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Oakil, A.T.M.; Manting, D.; Nijland, H.

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# Determinants of car ownership among young households in the Netherlands: the role of urbanisation and demographic and economic characteristics

Oakil, ATM; Manting, D. and Nijland, H.

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## Abstract

In the Netherlands, car ownership among young adults has slowly decreased in recent decades. The main causes of this trend are still unclear. Using a unique dataset in which vehicle registration data were combined with population and income register data for 2012/2013, this paper explores how car ownership among young Dutch households varies with household composition, urbanisation level (of household location), household income, employment status and ethnic background. Logistic regression analysis of this data revealed that urbanisation level and household composition are essential factors influencing car ownership. In addition, we found significant interaction effects between these two factors: the influence of urbanisation level on car ownership was much stronger for young couples than for young families or singles. Our results imply that increasing urbanisation and postponement of parenthood could reduce future car ownership among young adults in general. However, the increasing number of young families moving to more urbanised areas could increase future car ownership in cities.

Key word: Car mobility; Demography; Generation Y; Life stage; Millennials; Urbanisation

## 1. Introduction

In the past two decades, car travel by young adults has been declining in a number of developed nations (Blumenberg et al., 2012; [Delbosc and Currie, 2014](#); [Kuhnimhof et al., 2011](#); [Kuhnimhof et al., 2012](#); [Sivak and Schoettle, 2012](#)). There is much debate on the causes of this trend (Goodwin and Van Dender, 2013); factors considered include increased urbanisation, increased singlehood, the upcoming of e-communication, higher car mobility costs, increased economic insecurity and changing life styles. Demographic trends seem to be more important than economic developments or technological change (Metz, 2013); in particular, the role of traditional factors (such as income) appears to have weakened over the years (Goodwin and Van Dender, 2013). Besides these doubts on the most important causes of decreased automobility among young adults in developed countries (Goodwin and Van Dender, 2013), there are also some remarkable differences between the countries studied (IFMO, 2013). In this paper, we focus on car ownership among young adults in the Netherlands.

Like in many other countries, car ownership also has declined among young Dutch adults. For the 20–25 age group, it declined from 30% in 2000 to 25% in 2013, and for those aged 25 to 30, the respective decline was from 52% to 46%. Understanding trends in car ownership is important for policy-making and identifying future mobility scenarios, because car ownership is a major determinant of car use (Traa et al., 2014). Up until now, trends in car mobility among young adults in the Netherlands were explained mostly by aggregate demographic and economic trends ([van der Waard et al., 2013](#)). In contrast, our paper focuses on micro-level determinants (similar to [Delbosc and Currie \(Delbosc and Currie, 2014\)](#)). Using a unique dataset in which Dutch vehicle registration data were combined with population and income register data for 2012/2013, we addressed the question of how urbanisation level (household location) influences car ownership among young households, and whether this effect differs between household compositions (young singles, young couples, young families).

First, we describe the background literature of this study and our specific research questions. Following a description of the data set and methods, we present the results of logistic regression analysis of car ownership among young singles, couples, and families in the Netherlands. We

conclude with a discussion on how our results add to current insights into youth mobility, and the implications for future scenarios and policy-making.

## 2. Background literature and research questions

According to Goodwin and Van Dender (Goodwin and Van Dender, 2013), the recent decline in car use in developed countries may be explained by many factors, including traditional economic factors (such as fuel prices, taxes and national income growth), changes in quality and reliability of different transport modes, land-use planning (such as inner-city redevelopment), and changes in individual demographic behaviour, car preferences and life styles (such as postponement of parenthood and increased migration to cities). These trends will probably also influence car ownership among young Dutch adults. For example, like in many other countries, young adults in the Netherlands increasingly move to cities and postpone having children. The number of singles and students has also increased (Manting, 2014; van der [Waard et al., 2013](#)).

Recent studies on youth mobility in various countries show that car mobility among young adults is lower in cities than in rural areas, increases with age, and is higher among young families than among young childless couples ([Delbosc and Currie, 2014](#); IFMO, 2013; [Kuhnimhof et al., 2011](#)). Many factors may contribute to lower car ownership in Dutch cities. Here, public transport and bicycling are good alternatives to driving, while parking costs are higher than in rural areas. Furthermore, most cities have large populations of students, who have (almost) free access to public transport and generally cannot afford to have a car. Hence, many young adults living in cities will prefer to use public transport (or a bicycle) over driving a costly car. Other groups concentrated in cities include immigrants, who tend to use public transport more than private cars ([Harms, 2007](#)), and young singles, among whom car ownership is generally lower than among families or couples ([Potoglou and Kanaroglou, 2008](#)). All in all, there are enough reasons to assume that car ownership among young adults in the Netherlands will be lower in highly urbanised areas than in suburban and rural areas.

