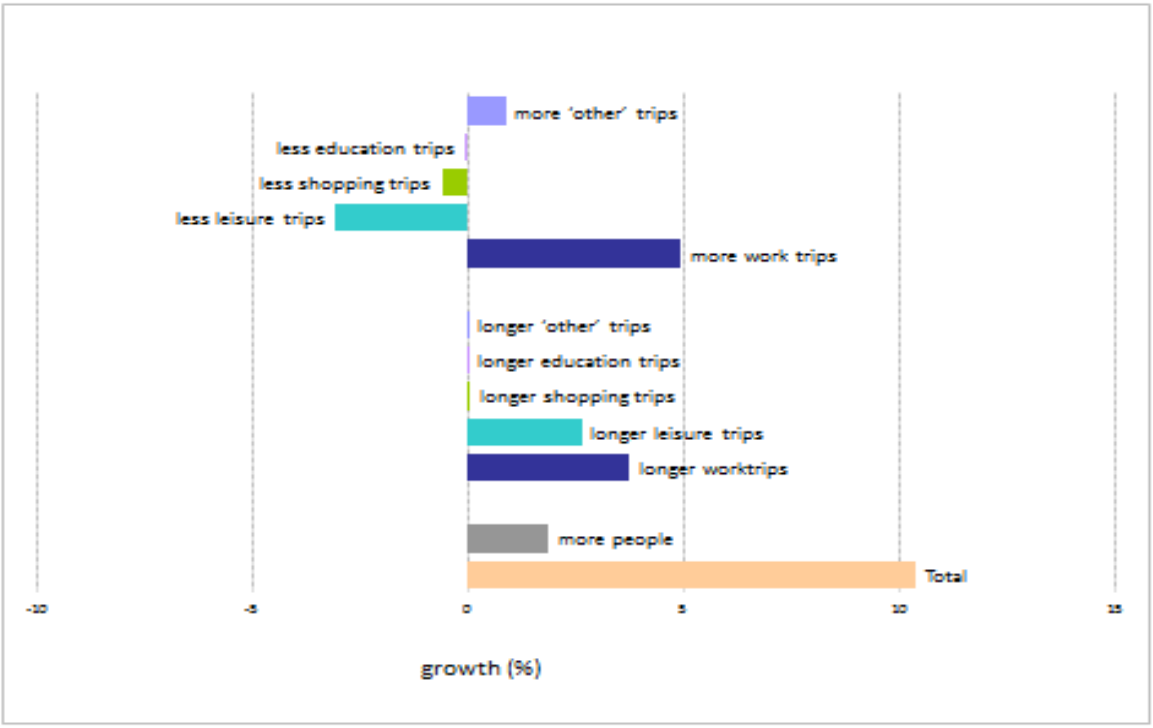

Figure 7. **Size of different components in the development of car use (drivers) 2000-2011**. Source: KiM based on OVG/MON/OViN

The 10% increase appears to be mainly caused by (1) an increase in the population, and (2) driving more often and further to and from work. Furthermore it is clear that, due to increased car ownership, a significant part of the extra kilometres as car driver originate from kilometres formerly made as car passenger. A second important influence in this component must have come from increased labour participation by women; the increase in this component is one and a half times higher for women than for men.

For non-work trips, the number of trips per person has dropped. But, as we travel further for these trip purposes, the number of kilometres per person did not change significantly between 2000 and 2011.

It is estimated that, if fuel prices had stayed constant in real terms (instead of the 16% rise), the total number of kilometres travelled as car driver would have been 2 to 3% higher.

Although the Dutch had around three hours a week less leisure time available in 2005 compared to thirty years ago, this had no consequences for the leisure time spent outside their houses (Verbeek & De Haan, 2011). Therefore, an increasing part of their leisure time involved mobility. Over the last 25 years, the number of trips and the number of kilometres travelled has increased as a result of increased incomes, a growth in car ownership, and a decrease in running costs. Apart from that, the available supply in leisure facilities increased by an estimated 800% since the mid-eighties (Metz, 2002). Nowadays the volume of leisure travel has stabilised and even slightly decreased since the economic crisis. Between 2003 and 2007, the trip distances increased, but the trip frequencies decreased. The increased trip distances could be correlated with scale developments in the leisure industry in the form of a larger and more varied supply of leisure attractions (PBL, 2010).

The decrease in leisure travel in more recent years can possible be correlated with the rise of the Internet and the use of social media, offering more possibilities for leisure activities at home. Available research data on how leisure time is spent do not offer enough insight into such developments yet. Another possible explanation could be an increase in leisure travel abroad, possibly in other modes (plane). This issue will be addressed later on. The developments are not equal for all age groups. Although not strong enough to change the total image of the decrease, we do see an increase in the number of leisure trips of older persons.

3.5 A specific look at car passengers

As mentioned before, the total number of kilometres travelled by car passengers decreased by over 9% between 2000 and 2011. The result of the decomposition along the three components mentioned earlier is presented in Figure 8.

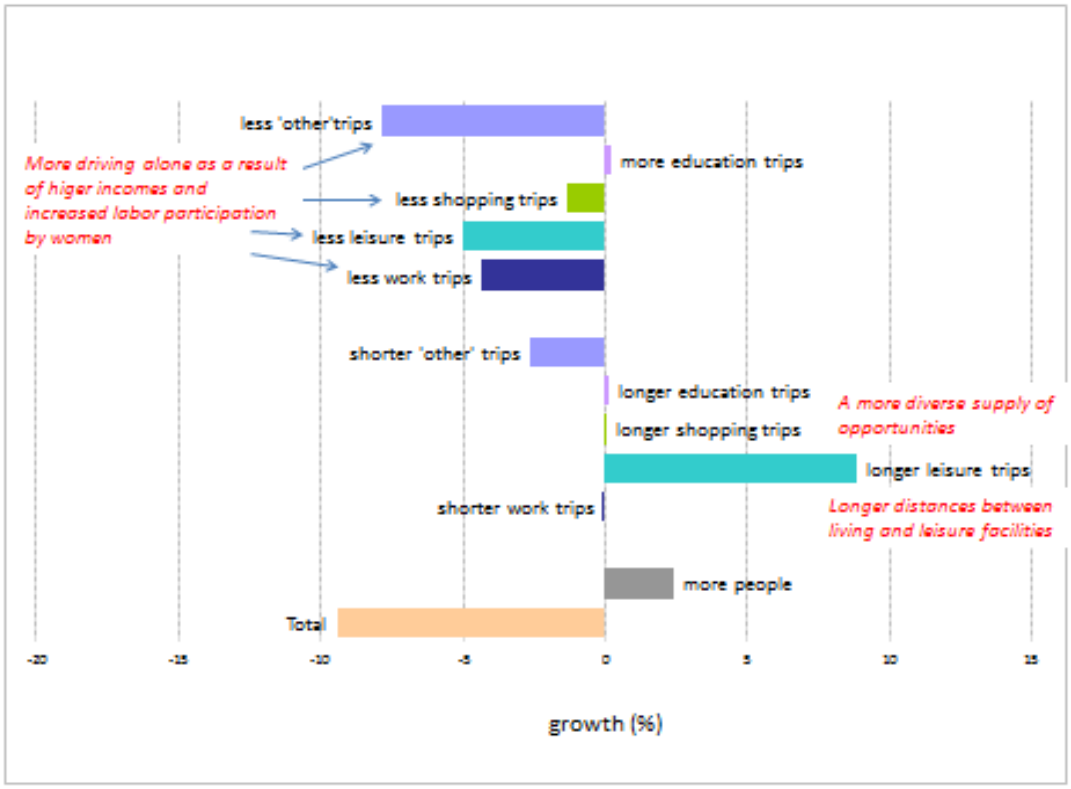

Figure 8. **Size of different components in development car use (passengers) 2000-2011**. Source: KiM, based on OVG/MON/OViN

Car use as a passenger has decreased for nearly all trip purposes. This development can be seen in nearly all age groups, apart from the elderly (60+). This trend fits with a more general societal trend of individualisation, and an increased appreciation of autonomy and independence. Higher income levels, increased driver licence holding, and increased car ownership have made this possible. Furthermore, the increased labour participation of women has played a role. The major part of the half a million jobs added in the Netherlands between 2000 and 2011 were taken by women (source: CBS). However, in the work related trip purpose, the decrease in car mobility generated by men is bigger. In the non-work related trip purpose, women contribute most to the reductions. That the car passenger mode does not drop in importance among the elderly is predictable. In part, this concerns generations from before the 'individualisation' trend, but apart from that it is imaginable that couples in this life stage choose to participate in activities together, while others are no longer able to travel by car on their own.

