PASSENGER CAR OWNERSHIP IN THE CZECH REPUBLIC

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Abstract

The main purpose of this paper is to model the vehicle ownership, specifically, what to examine the main factors of owning a private passenger vehicle by a household during the transition and post-transition period in the Czech Republic. Although, there are studies which analyse consumer's choice on car ownership jointly with car use and/or other choices such as on working or residence location or land use characteristics, we merely examine household decision to own a private car. Specifically, we analyse the effect of main socio-demographic and structural variables on household's choice to own at least one car, and then the choice on the number of private cars their possess. Lastly, we focus on factors that determine household choice for not having a car at all because of a lack of financial resources or of their preference rather stay without a car. Validity of our results is confirmed by similar findings from two different household-level datasets and as estimated for several time-periods. Our results are also in line with conclusions from other studies.

Key words: car ownership; household behaviour; static disaggregated car ownership model; discrete choice modelling; Czech Republic

JEL Code: D12, C25, O18

Introduction

Possession of a car has been becoming more frequent among households having many consequences on transport infrastructure, housing patterns, workplace decision, or individual's lifestyle. This tendency can be observed world-wide, although its rate may still vary. Indeed, while in the USA the number of cars and vans increased by less than 10% during 1994-2004, this number increased during same time by the rate of around 40% in Slovenia and Spain, of 70% in Poland and Portugal and by even more than 80% in Greece and Lithuania (Clark, 2009). Same happened in the Czech republic; while we report less than 275 vehicles per 1000 inhabitants or 683 vehicles per 1000 households in the year 1993, there are

already more than 420 and 1050 vehicles, respectively, in the year 2009. It resulted in the stock of car that became 20% larger in 5 years compared to the 1993 level, 30% larger within 10 years, or even almost 60% larger in the year 2008 (Czech Transport Yearbook).

The main purpose of this paper is shed a light on the vehicle ownership, specifically, what are the main determinants of having a passenger vehicle in a household during the transition and post-transition period in the Czech Republic. Although, there are studies which analyse consumer's choice on car ownership jointly with car use and/or other choices such as on working or residence location or land use characteristics, we merely examine household decision to own a private passenger car. Specifically, we analyse the effect of main socio-demographic and structural variables on household's choice to own at least one car, and then to the number of private cars. Lastly, we focus on factors that determine household choice not have a car at all because of lack of financial resources or of pure preference for not having a car. Most of our results are also in line with conclusions from other empirical studies

Development of models to predict the level of car ownership has quite long tradition and the first of them have been undertaken since the 1930's. These early models mostly aimed at explaining total number of vehicles by GDP per capita at national level using merely aggregated data. Later extended models, as reviewed by de Jong,Fox, Daly,Pieters and Smit (2004), differ according to the level of data aggregation, their static vs. dynamic character, their compliance with theory, targeting demand side merely or also supply side, or relying on joint estimation of car use or special treatment of business cars together with car ownership model.

Since the 1970's, the majority of research has focused on the development of disaggregated car ownership models. Micro data, either individual-level, or household-level observations, allowed to relate the probability to own a car to socio-demographic characteristics of the respondent and/or household, structural variables such as home location or attributes, the availability of other means of transport, family members working position and income, or the costs of ownership and car operation.

Using disaggregated data, there are several possible approaches to model car ownership itself. Binary choice on *'a having a car'* rather on the number of cars in the household is the simplest discrete choice analysis. For instance, the work by Dargay (2005) or Johnstone, Serret, and Dargay (2009) presents such applications. One can also examine binary choice on ownership status, i.e. the choice between a private and company car, or model the company car and total car ownership at the household level jointly. Further car ownership models aim at the number of cars or at the type of a car or all cars in the households. All of

these models merely deal with the demand side of the car market only. The earliest studies were based on cross-sectional data (e.g., Lerman & Ben-Akiva, 1976, or Train, 1980), but since then a temporal dimension has been introduced through using pooled time-series cross section, or panel data.

Static disaggregated car ownership models further aim at the number of cars. Bhat and Pulugurta (1998) provide a general guideline based on their strong evidence that the appropriate choice mechanism in this case is the unordered-response structure rather than using the ordered-response class of models. The former approach is also in line with random utility maximization principle. Other models based on disaggregated data may focus on the choice of car type such as engine size, fuel type, fuel consumption, or ownership type, given car ownership (e.g. Brownstone, Bunch and Train,(2000); Hensher & Greene, 2000).

Because consumer's choice on the possession of durable and his choice how much the durable should be used are most likely strongly interrelated, an analyst might model both these decisions jointly. For example, Train (1986) and Hensher, Barnard, Smith and Milthorpe (1992) just utilize such discrete-continuous models. Car ownership might be even modelled jointly with modelling of work location and a residential location through nested structure (Rich and Nielsen, 2001) or by exploring *structural equations system (e.g.* de Abreu e Silva, Golob and Goulias (2006)).

1   Literature Review on Determinants of Car Ownership

In our paper we concentrate on the s*tatic disaggregated car ownership* model to analyse household's decision on 'having a car'. This is also the reason why we focus our further literature review on factors of this choice. Whelan (2007) distinguishes three main groups of factors: i] available financial sources determined as by income or by working status, ii] household size and structure, and iii] wide environment in that household is living and spending time. High level of car ownership is also proved for the number of drivers, while annual car cost has a negative effect (Train, 1980).