It is also a common finding that car ownership among singles is lower than for households with children ([Potoglou and Kanaroglou, 2008](#)). This could be the result of singles having lower household incomes than families, or singles being jobless more often than parents. Another reason might be that families have more complex daily travel patterns, including trips to work, school and leisure activities. Child-related travels and activities are also more constrained in time and place compared to other household activities ([Kitamura, 1983](#)). For instance, child-related travels and activities limit the possibility to avoid rush-hours ([Oakil et al., 2015](#)). This relative inflexibility may lead to higher car dependency and thus could explain the higher level of car ownership among families with children compared to singles and childless couples.

Transport research in various countries has already established the importance of demographic characteristics (such as household composition) and urbanisation level for understanding car mobility (and, in some studies, car ownership) ([Bhat and Guo, 2007](#); [Cervero and Kockelman, 1997](#); [Dargay, 2002](#); [Golob, 1990](#); [Nolan, 2010](#); [Oakil et al., 2014](#); [Prevedouros and Schofer, 1992](#); [Rosenbloom, 1993](#); [Van Acker and Witlox, 2010](#)). However, these studies do not explicitly address the determinants of car ownership among young adults in the Netherlands. Hence, the first objective of our paper is to explore the influence of urbanisation and household composition on car ownership among young Dutch adults, after controlling for demographic and economic differences. Our second objective is to assess possible interactive effects between household composition and urbanisation level. Young singles, couples and families may experience different travel constraints and opportunities depending on their residential location. For example, couples living in high density areas were found to share more out-of-home household tasks than couples living in low density

areas (Schwanen et al., 2007). Moreover, travel mode preferences may vary per household type. The effect of urbanisation will be smaller for households that own a car because it is their preferred mode of travel, irrespective of where they live (Cao et al., 2009). Therefore, it is important to look at the interaction between household composition and urbanisation level. To the best of our knowledge, this has not yet been studied specifically for young adults in the Netherlands.

In summary, this paper aims to gain insight into micro-level determinants of car ownership among young Dutch households. In line with the above discussion, the paper addresses two specific questions:

1. To what extent does urbanisation level influence car ownership among young Dutch adults, after controlling for household composition, age, ethnic background, employment status and income?
2. To what extent does the effect of urbanisation level on car ownership among young Dutch adults vary with household composition?

### **3. Data and methods**

#### **3.1. Data sources**

To perform our analyses we used a pooled data set with a limited number of variables, combining vehicle registration data with register data from the Social Statistical Database (SSD) of Statistics Netherlands (Bakker, 2002) (data on population and households, employment and income, and residential location). The SSD data refer to 31 December 2012 and the vehicle registration data to 1 January 2013. All the data sets were pooled using unique person identification numbers created by Statistics Netherlands; mismatches (about 5 %) were excluded from the analyses. These large data sets facilitate the investigation of relatively small subgroups within the population, such as young families living at different locations. However, the data sets include only a limited number of variables, and hence do not allow to analyse many different factors.

#### **3.2. The selection of young households**

From the pooled data set, we selected young households in which all adults were 18 to 29 years old. Hence, only young adults living alone, as a couple or as a single-parent or two-parent family were selected. Of the 2,487,000 young Dutch adults in 2012, excluded from the analysis were about 1,042,000 young adults living with their parents, 22,000 living in institutional households (e.g. mental institutions or prisons) and 74,000 in undefined circumstances (category 'other'). Furthermore, about 248,000 young adults were excluded due to mismatches between data sets, missing values and consideration of households in which all adults were 18-29 years old. As a result, about 1,101,000 young adults, which constitute 861,000 young households, were analysed.

#### **3.3. Description of the variables**

The dependent variable in our analysis was household car ownership, being either 'zero' or 'one or more' (private and/or company cars). No distinction was made between 'one car' and 'more than one car' because in the Netherlands only a minority of young households (8 %) owns more than one car.

Several independent variables were included. Urbanisation level was defined by the number of addresses per km<sup>2</sup> in the 4-digit postcode area of the household's address. Following Statistics Netherlands, five urbanisation levels were distinguished: i) very high density areas with  $\geq 2500$  addresses per km<sup>2</sup>; ii) high density areas with 1500–2500 addresses per km<sup>2</sup>; iii) moderately high