The number of car passenger kilometres would have dropped even further if two contrary developments had not occurred. The first is an increase in trip length of passenger trips. This is primarily visible in leisure travel. The second is that the total number of inhabitants grew in the period considered.

4. POSSIBLE CAUSES OF THE REDUCED GROWTH IN CAR MOBILITY

4.1 What causes to look at?

The analysis presented above, and comparable research in other countries, support one common image, which is that the economic crisis and increasing fuel prices do not entirely explain the reduced growth in car mobility. In this section, the possible causes of this trend are further investigated. Based on an inventory of the kinds of drivers considered in research in other countries, and based on findings from the analyses presented above, the following four possible causes for the reduced growth in car mobility will be explored in more detail:

1. *Saturation in direct influencing factors*. Such factors can directly relate to the transport system (for instance, a saturation in car ownership levels), or lie outside the system (e.g. limitations in the amount of time spent on certain activities).
2. *Changing mobility of young adults*. From recent international research (Kuhnimhof et al 2011, 2012) and from our own analysis, it becomes apparent that young adults are a lot less mobile than they were 10 to 15 years ago. What could explain this reduced demand for mobility?
3. *Rise of the Internet society.* There are expectations of reduced mobility as a result of changes from physical to virtual activities;
4. *Increased international mobility of Dutch inhabitants.* International mobility is rather poorly incorporated in our travel statistics. The Dutch appear to be travelling more often and to further destinations abroad, especially for their holidays. It is possible that such trips are starting to substantially replace shorter trips in the Netherlands.

In the following paragraphs each of these four possible causes for the reduced growth in car mobility is considered in more detail.

4.2 Signs of saturation in relevant drivers

Car ownership and driver license holding

The availability of a car is an important prerequisite for car use, although this does not automatically mean that one needs to own a car to be able to use it. Currently around 8% of the automobiles in the Dutch car fleet are leased (Jeekel, 2011). In addition, there are several car sharing initiatives in the Netherlands, currently comprising over 2 600 vehicles.

Car ownership in the Netherlands increased from from 362 cars per 1000 inhabitants in 1995 to 460 cars per 1000 inhabitants in 2011. In the Randstad area, car ownership levels are around 420 cars per 1000 inhabitants, while in less densely populated areas car ownership levels are well over 500 cars per 1000 inhabitants. Between 1990 and 2011, car ownership in the Netherlands grew quite steadily by 1 to 2% per year. There are no apparent signs of saturation. However, car ownership levels in other OECD countries seem to have already reached a saturation level, although this level differs

among the countries. In the United Kingdom a stable level of around 500 cars per 1000 inhabitants appears to have been reached, while the stability figure is around 600 in France and Japan, 700 in Australia, and even 800 in the United States.

Table 2 shows that, over the last 20 years, car ownership of households in the Netherlands changed significantly. An increasing part of the population has become member of a household with two or more cars. Paradoxically, although there has been increased car ownership, there has been a slight increase in the share of people in households with no car. The changing household size, with an increasing number of one person households, plays a role here. Of one person households, 57% have a car available, while this%age is 96 for four person households (Jeekel, 2011).

Table 2. **Distribution of persons in households with different car availabilities**
Source: OVG/MON

	1991	**2001**	**2011**
Persons in households without a car	13%	14%	15%
Persons in households with one car	67%	58%	49%
Persons in households with two cars	18%	25%	31%
Persons in households with three cars or more	2%	3%	5%

Between 1995 and 2009, the%age of the Dutch population (over 18) holding a driver's license has increased from 80 to 84%. The increase was mainly among young people in the age group 18 to 24 years and among the group over 50. There was a small decrease among young adults between 25 and 29 years old.

Sivak en Schoette (2011) have analysed driver license holding in 15 countries between 1983 and 2008 (see Table 3). In each country, an increase among elderly people can be observed. The Netherlands is among the countries like Spain and Switzerland, where increases are visible among the very young and the elderly people. In this group, only Switzerland is, like the Netherlands, a country where car mobility appears to be stabilising. In the group of countries like the US and Germany, a reduction among young people can be seen. In this group are several other countries where car mobility appears to be stabilising.

Decrease among young people and increase among elderly people	**Increase among both young and elderly people**
USA Sweden Norway UK Canada Japan Germany	Spain Finland Poland Israel Latvia Switzerland **The Netherlands**
In red: stabilising car use	

Table 3: **Changes in driver licence holding in various countries**
Source: Sivak and Schoette 2011.

Income levels

Income levels appear to have a direct relationship with car ownership and car use. With growing income levels, car mobility increases. Several sources (Goodwin 2012, Miljard-Ball en Schipper 2011) indicate that, in recent years, car use of households appears to level off above a certain level of household income. In the US, this trend is clearly visible (ITF, 2012). An analysis performed by the Central Bureau of Statistics (CBS, 2008), shows the direct relationship between household income and car use; the analysis also shows a drop in car use in each income category after 2005, in line with the development in total car mobility. However, what cannot yet be seen in the Netherlands, is a levelling off of car use above a certain level of the household income.

Labour participation by women

Compared to other Western European countries, the Netherlands used to have a relatively low participation of women in the labour force. Over the last 20 years, however, this situation has changed rapidly, and has been identified as a major cause of increased car mobility. As mentioned before, women more often use the car for work related activities. Each extra working woman not only results in two extra trips on each working day, but also in travelling by car for other trip purposes. The combination of work, running a household, and taking care of children, asks for flexible mobility, for which the car is an ideal mode. As a result, the mobility pattern of these women have started to resemble more and more the mobility pattern of men. The so-called 'gender gap' seems to be nearly closed. Apart from this, an increased level of education among women has also played a role here (see Olde Kalter, Harms en Jorritsma 2011). However, from around 2007, the trend described above appears to change. From that moment, the level of labour participation by women stabilises at 60% and for men it even decreases slightly. These developments are most likely related to the economic crisis.

Changes in travel times

The Dutch population spends about one hour each day travelling. Over the recent years, little has changed in this pattern (see Figure 9). Also, travel times by car have not significantly changed. In 2009 on average the Dutch spent a bit more than 32 minutes in a car each day. This has not changed from 1995. As mentioned before, what has increased is the travel times spent in commuting.

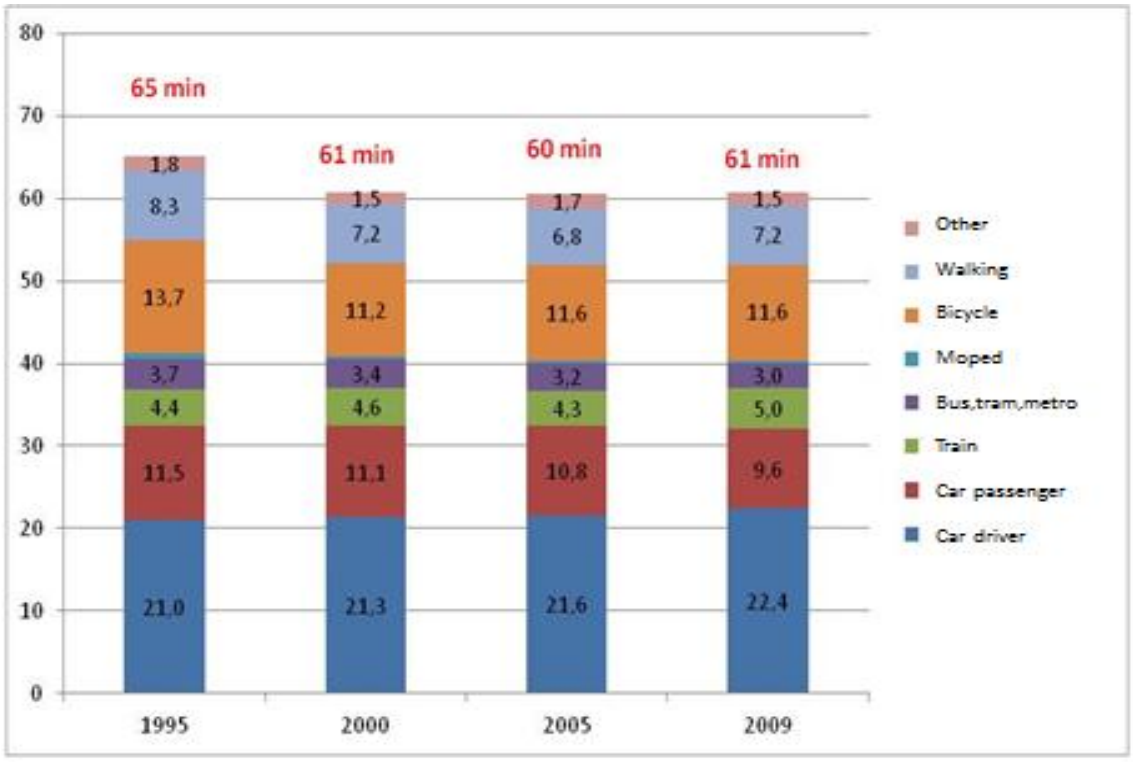

Figure 9. **Travel times per person per day by travel mode (in minutes), 1995-2009**. Source: OVG/MON