density areas with 1000–1500 addresses per km<sup>2</sup>; iv) low density areas with 500–1000 addresses per km<sup>2</sup>; and v) very low density areas with < 500 addresses per km<sup>2</sup>. Household composition included four types: young singles, young couples, young two-parent families and young single-parent families. Employment status was either unemployed or employed; in the latter case at least one member of the household held a (full-time or part-time) job on 31 December 2012, excluding self-employment. Although studies on car ownership use different ways of measuring household income (Dargay, 2002; Nolan, 2010; Oakil et al., 2014; Potoglou and Kanaroglou, 2008), we preferred to use household disposable income instead of standardising household income by household type. This was preferred because we assumed that car ownership among households depends more on the total income a household has than on standardised household income, especially so among young households, because they have a relatively low household income. In line with other studies (for example, (De Groot et al., 2011; Licaj et al., 2012)), household disposable income was categorised in quartiles, corresponding to < 7,600 euros/year, 7,600–15,800 euros/year, 15,800–24,800 euros/year, and > 24,800 euros/year. The age of the household's reference person was calculated by subtracting year of birth from 2012; four age categories were considered (18-20, 21-23, 24-26 and 27-29 years, respectively). Finally, we included ethnic background as an independent variable, because there are large differences in car ownership among ethnic groups and because most immigrants live in cities. In line with the approach of Statistics Netherlands, we classified households as either native Dutch, western immigrant or non-western immigrant, based on the country of birth of the household's reference person as well as the country of birth of his/her parents.

### 3.4. Statistical analysis

Following a descriptive analysis of the data set, we conducted various logistic regression analyses to assess the effect of urbanisation level and household composition on car ownership among young adults, after controlling for effects of household income, employment status, age and ethnic background. Interaction effects between urbanisation level and household composition were also tested. Regression analysis was chosen in order to unravel the effects of urbanisation level and other independent variables and any interaction effects, controlling for unobserved heterogeneity.

## 4. Descriptive analysis

Descriptive analysis of our data set (Table 1) shows that the majority of young households in the Netherlands (excluding young adults still living at home) have no car (60%), live in urbanised to highly urbanised areas (70%), and are singles (68%). About a fifth of young households are couples, and about a tenth are families (7% two-parent families, 4% single-parent families). The majority of young households have at least one job (68%) and are classified as native Dutch (69%). These data do not cover self-employment, and do not distinguish between part-time and full-time jobs. Based on other data sets (CBS and RWS, 2014), it can be assumed that more than half of young adults with a job have a full-time job (at least 30 hours per week).

**Table 1: Descriptive statistics of car ownership among young households in the Netherlands, and related demographic and economic factors.**

	Frequency (in thousands)	Percentage <sup>1</sup>
Household car ownership		
Households without a car	518	60
Households with at least one car	342	40
Age of household reference person		
18-20 years	97	11
21-23 years	197	23
24-26 years	271	31
27-29 years	297	34

Ethnic background of household reference person		
Native Dutch	592	69
Western	117	14
Non-western	151	18
Household composition		
Young couples	182	21
Young singles	587	68
Young two-parent families	58	7
Young single-parent families	34	4
Household employment		
Unemployed	279	32
At least one household member employed	582	68
Household disposable income per year		
1st quartile (< 7,600 euros)	215	25
2nd quartile (7,600–15,800 euros)	215	25
3rd quartile (15,800 euros–24,800 euros)	215	25
4th quartile (> 24,800 euros)	215	25
Urbanisation level		
Very high density areas with $\geq 2500$ addresses per km <sup>2</sup>	386	45
High density areas with 1500–2500 addresses per km <sup>2</sup>	217	25
Moderately high density areas with 1000–1500 addresses per km <sup>2</sup>	111	13
Low density areas with 500–1000 addresses per km <sup>2</sup>	86	10
Very low density areas with < 500 addresses per km <sup>2</sup>	60	7
<b>Total households</b>	<b>861</b>	<b>100</b>

<sup>1</sup> because of approximation percentage may not add up to 100 %.

When analysing the distribution of young households over different urbanisation levels (Table 2), we observe that the majority of young households live in urbanised to highly urbanised areas: in particular, young singles, couples and single-parent families live here. For instance, about three quarters of young singles live in urbanised to highly urbanised areas, compared to less than half of young families.

**Table 2: Distribution of young households over different urbanisation levels**

Urbanisation level	Young household compositions									
	Singles		Couples		Two-parent families		Single-parent families		Total	
	Freq. *000	%	Freq. *000	%	Freq. *000	%	Freq. *000	%	Freq. *000	%
Very high density areas with $\geq 2500$ addresses per km <sup>2</sup>	303	52	60	33	11	19	13	37	386	45
High density areas with 1500–2500 addresses per km <sup>2</sup>	145	25	46	25	16	28	11	32	217	25
Moderately high density areas with 1000–1500 addresses per km <sup>2</sup>	64	11	30	16	12	21	5	15	111	13
Low density areas with 500–1000 addresses per km <sup>2</sup>	46	8	27	15	10	18	3	10	86	10
Very low density areas with < 500 addresses per km <sup>2</sup>	30	5	20	11	8	15	2	6	60	7
<b>Total</b> <sup>1</sup>	<b>587</b>	<b>100</b>	<b>182</b>	<b>100</b>	<b>58</b>	<b>100</b>	<b>34</b>	<b>100</b>	<b>861</b>	<b>100</b>

<sup>1</sup> because of approximation percentage may not add up to 100 %.