Conclusion

Contrary to other OECD-countries, where a reduction (in growth) in car use is apparent, there are no real signs of saturation as an explanatory factor for reduced car mobility in the Netherlands. The factors considered in the analysis can hardly have played a significant role in the levelling off of car mobility growth. An exception to this is the level of labour participation by women. In the last two decades the existing 'gender gap' was more or less closed, and from 2007 on, the labour participation by women seems to stabilise, which could be correlated with the economic crisis. This phenomenon is likely to have caused part of the decrease in car mobility in the more recent years.

4.3 Mobility of young adults

Introduction

The current young adults between 18 and 30 years of age are often called 'Generation Einstein' or 'Generation Y'. They grew up in the IT-era. Computers have no secrets for them; mobile phones or smartphones are indispensable to them, and they appear to be constantly 'on line'. They are more independent and more individualistic than their peers of 10 to 15 years ago. Collective values seem to be less important to them, and small social networks all the more important. These are a number of conclusions from a book by Spaanenberg and Lampert (2011) on the present-day younger generation. Whether this way of life is also reflected in alternative travel behaviour is the question that we will try to answer here.

From other (American) research, it can be learned that two-thirds of young adults (both students and workers) prefer having an Internet connection to having a car of their own (CISCO, 2011). The development towards an e-society could be of influence on the way the young generation 'looks' at cars. An indication that Generation Y prefers to own a smartphone rather than a car can be found in the following quote from Business Week: "Though the car is still a gateway to independence, Generation Y has more ways to connect with the outside world than young buyers of past generations" (Business Week 2012).

The research on mobility behaviour among young adults in Germany and the United Kingdom (Kuhnimhof et al 2011, 2012) shows a strong shift towards more use of the bicycle and public transport, indicating a change in 'orientation' away from the car. The same type of changes in mobility patterns can be seen in the US. For the Netherlands a comparable type of research effort was made based on data from the annual mobility surveys of 1995-2003 (Onderzoek Verplaatsingsgedrag CBS (OVG)) and 2004-2009 (Mobiliteitsonderzoek Nederland RWS (MON)). In addition to this quantitative research, and in cooperation with the Netherlands Institute for Social Research (SCP), a number of focus group meetings were organised to gain more insight into the underlying factors influencing the mobility patterns of young adults (Veldkamp, 2012).

Decreasing mobility among young adults

As illustrated before, young adults nowadays travel a lot less by car. What was not mentioned before is that, in general, they are less mobile than around 15 years ago. The total number of trips per person per day made by young adults decreased by 21% from 3.49 to 2.75 trips per day per person between 1995 and 2009. Young adults also travelled significantly fewer kilometres. In 1995 this was on average 41 km per person per day; in 2009 this was 38 km per person per day — a decrease of 7%. They also spend less time travelling. In 1995 this was on average 77 minutes per person per day, which was reduced to 68 minutes per person per day in 2009.

These are overall averages. But, there are some differences between men and women. Young women make more trips than young men, but the length of their trips is shorter. Between 1995 and 2009, the decrease in the number of trips is smaller among women

than among men; but the number of kilometres travelled by women increased by 6% (see Figure 10).

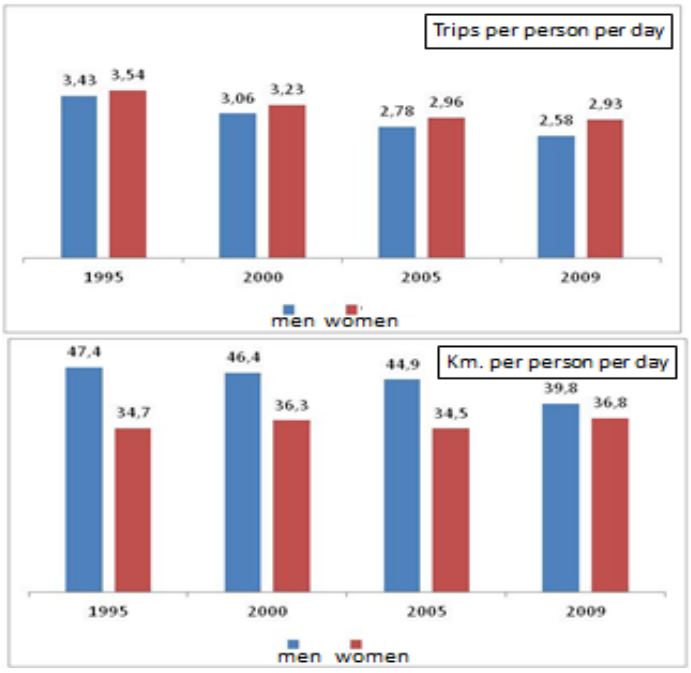

Figure 10: **Number of trips and kilometres travelled per person per day, by gender, for young adults (18-30 years of age).** Sources: OVG, MON (1995-2009).

Taking a closer look at the various modes (see Figure 11), a clear reduction in all modes can be seen, except for the train. In 2009, young adults more frequently use the train than in 1995 (31% more trips per person per day). Especially among women, public transport use has gone up considerably.

In terms of the total number of kilometres travelled per person per day, the men show a 16% reduction (see Figure 11). Entirely in accordance with the number of trips, the reduction applies to all modes. For young women, the picture is a bit different. Although the number of trips by bicycle has decreased, the distance travelled has increased. The same (although in a more moderate way) goes for driving a car. Especially train usage is growing, not only in terms of trips but also in terms of kilometres travelled per person per day.

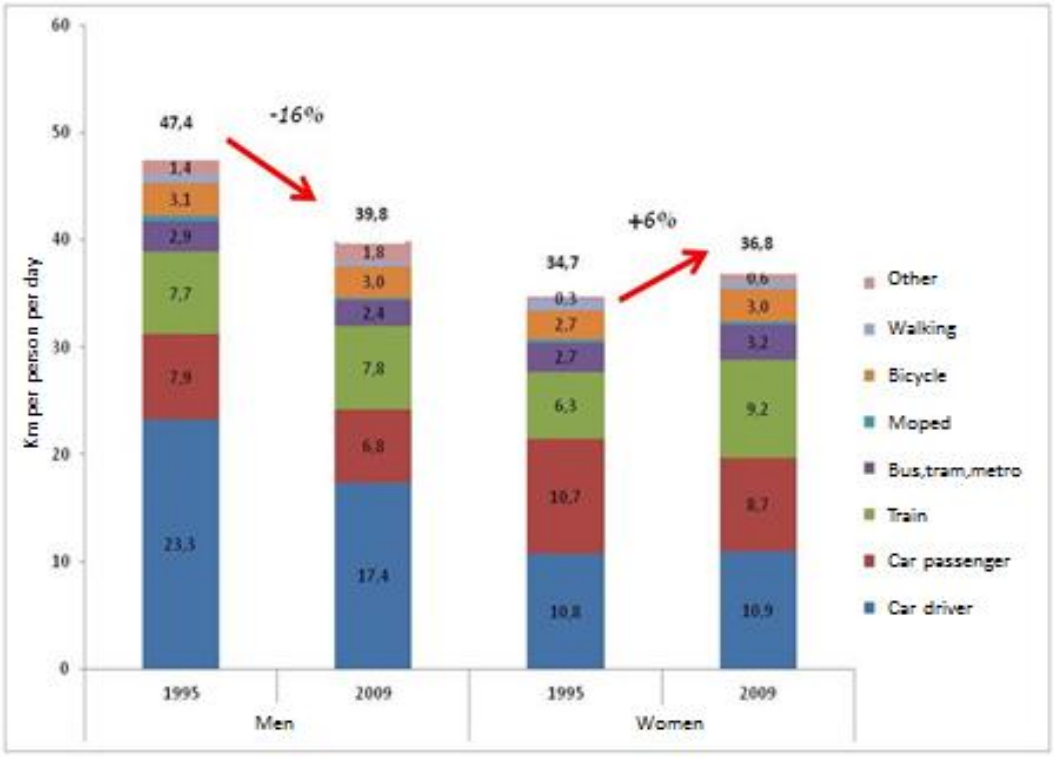

Figure 11. **Number of kilometres travelled by young adults per person per day, by travel mode, 1995 and 2009**, Source: KiM, based on OVG/MON.