## 5. Logistic regression analysis

To answer our first research question (to what extent does urbanisation level affect car ownership among young households), we compared a logistic regression model in which urbanisation level was the only explanatory variable (Model 1 in Table 3) to a model in which demographic and economic characteristics such as age, ethnicity, household composition, employment and income were also included (Model 2, Table 3). This should improve our understanding of how demographic and economic variables interact with the effect of urbanisation level on car ownership. Model 1 shows that the likelihood of household car ownership decreases with urbanisation level: young households are less likely to own a car when they live in high density areas (low odd ratio), and more likely to own in car in low density areas (high odd ratio). Model 2, which includes demographic and economic factors, shows a similar effect of urbanisation level on car ownership, although this effect is somewhat reduced in the presence of the additional explanatory variables ( $\beta$ -coefficients for urbanisation level are reduced by about 20%). Including demographic and economic factors does improve overall model performance (pseudo rho-squared increases from 0.09 in Model 1 to 0.37 in Model 2). Furthermore, the results of Model 2 show that the likelihood of car ownership is lower for young adults who are relatively young (18-20 years), single or unemployed, or who have an immigrant background or low income. These groups often live in urban areas. For instance, about 40% of young households in very high density areas are unemployed compared to about 20% in very low density areas in our data set. Hence, the lower likelihood of owning a car in urban areas is partly due to differences in age, household composition, income, employment status and ethnic background of young adults living in cities versus less urbanised areas. In other words, the effect of urbanisation level on car ownership among young adults can be partly explained by underlying demographic and economic factors.

Model 2 confirms that car ownership among young adults is also influenced by household composition (Table 3). Young singles and single-parent families are the least likely to own a car, whereas two-parent families are the most likely to own a car, compared to childless couples. This result suggests that, besides household income, age and employment situation, other factors not included in the model affect car ownership as well; in particular, the more complex travel and activity patterns of families (compared to childless couples and singles) could also be important. Finally, model 2 confirms results of earlier studies in the Netherlands and other countries ([Cervero and Kockelman, 1997](#); [Clifton and Lucas, 2004](#); [Dargay, 2007](#); [Golob and Van Wissen, 1989](#); [Nolan, 2010](#); [Potoglou and Kanaroglou, 2008](#)). For instance, within the age range of young adults (18-29 years) the oldest households are more likely to own a car than the younger households. Furthermore, young non-western households are less likely to own a car than young Dutch households, while young western households are least likely to own a car. One explanation for the latter may be that young western households often consist of students (mainly from European countries). In line with other studies, we found that young adults with the highest income (4<sup>th</sup> quartile, > 24,800 euros) are much more likely to own a car compared to the lowest income group (1<sup>st</sup> quartile, < 7,600 euros). In addition, households with one or more working members are more likely to own a car than households without employment, which may be explained by the fact that people with a job often need a car for commuting to work and generally have more money than people without a job.

**Table 3: Results of logistic regression analysis**

	Model 1		Model 2		Model 3	
	$\beta$	odd ratio	$\beta$	odd ratio	$\beta$	odd ratio
<b>Urbanisation level</b>						
Very high density areas with $\geq 2500$ addresses per km <sup>2</sup> (ref.)						
High density areas with 1500–2500 addresses per km <sup>2</sup>	0.88	2.41	0.76	2.14	0.94	2.56
Moderately high density areas with 1000–1500 addresses per km <sup>2</sup>	1.35	3.86	1.06	2.89	1.36	3.90
Low density areas with 500–1000 addresses per km <sup>2</sup>	1.75	5.75	1.36	3.90	1.72	5.58
Very low density areas with $< 500$ addresses per km <sup>2</sup>	2.02	7.54	1.61	5.00	2.01	7.46
<b>Household composition</b>						
Young couples (ref.)						
Young singles			-0.33	0.72	-0.17	0.84
Young two-parent families			0.52	1.68	0.92	2.51
Young single-parent families			-0.70	0.50	-0.13	0.88
<b>Age of household reference person</b>						
18-20 years (ref.)						
21-23 years			0.77	2.16	0.77	2.16
24-26 years			1.28	3.60	1.29	3.63
27-29 years			1.54	4.66	1.55	4.71
<b>Ethnic background of household reference person</b>						
Native Dutch (ref.)						
Western			-0.70	0.50	-0.70	0.50
Non-western			-0.18	0.84	-0.20	0.82
<b>Household employment</b>						
Unemployed (ref.)						
At least one household member employed			0.70	2.01	0.69	1.99
<b>Household disposable income per year</b>						
1st quartile ( $< 7,600$ euros) (ref.)						
2nd quartile (7,600–15,800 euros)			0.69	1.99	0.69	1.99
3rd quartile (15,800–24,800 euros)			1.77	5.87	1.77	5.87
4th quartile ( $> 24,800$ euros)			2.74	15.49	2.73	15.33
<b>Interactions</b>						
High density areas * Singles					-0.18	0.84
Moderately high density areas * Singles					-0.33	0.72
Low density areas * Singles					-0.40	0.67
Very low density areas * Singles					-0.46	0.63
High density areas * Two-parent families					-0.52	0.59
Moderately high density areas * Two-parent families					-0.66	0.52
Low density areas * Two-parent families					-0.76	0.47
Very low density areas * Two-parent families					-0.71	0.49
High density areas * Single-parent families					-0.71	0.49
Moderately high density areas * Single-parent families					-0.99	0.37
Low density areas * Single-parent families					-1.08	0.34
Very low density areas * Single-parent families					-1.10	0.33
Constant	-1.17		-3.85		-3.99	0.02
<b>Pseudo rho-squared</b>	<b>0.09</b>		<b>0.37</b>		<b>0.37</b>	

Note: All variables are significant at the 99 % level.



To answer our second research question (to what extent does the effect of urbanisation level on car ownership among young adults vary with household composition), we tested a third model, including an interaction variable between household composition and urbanisation level (Model 3, Table 3). Although the inclusion of the interactions did not improve the overall explanatory power of the model, all interaction effects were negative. This means that the effect of urbanisation level on car ownership varies with household composition. These interactions are further clarified in two additional tables (Table 4 and 5), which combine base effects and interaction effects from Model 3, using 'young couples' and 'very high density areas' as reference category for household composition and urbanisation level, respectively. Table 4 shows the effect of household composition on car ownership when the urbanisation level is fixed (calculated by adding the coefficient values of household composition and interaction variables), while Table 5 shows the effect of the urbanisation level on car ownership when household composition is fixed (calculated by adding the coefficient values of urbanisation level and interaction variables).

**Table 4: Effect of household composition on car ownership, for different urbanisation levels**

Urbanisation level	Young household compositions						
	Couples	Singles		Two-parent families		Single-parent families	
			$\beta$	odd ratio	$\beta$	odd ratio	$\beta$
Very high density areas	Ref.	-0.17	0.84	0.92	2.51	-0.13	0.88
High density areas	Ref.	-0.17-0.18 =-0.35	0.70	0.92-0.52 =0.40	1.49	-0.13-0.71 =-0.84	0.43
Moderately high density areas	Ref.	-0.17-0.33 =-0.50	0.61	0.92-0.66 =0.26	1.30	-0.13-0.99 =-1.12	0.33
Low density areas	Ref.	-0.17-0.40 =-0.57	0.57	0.92-0.76 =0.16	1.17	-0.13-1.08 =-1.21	0.30
Very low density areas	Ref.	-0.17-0.46 =-0.63	0.53	0.92-0.71 =0.21	1.23	-0.13-1.10 =-1.23	0.29

Table 4 shows that, overall, young two-parent families are more likely to own a car, and young singles and single-parent families less likely to own a car, compared to young couples. This pattern is observed at all levels of urbanisation. However, while young two-parent families are 2.5 times (odd ratio=2.51 /  $\beta$ =0.92) more likely to own a car when they live in the highest density areas, they are only 1.2 times (odd ratio=1.23 /  $\beta$ =0.92-0.71) more likely to own a car in the lowest density areas, compared to young couples at the same locations. In other words, in rural areas car ownership among young two-parent families differs much less from car ownership among young couples than in urban areas. Table 4 also shows that car ownership among young singles and young single-parent families in highly urbanised areas is almost similar to car ownership among couples in these areas, but relatively lower in rural areas. In the latter, the likelihood of young singles owning a car is reduced by half compared to young couples in the same location; for young single parents this likelihood is reduced by two-thirds.