Young adults who own a car generally make little use of public transport and the bicycle. However, over the years the use of these modes has increased a little. Consequently, car use has decreased significantly. The young adults who do not own a car make a lot more use of public transport and the bicycle. Their mobility pattern remains more or less constant over time. But, also in this group, a somewhat declining orientation towards the car (as a passenger) seems to have occurred.

More students, fewer young adults working

The composition of the group 'young adults' has been changing recently. Although the volume of the age group from 15 to 17 year olds increased by 5% in the period 2001-2011, the number of young adults working decreased by 20% in the same period (Source: CBS). An increasing number of young adults are engaged in education instead of work. In particular, their participation in higher education has increased rapidly. For the age group 18 to 25 years of age, participation in higher education has increased by 40%! These changes in societal positioning have their impact on mobility, since a working young adult travels many more kilometres than a learning young adult (see Table 4). Note that this difference in kilometres per trip purpose has hardly changed over the years.

	Men	Women	
1995	7.300	3.800	Working
	1.100	600	Studying
2011	6.500	3.700	Working
	1.200	800	Studying

Table 4: **Annual number of kilometres travelled by car for working and studying young adults.** Source: KiM, based on OVG/MON/OViN.

Re-urbanisation

Not only have changes in societal positioning taken place, but (probably partly correlated with this development) young adults more often tend to live in high-density urban areas. Between 1995 and 2009, the share of young adults living in high-density urban areas has increased and their share in moderate density urban areas and in rural areas has declined. Note that a comparable re-urbanisation trend took place for all other age groups. In high density urban areas, young adults make more trips per person per day than those living in other types of areas. They also tend to make longer trips. It needs to be pointed out here that inhabitants of high density urban areas are much more inclined to use public transport and the bicycle. This can clearly be seen from the situation in a city like Amsterdam, where one can also notice an increase in the 'market share' of the bicycle for shorter distances and public transport for longer distances (see Figure 12).

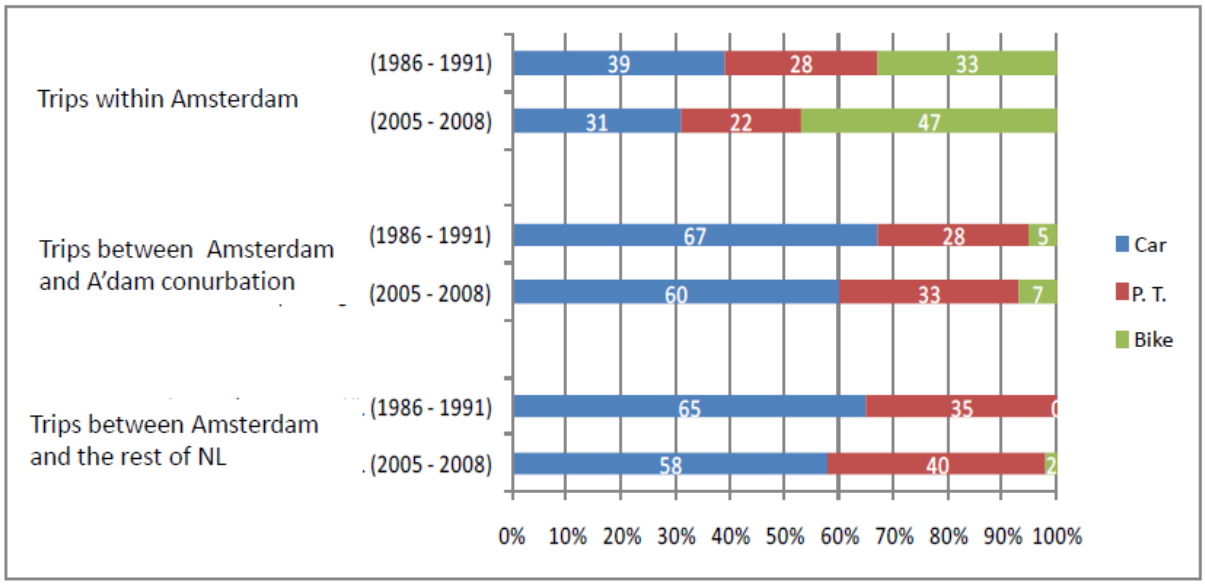

Figure 12. **Mobility development in Amsterdam**;
Source: Amsterdam DIVV (2010), MON/OVG

More mobility related to leisure and education; less related to work, social contacts, and shopping

In 2009, young adults made more trips for leisure and education purposes than young adults in 1995 (9% and 13% respectively). In 2009, the trips for these purposes involved longer distances than comparable trips in 1995. The longer trips for educational purposes are due to the concentration of educational facilities. Young adults nowadays make fewer trips for work, shopping, and social contacts. The last development could point to an increased orientation of young adults towards activities via the Internet (e.g. to maintain their social contacts).

Although in absolute terms young women make more kilometres for the trip purposes 'visiting friends and relatives' and 'shopping' than their male counterparts, this volume has dropped by 9% and 22% respectively (see Figure 13). The increased use of the train is probably related to the increased participation in educational activities and the associated availability of a student public travel pass. Nearly one third of the growth in train use in the period 2000 to 2011 is estimated to originate from the use of the student travel pass.

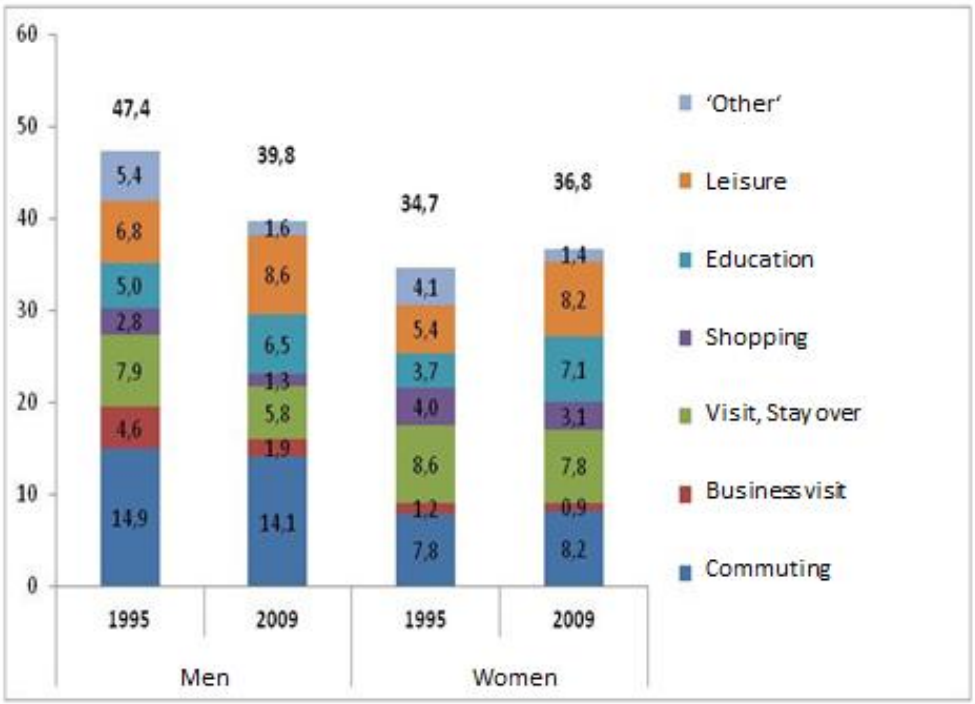

Figure 13. **Kilometres travelled per person per day by young adults, by trip purpose, 1995 and 2009**. Source: KiM, based on OVG/MON.

In line with these developments, travelling by train for leisure and for educational purposes has been increasing. An increasing number of train trips are made over longer distances. There is also an increase in the number of trips by train for work related trips.

However, this does not result in an increase in the number of kilometres travelled per person per day.