Table 5 shows that the effect of urbanisation level on car ownership is relatively smaller for young singles, two-parent families and single-parent families, compared to young couples. For example, while young couples are 7.5 times (odd ratio=7.46,  $\beta$ =2.01) more likely to own a car in the lowest density areas compared to the highest density areas, young two-parent families are only 3.7 times (odd ratio=3.67,  $\beta$ =2.01-0.71) more likely to own a car in the same comparison. This once again shows that car ownership among young families is less influenced by urbanisation level than car ownership among young couples. This could be explained by the fact that young families are overall more likely to own a car because of the additional travel needs arising from having young children. Since child-related travel and activities are often constrained in time and place, many young families may want a car as a mobility solution irrespective of where they live. However, urbanisation level

still matters to some extent. Young families are still more likely to own a car in low density areas than in high density areas. This may be due to the better accessibility by public transport in high density areas, which reduces time and place constraints and hence the need to own a car. In addition, there has been a growing tendency, especially among highly educated young adults, to stay in the cities even after starting a family. For a number of reasons (for example, housing programmes enabling young adults to remain living in cities, life-style changes concerning commuting, and probably the economic crisis), over the last decade, young families moved to suburban areas less often than before (Manting, 2014).

**Table 5: Effect of urbanisation level on car ownership, for different household compositions**

Young household compositions	Urbanisation level								
	Very high density areas	High density areas		Moderately high density areas		Low density areas		Very low density areas	
		$\beta$	odd ratio	$\beta$	odd ratio	$\beta$	odd ratio	B	odd ratio
Couples	Ref.	0.94	2.56	1.36	3.90	1.72	5.58	2.01	7.46
Singles	Ref.	0.94-0.18 =0.76	2.14	1.36-0.33 =1.03	2.80	1.72-0.40 =1.32	3.74	2.01-0.46 =1.55	4.71
Two-parent families	Ref.	0.94-0.52 =0.42	1.52	1.36-0.66 =0.70	2.01	1.72-0.76 =0.96	2.61	2.01-0.71 =1.30	3.67
Single-parent families	Ref.	0.94-0.71 =0.23	1.26	1.36-0.99 =0.37	1.45	1.72-1.08 =0.64	1.90	2.01-1.10 =0.91	2.48

The relatively smaller effect of urbanisation level on car ownership among young singles and single-parent families, compared to couples, may be due to various reasons. Young singles are often students, who have free public transport passes and therefore may choose to use public transport in cities as well as in lower density areas. Financial constraints will probably also contribute to the generally low car ownership among this group, and among single-parent families. Single-parent families may experience higher financial constraints due to child-related expenses, which may limit their ability to buy and own a car.

To put these results differently, urbanisation level has the strongest effect on car ownership among young couples, for whom the likelihood to own a car increases most strongly with decreasing urbanisation level. Apparently, young couples living in high density areas are better able to reduce the complexity of their travel needs (and hence their car dependency) than young families in these areas.

## 6. Discussion and conclusion

As in many other developed countries, car ownership among young adults is declining in the Netherlands. In 2013, about 60 % of young adults aged 18 to 29 (excluding those still living at home) did not own a car (Table 1). The majority of these young households are singles (68 %), whereas only 11 % includes children (single-parent or two-parent families). Furthermore, the number of young adults moving to cities has increased rapidly over recent years: in 2013, 70 % of the 18- to 29-year-olds lived in (highly) urbanised areas. Based on our analysis, we conclude that both urbanisation and increased singlehood are likely to have contributed to the decline in car ownership among young adults: car ownership among all young households is lower in highly urbanised areas than in suburban and rural areas, and lower among singles than among couples. Two-parent families have the highest probability of owning a car, at all urbanisation levels. If the rise of singlehood and voluntary childlessness continues (as projected by regional population forecasts in the Netherlands), then a further decline in car ownership among young adults is indeed very likely. Household

composition as well as urbanisation level are the most important factors, even after controlling for other relevant demographic and economic variables (Table 2). Our results also support the notion that families with children are much more car-dependent than singles and couples, due to their more complex daily travel needs.

In addition, we found that the effect of urbanisation level on car ownership indeed varies between household compositions. Young two-parent families, for instance, are more likely to own a car compared to couples, irrespective of household location. In high density areas, young singles and couples are much less likely to own a car than young (two-parent) families. Hence, the expected decline in car ownership among young households due to increasing urbanisation will vary with household composition. For example, if the number of young couples increases relative to the number of young families (for instance due to delayed parenthood or increasing voluntary childlessness), then highly urbanised areas will see a greater decline in car ownership than rural areas, where couples are more likely to own a car. This decline will be even stronger if the number of young couples increases relatively more in highly urbanised areas than in rural areas.

In the Netherlands, suburbanisation — especially of young couples and young families — has slowed down significantly during the past few decades. Young families, in particular, increasingly prefer living in the city instead of the suburbs. It is unsure what will happen when the economy recovers in the coming years; will young families and couples planning to start a family 'catch up' and move to the suburbs, or will their preference for living in cities, even after having children, be a long-lasting trend? In the first case, car ownership will decline more rapidly in the cities, but increase in the suburbs; in the second case, car ownership will decline less rapidly in the cities, and also decline (rather than increase) in the suburbs.

Recent transport studies suggest that delays in demographic transitions (such as delayed parenthood) have a significant impact on car mobility (for example, [\(Delbosc and Currie, 2014\)](#)). It is generally assumed that many decisions by young adults are temporary and highly context-dependent (i.e. contingent on their relationship status, economic conditions, current policies, etc.). Some studies suggest that young singles postpone forming permanent relationships and having children, but that they will catch up later. And thus, that car ownership is postponed now but will catch up later. This is indeed possible ([\(Manting, 2014\)](#)), since a large number of young singles and couples will eventually start a family. However, this argument neglects the continuous and increasing trend in (voluntary) childlessness over the generations. To give an indication of the rise in childlessness among older birth cohorts, the proportion of women without children has risen from 14 % (women born 1945–49) to 20 % (women born in 1960–64), whereas childlessness among men has risen from 16 % to 25 % in the same cohorts ([\(CBS, 2010\)](#)). If this trend continues among the younger generations, car ownership is likely to decline even more. Moreover, it is possible that part of the young generation will not catch up on car ownership later in life, because they have become used to living without a car of their own. While some think that the peak car hypothesis is a risky assumption for future transport scenarios ([\(ITF, 2011\)](#)), it is also questionable to assume that the younger generations will catch up on car mobility later in life, reaching car ownership levels of older generations ([\(van der Waard et al., 2013\)](#)).

Our study shows a number of trends that are relevant for future policy and research. Firstly, our results confirm that spatial policies to reduce car mobility through developing compact cities and constructing high density neighbourhoods are indeed likely to discourage car ownership and car dependency. However, our analysis also shows that the impact of such policy interventions may differ between household compositions. Therefore, assessment of these interventions should take into account that car ownership not only varies with urbanisation level but also with household composition.

Secondly, car ownership plays a role in future car use. Goodwin and Van Dender (Goodwin and Van Dender, 2013) identified three scenarios (short-term decline, saturation, and car peak) and argued convincingly that each would be equally likely. Our study shows that yet another uncertainty should be considered: will the present generation of young adults catch up on car ownership later in life, or not? Demographers expect a further rise in singlehood and voluntary childlessness, in addition to further delays in cohabitation and parenthood. Our data set did not allow us to analyse the direct impact of declining car ownership on actual car use. However, even if we could have analysed this relationship for young adults, it still would have been difficult to predict future developments. Will the decline in car ownership among young adults lead to an overall decline in car use, or will young adults more often use cars they do not own (the 'Share Economy')?

The future of transport systems and land use depends — among other things — on the mobility behaviour of next generations. It is imperative that in-depth focus should be given to understand this behaviour. In this regard, our study contributed by looking into the interactive effects of household composition and urbanisation level on car ownership by young adults. However, in our analyses, we could not include young adults still living with their parents, because of a number of restrictions of the data set. This is quite a large group among young adults aged 18–29 and further research is needed. Also, further research should focus on the interplay between demographic transitions (e.g. from singlehood to long-term relationships, to parenthood), household residential choices and mobility patterns.

## 7. References

- Bakker, B.F., 2002. Statistics Netherlands' approach to social statistics: The social statistical dataset. *OECD Statistics Newsletter* 11, 4-6.
- Bhat, C.R., Guo, J.Y., 2007. [A comprehensive analysis of built environment characteristics on household residential choice and auto ownership levels. \*Transport. Res. Part B: Methodol.\* 41, 506-526.](#)
- Blumenberg, E., Taylor, B.D., Smart, M., Ralph, K., Wander, M., Brumbagh, S., 2012. What's Youth Got to Do with It? Exploring the Travel Behavior of Teens and Young Adults. UCLA Institute of Transportation Studies.
- Cao, X., Mokhtarian, P.L., Handy, S.L., 2009. [Examining the impacts of residential self-selection on travel behaviour: a focus on empirical findings. \*Transp. Rev.\* 29, 359-395.](#)
- CBS, 2010. More childless men. Statistics Netherlands, Netherlands.
- CBS, RWS, 2014. Onderzoek Verplaatsingen in Nederland 2012, In: CBS/RWS (Ed.). DANS.
- Cervero, R., Kockelman, K., 1997. [Travel demand and the 3Ds: density, diversity, and design. \*Transport. Res. Part D: Transp. Env.\* 2, 199-219.](#)
- Clifton, K., Lucas, K., 2004. Examining the empirical evidence of transport inequality in the US and UK., In: Lucas, K. (Ed.), *Running on empty: transport, social exclusion and environmental justice.* Bristol, The Policy Press.
- Dargay, J., 2007. [The effect of prices and income on car travel in the UK. \*Transport. Res. Part A: Policy Pract.\* 41, 949-960.](#)
- Dargay, J.M., 2002. [Determinants of car ownership in rural and urban areas: a pseudo-panel analysis. \*Transport. Res. Part E: Logist. Transport. Rev.\* 38, 351-366.](#)
- De Groot, C., Mulder, C.H., Manting, D., 2011. [Intentions to move and actual moving behaviour in the Netherlands. \*Hous. Stud.\* 26, 307-328.](#)
- Delbosc, A., Currie, G., 2014. [Changing demographics and young adult driver license decline in Melbourne, Australia \(1994–2009\). \*Transportation\* 41, 529-542.](#)
- Golob, T.F., 1990. [The dynamics of household travel time expenditures and car ownership decisions. \*Transport. Res. Part A: Policy Pract.\* 24, 443-463.](#)