Only small reductions in mobility in high-density urban areas; increase in use of public transport and the bicycle

As mentioned earlier, there was an increase between 1995 and 2009 in the number of young adults living in high density urban areas, and a decrease living in other urban and rural areas. Young adults living in high density urban areas make more trips and travel more kilometres per person per day than those living in other urban and in rural areas. For people living in urban areas as well as those living in rural areas, the period 2000 to 2009 shows a trend of decreasing numbers of trips and shorter trip distances. In urban areas this decrease was more modest than in rural areas (see Figure 14).

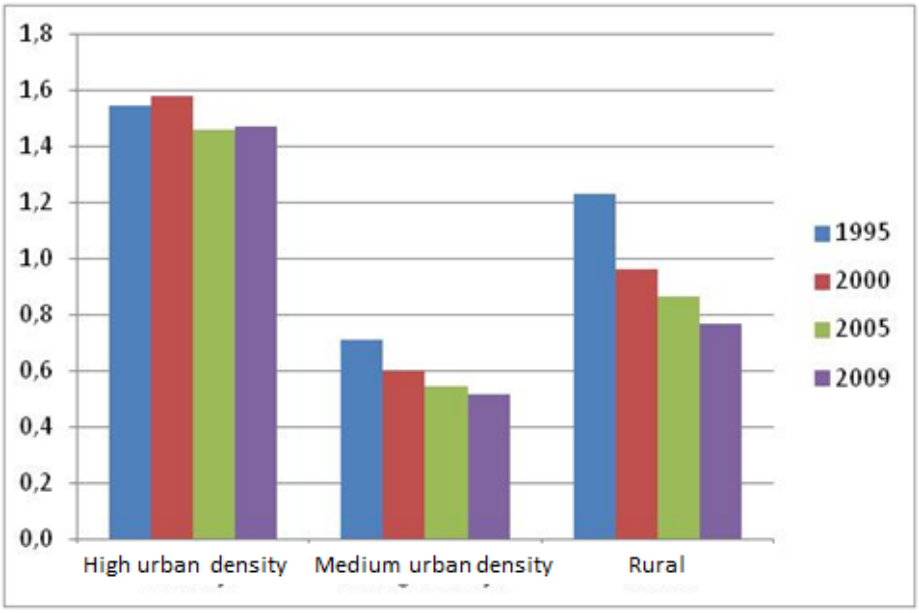

Figure 14. **Trips per person per day by young adults by dwelling location, 1995-2009**.
Source: KiM, based on OVG/KIM.

A more detailed comparison of the situation in 1995 and 2009 shows a strong decrease in the number of trips made by car and on foot by young adults living in both urban and rural areas. In urban areas, one can also see a shift towards the bicycle, local public transport, and the train (+9%,+10% and +41%, respectively). This shift also becomes apparent in the number of kilometres travelled per person per day in these modes. This development is in line with the changes in the travel behaviour of young adults in Germany (Kuhnimhof, 2012), although the effect there is much less prominent. This does not necessarily mean that the Dutch young adults are lagging behind. It must be remembered that bicycle use was already very high in the Netherlands compared to Germany, and that all Dutch students have had a free public transport mobility pass

(either for the weekend or for weekdays) since 1991. It is quite conceivable that the shift to public transport by young adults that has been seen recently in Germany took place earlier in the Netherlands with the introduction of this card. Please note that young adults living in rural areas also travelled more by train in 2009 than in 1995 (12% more trips and 10% more kilometres per person per day).

Car ownership and driver's licence holding

Having examined the decreased mobility among young adults, the question arises: which factors, apart from the structural changes in societal positions (fewer workers, more students), could have influenced the trends. A closer look at driver's licence holding and car ownership among young adults shows that there has hardly been any change in these factors between 1995 and 2009. Driver's license holding stays around the 70% level. Among young males, a slight decrease is noticeable. But, contrary to this, there has been a slight increase among young females. More or less the same trend, but with slightly bigger fluctuations, can be seen regarding car ownership. In 1995, about 32% of young adults owned a car; in 2009 this was 30%. Moreover, car ownership among young adult men decreased from 38 to 33%. Most probably this is correlated with their changing societal position (fewer workers, more students). Contrary to this, there was an increase in car ownership among young adult women. The reduced car ownership among men possibly explains their stronger decrease in car use than that of women.

Labour participation

The number of non-active young adult women (not working, no student) has decreased significantly in recent years; this trend does not apply to men. The level of labour participation among young adult women increased strongly, as in other age groups. Between 1995 and 2009, labour participation among young adult women rose from 63% to 79%. Over the last few years, the level has stayed fairly constant, just like among the rest of the Dutch female population. The strong increase in labour participation significantly contributes to the increase in the number of kilometres travelled per person per day for work-related trips among young adult women.

For men in the same age group, labour participation did not significantly change, remaining around the 90% level. Among younger men there has been a decrease in work related kilometres travelled per person per day.

When the absolute changes in numbers of workers and students are taken into consideration, there has been a strong decrease in the number of workers. In 2011 there were 176 000 fewer young adults working compared to 2001 (CBS Jeugdstatline, 2012). Combined with the slight drop in car ownership, this accounts for the drop in work related trips and the associated number of kilometres. At the same time, the number of students among young adults increased by around 136 000 (Source: CBS Jeugdstatline, 2012). A large proportion of these studying young adults live in the high density urban areas, where the major educational institutes are. Taking this development into account, it is not surprising that the mobility of young adults in high density urban areas decreased only slightly. Car ownership in these areas is lower than the national average, and is even lower among the young. Other modes of transport are more convenient

alternatives here, as can be seen from the increase in public transport use and in the use of the bicycle.

Attitudes toward the car

One possible explanation for the decrease in car mobility is a changing attitude of young adults toward the car. Where once a car was seen as the most desirable good, today it might be more important to have digital contacts and to experience the freedom of choice of transport modes, depending on the type of activity that one wants to undertake. The focus group discussions mentioned earlier revealed that, in the year 2012, the car still has a high aspiration content for young adults. Having a car equals freedom, independence, availability, comfort, and convenience. This proves to more true for lower educated young adults than for higher educated young adults. This seems in contradiction with the observed trends. However, we have no way to compare these attitudes to those about the status of the car in 1995. Such an outcome must therefore be interpreted as a relative judgment, as compared to about 15 years ago. The status of the car among young adults at that time was probably higher than it is now.

Another possible explanation for declining mobility among young adults is the ubiquitous Internet society. Young adults develop increasingly many e-activities through the Internet (social media, Internet shopping) and the mobile phone / smartphone. They are online constantly, and the smartphone is one of their basic necessities. This is evident from existing literature and data, and is also clear from focus group discussions. E-working has not yet significantly made its appearance among young adults. Certainly, less educated young adults often have jobs where working at home is not possible (healthcare, retail, driver). The group discussions also revealed that 'WhatsApp' possibly partly replaces visiting friends and relatives, resulting in fewer physical social contacts, thus less mobility. This seems in line with the decrease in the number of trips and mileage for the trip purpose 'visiting friends and relations'. On the other hand, the participants also indicated that the Internet has an alert function for events, festivals, and other activities, which might provoke more trips over longer distances. The alert function of the smartphone can also lead to increased mobility, because you know where your friends are. This kind of notion may support the finding that young adults increasingly make leisure trips over longer distances.

Conclusion

From the analyses of the data from the Onderzoek Verplaatingsgedrag (OVG 1995-2003) and the Mobiliteits Onderzoek Nederland (MON 2004-2009), it can be deduced that young adults aged 18 to 30 years indeed became less (auto)mobile between 1995 and 2009. This refers both to the number of trips and the distance travelled per person per day. This result is in line with the trend found for German young adults. However, unlike the German young adults, the young Dutch shifted much less to bicycle, bus, tram, and metro between 1995 and 2009. Exceptions are the young adults in high density urban areas. Among them, we see a shift towards bike, (urban) public transport, and train.

Usual explanatory variables, such as having a driver's license and car ownership, have changed very little over time, and therefore offer no adequate explanation for the decrease in car mobility.

Furthermore the employment rate of women has reached a ceiling, and may thus have had an impact on the decrease of mobility among young adults.

The apparent decrease in the number of working young adults, and a clear increase in the number of young adults participating in higher education, undoubtedly have had an effect on car mobility. These developments have gone hand in hand with a substantial shift towards living in high urban density areas.

Although much quoted in publications on reduced car mobility, a significant change in attitude toward the car could not be determined. The existence and possible impact of such a trend remains unclear.

Finally, the impact of the increasing use of social media and smart phones cannot yet be assessed.

4.4 The influence of the Internet society

Introduction

To what extent does the increasing use of IT in society influence the reduction in growth in car mobility? To answer this question, we performed a literature review and desk research, specifically looking at:

- how IT affects daily activities;
- to what possible changes in mobility behaviour IT can lead;
- the extent to which these changes in mobility behaviour also lead to an observable change in mobility (number of trips or kilometrage).

Often it is expected that the further digitisation of society will lead to a decrease of physical mobility. However, the separation between physical and virtual activities is not that sharp (Schwanen *et al*., 2008). IT not only replaces physical activities by virtual activities , it also generates new activities and associated mobility. The (mobile) Internet leads to a change in the organisation of activities. We are still in the middle of this development, and new developments are taking place so quickly that it is not possible to assess their net impact on mobility.

Availability and use of the Internet in the Netherlands

With 89% of Dutch households having an Internet connection (Eurobarometer, 2012), the Netherlands plays a leading role in Europe in this field. In 2011, 86% of Dutch Internet users were online every day or almost every day. In 2005, this was 68%. In 2011, the Internet is still most used at home. In 2011, half of all Internet users have Internet access through mobile devices such as a laptop, a Smartphone or a tablet. This

share is growing rapidly. Especially young adults use tablets often on the road or at other locations, such as school and work. Several Internet activities are now quite well established, such as Internet banking. The Dutch are among the most frequent on-line shoppers in the world (Source: Eurobarometer, 2012). The most important Internet activity is communication; the Internet is also widely used as an information source.

Types of e-activities

The number of activities that can be performed over the Internet is growing rapidly. We focus here on those activities for which a sizeable impact on mobility can be expected: shopping, working, banking, meetings, and leisure activities.

E-commerce is nothing else but buying and selling of goods through the Internet. This can be a selling process between businesses and consumers (web shops), but also between consumers (for instance through e-Bay). The shopping process has changed due to the Internet. The strong increase in sales through the Internet does not necessarily mean that, for those specific transactions, no physical stores are visited. People often make their choices on the Internet, visit the physical store to check whether the chosen product fits their requirements, and make the actual purchase through the Internet (I&O Research, 2011). Sites like e-bay.com have created a new market, where consumers can easily buy and sell second hand products. Research shows that 46% of these transactions would not have taken place without the Internet (Weltevreden *et al.,* 2009).

The number of Internet purchases is increasing very fast. Now, nearly 10% of all shopping in the Netherlands is done through the Internet. (I&O Research, 2011). For daily shopping, the share is still limited. The Dutch mainly buy books, clothing, and sports gear through the Internet; they also book transport tickets, holidays, and accommodations through the Internet. The number of orders that consumers place on the Internet is increasing, as well as the average amount of money spent annually on Internet purchases (at 890 EUR in 2011). The most important reasons for purchases through the Internet are ease, flexibility, and speed of delivery. Having a preference for traditional shopping appears to be the most important reason for not shopping online. Especially young people consider e-shopping to be a social activity.

E-working is the flexibilisation of working activities in space and/or time. This can either be done by working at home for a day, working in a "flex-office", or working in any other location providing the necessary facilities. Another option is to work at home part of the day, to avoid peak hour traffic. In 2010, just over a quarter of the Dutch workforce worked at home for a part of their usual working hours (> 1 hour a week). This share has been quite constant over the last few years. The number of hours working at home has shown a small increase, from an average of 5.5 hours a week in 2005 to 6.2 hours a week in 2010 (CBS, 2012). The possibilities to work at home strongly differ among sectors, types of job, age groups, and genders. Most work at home takes place in sectors like education and financial services. For people working in sectors such as building and the hotel and catering industry, working at home is difficult and, therefore, very low.

Internet banking is the performing of several banking activities from home through the Internet. The introduction of Internet banking offered the opportunity to undertake traditional banking activities (make payments, open and close accounts, buy shares, etc.) at any moment of the day and during the weekends. With 11 million Internet banking Dutch citizens in 2011, Internet banking is fully adopted in society (Eurobarometer, 2012). In 2012 all major banks have introduced applications for Internet banking for mobile devices, which means that banking has become 'footloose'.

E-conferencing is using a real time connection between two or more business partners. This can either be by telephone or by video connection. When the Internet is used, the procedure is called Web conferencing. The market for E-conferencing has grown strongly over the last 20 years as a result of cheaper platforms (PC and Web-based) for video conferencing. 15% of all Dutch employees state that they can have virtual meetings (Ruigrok, 2011). 68% of business air passengers state that they have access to videoconferencing in their company (Denstadli *et al.,* 2012). The availability of video conferencing differs by sector. It is specifically available in the financial world and in the high tech industry.

E-leisure. There are many (social) leisure activities that fit under this umbrella. For many leisure activities, such as visiting the zoo, a museum, or a party, no virtual alternative is available. In this case IT plays a role only in arranging such leisure activities. Here we focus on activities in which IT plays a certain role, for instance making contacts and communicating with friends through social network sites (Facebook, Hyves, LinkedIn), online and/or mobile gaming, listening to music (Spotify) and watching films through the Internet (YouTube, video on demand). These ways of spending leisure time have quickly become popular in the Netherlands, and are much used. An illustration: Facebook had 8.8 million unique visitors in the Netherlands in March 2012 (2/3 of all the Dutch who are 'on line'), while this was 6.6 million in April 2011 (Marketingfacts, 2012).

The use of e-mail is fully used in the Netherlands, with well over 90% participation for all age groups. More than half of the Dutch population visits social network sites; about one third of the Dutch exchange text messages, chat, or read blogs. Among young people between 16 and 25 years old, social network sites and the exchange of text messages is very popular. This type of (social) leisure time spending has penetrated much less in the higher age groups. It is unknown whether this has to do with age or with the increased possibilities of IT over the years (www.cbs.nl).

Effects of E-activities in general

To gain a better insight in the effects of E-activities on mobility, a distinction among four different kinds of effects is useful (Mokhtarian, 2002):

- *Substitution effect*: A location based activity is replaced by an IT based counterpart, as a result of which physical mobility is (partly) replaced by virtual mobility; an example is working independent of time and place instead of working in an office.

- *Complementarity effect:*
  - ✓ *Generation effect*: Use of IT leads to new location-based activities, which would have not occurred without the use of IT; therefore, extra mobility is generated. An example is a coupon received by e-mail that encourages the consumer to visit a physical store to get a discount on certain goods.
  - ✓ *Efficiency effect*: The use of IT for an activity is directly linked to an activity at another location because of efficiency purposes at such a location, leading to an increase in mobility; an example is the retrieval at a post office or physical store of products purchased through the Internet.

- *Modification or adjustment effect*: The use of IT leads to an adjustment of mobility, but does not replace, stimulate, or eliminate it. An example is the adjustment of a departure time or a route as a reaction to the receipt of travel information (through the use of IT).

- *Neutrality effect*: The use of IT has no impact on other activities and related travel. Examples are online gaming, impulse purchases over the Internet, and online music sharing.

In many studies only the substitution effects are considered.

Mobility effects of specific types of E-activities

E-commerce

Buying through online shops leads to different, contradictory effects on mobility. Sometimes mobility is directly reduced, for instance when a holiday is booked through the Internet instead of at a travel agency. Sometimes the E-shopping generates physical mobility, for example when the consumer receives coupons by e-mail, which he or she needs to spend at a physical store. Physical shopping can also be a necessary part or a side effect of the online shopping, for example when products bought online need to be picked up and/or must be paid for at a physical store. Products that are purchased through the Internet, but would not have been bought without the Internet, do not affect the mobility of persons.

Shopping on the Internet also has an impact on freight traffic. Consumer products purchased on the Internet usually need to be delivered to the home address. What the impact is varies by type of product. Nearly 80% of all online purchases generate a freight movement, either with a delivery at home or at the working address (Weltevreden and Rotem-Mindali, 2009). About 10% of online purchases are picked up by the consumer at a post office, a delivery point, or at a shop. In these cases, there is thus both passenger and freight mobility involved. Products such as tickets and music are digitally delivered (7%); in this case no physical mobility is involved.