- Golob, T.F., Van Wissen, L., 1989. A joint household travel distance generation and car ownership model. *Transport. Res. Part B: Methodol.* 23, 471-491.
- Goodwin, P., Van Dender, K., 2013. 'Peak Car'—Themes and Issues. *Transp. Rev.* 33, 243-254.
- Harms, L., 2007. Mobility among ethnic minorities in the urban Netherlands. *Urban Mobility and Social Inequity*. Retrieved from: <http://www.difu.de/en/publikationen/german-journal-of-urbanstudies> 46.
- IFMO, 2013. *Mobility Y: The Emerging Travel Patterns of Generation Y*. Institute for Mobility Research, Zurich, Switzerland.
- ITF, 2011. *Transport Outlook: Meeting the Needs of 9 Billion People*. International Transport Forum/OECD, pp. 2-11.
- Kitamura, R., 1983. *Serve passenger trips as a determinant of travel behaviour*. Recent Advances in Travel Demand. Gower, Aldershot, UK.
- Kuhnimhof, T., Buehler, R., Dargay, J., 2011. A new generation: Travel Trends among Young Germans and Britons. *Transport. Res. Rec.* 2230, 58-67.
- Kuhnimhof, T., Buehler, R., Wirtz, M., Kalinowska, D., 2012. Travel trends among young adults in Germany: increasing multimodality and declining car use for men. *J. Transp. Geogr.* 24, 443-450.
- Licaj, I., Haddak, M., Pochet, P., Chiron, M., 2012. Individual and contextual socioeconomic disadvantages and car driving between 16 and 24 years of age: a multilevel study in the Rhône Département (France). *J. Transp. Geogr.* 22, 19-27.
- Manting, D., 2014. Ruimtelijk beleid kan niet zonder demografische analyse.
- Metz, D., 2013. Peak car and beyond: The fourth era of travel. *Transp. Rev.* 33, 255-270.
- Nolan, A., 2010. A dynamic analysis of household car ownership. *Transport. Res. Part A: Policy Pract.* 44, 446-455.
- Oakil, A.T.M., Ettema, D., Arentze, T., Timmermans, H.J.P., 2014. Changing household car ownership level and life cycle events: an action in anticipation or an action on occurrence. *Transportation* 41, 889-904.
- Oakil, A.T.M., Nijland, L., Dijst, M., 2015. Rush hour commuting in the Netherlands: Gender-specific household activities and personal attitudes towards responsibility sharing. *Travel Behav. Soc.*
- Potoglou, D., Kanaroglou, P.S., 2008. Modelling car ownership in urban areas: a case study of Hamilton, Canada. *J. Transp. Geogr.* 16, 42-54.
- Prevedouros, P.D., Schofer, J.L., 1992. Factors affecting automobile ownership and use. *Transport. Res. Rec.*, 152-160.
- Rosenbloom, S., 1993. *Women's travel patterns at various stages of their lives*, In: Katz, C., Monk, J. (Eds.), *Full circles: geographies of women over the life course*. Routledge, London and New York.
- Schwanen, T., Ettema, D., Timmermans, H., 2007. If you pick up the children, I'll do the groceries: spatial differences in between-partner interactions in out-of-home household activities. *Environ. Plan. A* 39, 2754-2773.
- Sivak, M., Schoettle, B., 2012. Recent changes in the age composition of drivers in 15 countries. *Traffic injury prevention* 13, 126-132.
- Traa, M., Geilenkirchen, G., Hilbers, H., 2014. *Kortetermijnramingsmodel voor het bezit en gebruik van personenauto's in Nederland*. PBL, Den Haag.
- Van Acker, V., Witlox, F., 2010. Car ownership as a mediating variable in car travel behaviour research using a structural equation modelling approach to identify its dual relationship. *J. Transp. Geogr.* 18, 65-74.
- van der Waard, J., Jorritsma, P., Immers, B., 2013. New drivers in mobility; what moves the Dutch in 2012? *Transp. Rev.* 33, 343-359.