In general, E-shopping leads to a slight decrease in the number of trips and the number of kilometres in personal mobility, and to a slight increase in freight movements and kilometres. E-commerce between individuals (C2C commerce), for example through sites like e-bay, lead to a greater number of trips and higher number of kilometres. This applies to both passenger and freight transport (Weltevreden and Rotem-Mindali, 2009). This is partly because impulse purchases are involved (50%), which normally would not have been made, partly because consumers pick up the goods from people who live

further away than the store where they would have normally bought it, and partly because the purchase involves a parcel service delivery.

E-working

E-working also has several conflicting effects on mobility. Its primary effect is a substitution effect, whereby the physical commute is replaced by telecommuting. In the second place, there can be a modification effect. When travel and/or working hours are adjusted and/or activity chains changed (for instance getting the children from school first and work some extra hours in the evening), overall mobility remains equal. This modification effect can still be felt on the road, because the mobility is better spread over the day (Ministry of Infrastructure and the Environment, 2011). E-working can also lead to an increase in mobility. For instance when the car left home by the person working at home is, meanwhile, used by another member of the household (generation effect) for other types of trips (care, shopping). Little is known, therefore, about the net impact of E-working on mobility.

Internet banking

*M*ainly involves substitution effects. The physical visit to the bank is replaced by a virtual visit. However, the decrease in personal mobility is limited, as people rarely went out only to visit the bank. Such a trip was usually combined with other shopping activities.

E-conferencing

Face-to-face meetings and video conferencing serve different purposes and, therefore, complement each other. Face-to-face meetings are especially suited to create confidence, to negotiate, and (for first time meetings) to get acquainted. Videoconferencing is usually chosen for exchange of information, project activities, contact with (international) headquarters, and follow-up conversations. Therefore, there are mostly neutrality effects involved, and only limited substitution effects. When substitution is at all involved, this is mainly on (international) air travel (Denstadli *et al*., 2012). At a maximum rate of application, E-conferencing is estimated to be able to replace about 5 to 17% of international business air travel (Mensink, 2010). However, E-conferencing also has a limited generation effect, because of the generated need to have occasional physical meetings. No information is available on the substitution effects of video conferencing on Dutch (car) mobility.

E-spending on leisure time

Very little is known about the effects of E-spending on leisure time. Recent empirical studies do not indicate a substitution effect (Andreev *et al.,* 2010). Social network activities through the Internet mainly facilitate the maintenance of existing contacts (Boyd & Ellison, 2007; Ellison *et al.,* 2007). Social contacts through the Internet could possibly lead to fewer trips with a social purpose (Veldkamp, 2012). Besides this, there could also be a limited generation effect, because of the wish to physically meet people whom one has met through the Internet. However, the size of this effect is unknown. Finally IT can also have modification effects — for instance, because by means of mobile devices, the time and location of meetings can quickly be changed and communicated.

Conclusion

It is certain that the increasing digitisation of society has an impact on mobility. However, from the available literature and data, it is often difficult to deduce how large the net impact is.

A straight answer to the question whether IT has an impact on mobility cannot be given. As shown above, the various E-activities have different effects on mobility. Virtual activities may either lead to a decrease in mobility, an increase of mobility, or an indifferent effect on the volume of mobility, and can have side effects in terms of shifting the volume in time (for instance from a peak to an off-peak period). Table 5 shows the different types of E-activities and summarises the kind of effects on mobility that can be expected.

Type of E-activity	Substitution	Neutrality	Modification	Generation	Efficiency
E-working	X		X	X	
Business to Consumer E-commerce	X	X	X	X	X
Consumer to Consumer E-commerce	X			X	
Internet banking	X				
E-conferencing	X	X		X	
Leisure time spent on Internet	X		X	X	X

Table 5. **Expected effects on mobility from different types of E-activities**

We cannot offer a conclusive explanation for the observed stabilisation in car mobility resulting from increased E-activities. To be able to establish the impact on car mobility of the e-society, more research is needed.

In addition, it is interesting to note that we are in the middle of fast changing IT capabilities. The use of mobile devices (smartphones and tablets) is growing very rapidly. Unlike Internet on fixed PCs, mobile Internet will ensure that activities can really be carried out 'footloose', enables constant adjustments of activity patterns and associated transport activities, and enables 24-hour contact between individuals. The expectation is that the impact of IT on the mobility will further increase in future.

4.5. Increased international mobility of the Dutch population

Strong increase in trips abroad, but they are modest in numbers

The Dutch are increasingly travelling abroad, not only to go on holiday, but also to work, to visit family and friends, or to stay in their second houses somewhere in France or Spain. During the time that we are abroad, we cannot make any trips in the Netherlands. The levelling off of the growth in car mobility might have something to do with the increase in international travel, whether by car, train, or plane. The international mobility of the Dutch population was analysed using data from the Continuous Holiday Survey (CVO) for 2002 to 2011, and the Mobiliteitsonderzoek Nederland (MON) for 2004 to 2009. This means that not all foreign mobility is in this analysis. Business travellers, students who study abroad for a longer period, expatriates, and retired people staying in southern Europe during the winter, are examples of groups that are not in the analysis. Similarly, the mobility of foreigners in the Netherlands is not part of the analysis, because of a lack of information regarding such groups.

The total number of trips made by the Dutch population that cross the border is estimated to have increased by around 18% between 2004 and 2009, while their trips on national soil have hardly changed during the same period. Together, the Dutch made around 150 million trips abroad in 2009, which is about 2% of the total of national trips (excluding bicycle and walking).

About 88% of the trips to and from abroad concern daily international trips for work, shopping, studying, etc. Two thirds of these trips are shorter than 50 km. The favourite destinations for daily activities are Belgium and Germany. The daily trips are mainly made to visit our neighbouring countries for leisure activities, and to a lesser extent for work, education, or shopping. The car is the favourite mode (see Figure 15). Over the years, the proportion of the use of the car for shopping and leisure declined at the expense of other modes of transport. Plane and train become more important. Perhaps the introduction of the fast trains (ICE and TGV) has been of significance here. For work-related trips, the share of the car has been more or less constant.

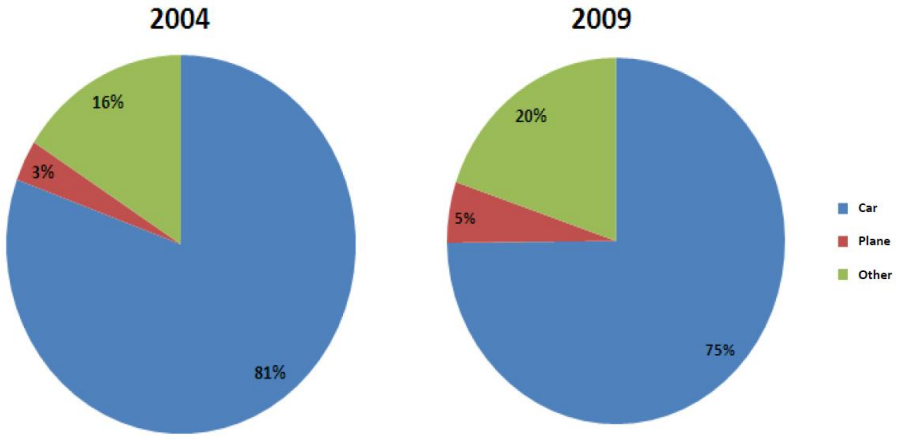

Figure 15. **Mode distribution for Dutch trips abroad (excluding holidays)**
Source: KiM based on MON-data

Strong increase in kilometres travelled during holidays

The remaining 12% of the international trips are for holidays (defined as a stay abroad of 3 days or longer). The number of foreign holiday trips increased by 11% between 2002 and 2011; the number of kilometres involved increased by 34%. Nowadays, a Dutch holiday trip involves on average around 3,500 kilometres (return distance). In total, in 2011 the Dutch travelled about 65 billion kilometres for foreign holidays, which is 34% more than in 2002. Measured in kilometres, this is approximately equal to one third of the total domestic mobility. Foreign holiday destinations are further away and the stay abroad is longer than for non-holiday activities. On average, a trip lasts 10 days per person. This duration of the foreign trip has not changed over the last 10 years. However, because they take a holiday more often, the Dutch on average stay abroad a bit longer than 10 years ago.

For holidays abroad, the plane is becoming more and more important (see Figure 16). In 10 years' time, its share in holiday trips has increased from 25 to 35%. Measured in kilometres, the share grew from 59% in 2002 to 71% in 2011. The rise of the plane was at the expense of the car, which saw its share in longer holiday trips decline.

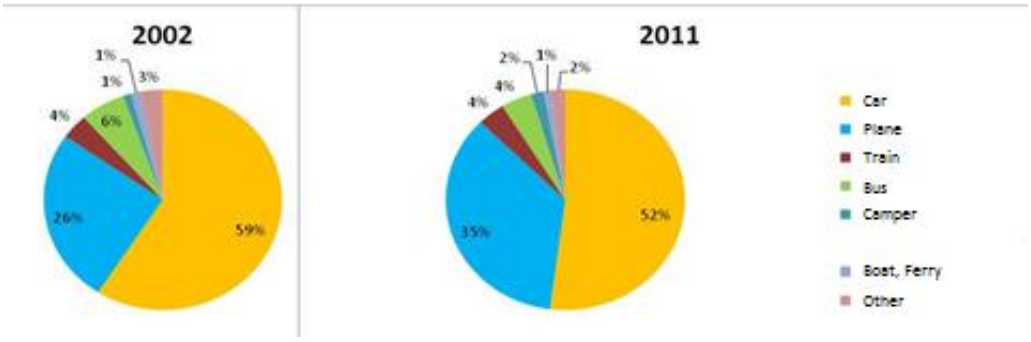

Figure 16. **Mode distribution for foreign holiday trips by the Dutch population**

However, it is interesting to see that, although the car is used less to travel to the holiday destination, in the case of about 11% of holidays abroad, a car is hired locally. With these cars, the Dutch travel on average about 1150 kilometres during their trip. People that use their own car for the holiday trip, on average drive around about 440 kilometres around their holiday destination (Peeters et al., 2010). This means extra holiday car mobility of the Dutch of around 5 billion kilometres, which is about 1% of domestic car use.

Regarding foreign holidays, Germany has overtaken France as the favourite holiday destination. Traditional destinations such as the Ardennes and Luxembourg have lost importance. The destinations in the sun have shifted somewhat further away; somewhat less use of Greek destinations in favour of more use of Turkey and Egypt; somewhat less to the Costa Brava and some more to the Algarve. More exotic destinations in Asia, Africa, and South America have seen a strong growth, as have visits to Indonesia and the Netherlands Antilles. There are strong fluctuations in destinations from year to year, which may be due to regional social unrest or natural disasters.

Conclusion

In recent years, the international mobility of the Dutch has significantly outpaced the growth in mobility within the Netherlands. However, the contribution to the explanation for the slowdown in the growth of domestic car mobility has been limited. This is because the total volume of international trips relative to that in the Netherlands is small — about 2% (not including walking and cycling).

4.6. Synthesis: Causes of the levelling off in car mobility

Based on an inventory of the kind of drivers considered in research in other countries, and based on the findings of analysis of developments in the Netherlands, we have considered the following four possible explanations for the levelling off in car mobility:

1. Possible signs of saturation in direct influencing factors;
2. Changing mobility of young adults;
3. The rise of the Internet society;
4. Increased international mobility of Dutch inhabitants.

Saturation in direct influencing factors: limited contribution

Between 2000 and 2010, persons between 18 and 29 years have contributed considerably to the reduction in car use. Unlike other Western countries, in the Netherlands there has been little effect through changes in direct influencing factors such as car ownership, driver's license holding, or income. These factors appear to play only a minor role in the explanation of the levelling off in car mobility. An exception is the development in labour participation by women. After a strong increase, this has stabilised since 2008; from this year, a slight decrease in the labour participation by men can be seen. All in all, the contribution of possible saturation phenomena appears to be limited.

Changing mobility of young adults: substantial contribution

The (car) mobility of young adults has decreased sharply since 1995, both in terms of the number of trips and the number of kilometres travelled (also when the changes in size of this age group is taken into account). Usual factors, such as holding a driver's license and car ownership, changed very little over time and offer no adequate explanation for the decrease. The employment rate among young women has reached a ceiling, and may have had some influence. The number of working young adults has declined, while at the same time a lot more of them participated in higher education. This process went hand in hand with a substantial shift towards living in high density urban areas. Combined with the lower car ownership levels in this group this has led to fewer work-related car trips. Although much quoted in publications on reduced car mobility, a significant change in the attitudes of young adults could not be determined. The possible impact of such a trend remains unclear. The same applies to the impact of the increasing use of social media and smart phones, which could not (yet) be established.

The rise of the Internet society: possible contribution, not to be determined

Many expect that changing different types of physical activities into virtual activities has led to a decrease in (car) mobility. This will certainly have been the case, but these developments in E-activities also generate new activities, with associated mobility. The strong growth in E-commerce has had an effect on the number of (shopping) trips, the kilometres travelled, and the number of trips and kilometres involved in deliveries. For the time being, it remains unclear the extent to which this has led to a substantial contribution to the levelling off of car mobility. This also holds for the introduction of E-working and the use of social networks for leisure activities.

Increased international mobility: limited contribution

In recent years, the international mobility of the Dutch has significantly outpaced the growth in mobility within the Netherlands. However, the contribution to the explanation for the slowdown in the growth of domestic car mobility is limited. This is because the

total volume of international trips relative to that in the Netherlands is small — about 2% (not including walking and cycling).

5. IMPLICATIONS FOR POLICY DEVELOPMENT AND ASSOCIATED RESEARCH QUESTIONS

The levelling off of car mobility in the Netherlands and the findings from the analysis looking at causes for this phenomenon have some implications for policy development and research.

The need to deal with an even more uncertain future

A first policy implication is related to the question whether the levelling off of car mobility in the Netherlands is a phenomenon that will continue, because of systematic 'new' developments which were never before acknowledged, or that it is just a temporary development, caused by 'normal' fluctuations in demand over time. The answer to this question could be of major consequence for policy development in terms of the need for extra infrastructure capacity and the associated funding.

From the analysis, it is clear that some of the causes found are already taken into account in the long-term scenarios for the development of road traffic that are currently used by the Ministry of Infrastructure and the Environment in program and project assessments (Ministry of Infrastructure and the Environment, 2011b). Examples of this are changing car ownership levels, demographic change, and spatial distribution of houses and working locations. A difference with these projections might be that some of these developments have manifested themselves somewhat earlier than expected previously. However, this should not have a strong impact on long-term projections.

Little contribution to the levelling off of car mobility could be determined from the analysis of other causes studied. Either the contribution was very modest, or it was not possible to determine a contribution because of lack of data. This implies an (extra) uncertainty for the existing projections for future developments.

Another issue is the economic crisis, which somewhat 'troubles' the analysis, but must have had a downward effect on car use over the last few years; but it can lead to an increase in car mobility when the economy starts to grow again. Based on this, and on the fact that traffic volumes are also influenced by predicted increases in freight volumes, it is not to be expected that the development in road traffic will move out of the bandwith of current projections. These projections show modest to moderate growth in traffic volumes over the next decades. However, it can be concluded that the development will most probably be close to the lower bound of the bandwith (modest growth).

The large uncertainties should be an extra impulse for policymakers to focus on low growth scenarios in addition to the more common high growth scenarios. From a policy point of view, this suggests that more attention in policy development be given to adaptive strategies, to avoid the supply of costly overcapacity in the transport system.

A related research question here is what instruments are available and can be applied for designing adaptive policies?

More policy attention for groups

The analysis of the levelling off of car mobility shows rather large differences in the development of mobility behaviour in different segments of mobility (age groups, trip purposes). These differences suggest that more specific attention be given to differences between groups in the policymaking process.

Specific research questions here are what effect changing preferences towards the car among young adults could have on policymaking, what can be expected regarding the future mobility behaviour of current young adults, and to what extent does the current mobility behaviour of young adults influence the behaviour of other age groups?

Changing travel patterns require a more robust transport system

A more adaptive policy regarding the supply of infrastructure will undoubtedly lead to a system that makes better use of existing capacity and will have less overcapacity. However, in society we also see a very fast penetration of mobile Internet devices, such as smartphones and tablets. These devices enable the traveller to respond very quickly to activities or events which he/she would otherwise not have noticed. The total transport system (with little overcapacity), will have to be able to cope more and more with such new types of fluctuations in demand. This requires extra policy attention for network management aimed at providing robust system solutions.

Focus on re-urbanisation

The analysis shows that part of the explanation for the levelling off of car mobility is related to the process of re-urbanisation. This process will come with an increased number of trips related to the high density urban areas. This may require specific policy attention for the interactions between local and national infrastructure networks.

Related research questions are to what extent the re-urbanisation trend will continue, and what it means for the position of various travel modes within the mobility system.

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