Among all socio-demographic variables ***household income*** is an important factor in determining the car ownership of a household. Positive effect of income is intuitively plausible since the acquisition as well as maintenance of a car is money requiring activity. The effect of income was found to be greater for less reach regions, supporting the declining income elasticity hypothesis (Dargay, 2005; Guiuliano & Dargay, 2006). ***Household size*** is further important factor; the bigger the household, the more cars they are likely to own. This

effect is also found when having a car is modelled (see e.g. Dargay, 2005). This tendency may be explained by household structure. Higher demand for having a car may result from the need to transport a largish number of people and benefiting from the economy of scale and/or from flexibility to transport own children. In fact, some studies found positive effect of having ***children***, however there are other studies which found the opposite effect especially for the number of children. Clark (2009) see reasoning of positive effect of household size on high level of car ownership in requirement for a car by each adult in family for everyday business. In fact, car ownership increases with ***the number employed*** in the household.

The ***age*** (usually of the head of the household) also had significant effect. Most studies found the negative effect of age, however, Nolan found the reverse relationship. Assensio et al. study indicates "life-cycle" effect when younger than 25 and older than 55 have lower car ownership levels than the middle age group. Car ownership is also greater for households headed by a ***man***. The effect of ***education*** is less clear.

The residence location and other transport-relevant house characteristics like having possibility to have a garage are the key housing structure variables. The probability to have a car decreases with ***the size of the municipality of residence***, that indicate on the higher availability of other means of transport such as public means of transport, worse congestion problems and higher parking price. ***Accessibility*** as measured by the number of facilities around the residence, proximity to city center, or population density decreases the probability to own a car. Considering house characteristics, the only effect was proven for living in a ***single-family detached house*** that might indicate better opportunity to park their car safely.

The effect of consumer attitudes and lifestyles on their choice of vehicle type is analysed only more recently.

2   Data

We utilize two specific micro-data both based on surveys conducted regularly by Czech Statistical Office. Household Budget Survey is the first and the database includes information about household annual expenses on several hundred consumption items, income from various sources, possession of durable goods, home characteristics and other socio-economic data of household members. Households included in the survey are selected using the non-probability quota sampling technique and the annual samples have on average 2,700 to 3,000 observations each year. Our dataset covers the period of 1993-2009 and includes more than 46,596 observations; possibility to use a company car is recorded in HBS since 2001.

Table 1: Descriptive statistics of HBS 1993-2009 and CZEC-SILC 2005-2009.

Variable	Description	HBS 1993-2009		SILC 2005-2009	
		Mean	*Std Dev*	*Mean*	*Std Dev*
income	annual net income [thousands 2005-CZK]	257.84	137.80	264.03	184.98
hhsize	continuous [no. of family members]	2.58	1.21	2.38	1.24
shretired	continuous [share of retirered person on]	0.22	0.39	0.40	0.46
unempl	continuous [no. of unemployed]			0.07	0.28
children	dummy [=1 if have a chil]	0.47	0.50	0.53	0.87
childcount	continuous [no. of children]	0.79	0.96	0.32	0.47
child05	dummy [=1 if with child younger than 5]	0.18	0.44	0.14	0.41
child69	dummy [=1 if child with age b/w 6 to 9]	0.15	0.40	0.08	0.30
child10	dummy [=1 if with a child older than 10]	0.46	0.76	0.31	0.66
male	dummy [=1 if the head is male]	0.76	0.43	0.73	0.44
age	continuous [age of the head]	48.45	14.52	54.02	16.39
eduP1	dummy [=1 with basic education of head]	0.06	0.24	0.49	0.50
eduP2	dummy [=1 with secondary education]	0.44	0.50	0.21	0.41
eduP3	dummy [=1 with A-level education]	0.37	0.48	0.22	0.42
eduP4	dummy [=1 with after-secondary training]	0.01	0.09	0.02	0.13
eduP5	dummy [=1 with university education]	0.12	0.32	0.06	0.23
city500	dummy [=1 if municipality with less than 500 people]	0.07	0.25	0.08	0.27
city2000	dummy [=1 if between 500 to 2,000]	0.16	0.36	0.19	0.39
city5000	dummy [=1 if between 2,000 to 5,000]	0.09	0.28	0.12	0.33
city10k	dummy [=1 if between 5,000 to 10,000]	0.06	0.23	0.09	0.29
city50k	dummy [=1 if between 10,000 to 50,000]	0.25	0.44	0.23	0.42
city100k	dummy [=1 if between 50,000 to 100,000]	0.15	0.36	0.12	0.33
city1000k	dummy [=1 if larger than 100,000]	0.22	0.42	0.09	0.28
Prague	dummy [=1 if Prague]	0.141	0.35	0.089	0.29
familyhouse	dummy [=1 if family detached house]	0.18	0.38	0.37	0.48
terraced	dummy [=1 if terraced house]	0.13	0.34	0.10	0.31
rental	dummy [=1 if the tenant]	0.50	0.50	0.22	0.41
MHDma	dummy [=1 if have expenses on public means of transport]	0.64	0.48	NA	NA
FAUTOma	dummy [=1 if have a company car]	0.05	0.21	NA	NA
pfuel	[price of motor fuel in 2005-CZK per l]	28.03	2.80	26.97	1.83
can't afford	dummy [=1 if cannot afford have a car]	*NA*	*NA*	0.13	0.33
would not like	dummy [=1 if wouldn't like to own a car]	*NA*	*NA*	0.27	0.44
have a car	dummy [=1 if have a car]	0.63	0.48	0.60	0.49
have 2 cars	dummy [=1 if have two cars]	0.06	0.24	*NA*	*NA*
have 3 cars	dummy [=1 if have three cars]	0.002	0.05	*NA*	*NA*

Source: Compiled by the author based on HBS and CZECH-SILC datasets. NA not available variable.

The second is the EU-SILC, an EU-wide survey on family statistics on incomes and living conditions. This survey is annually conducted since 2005 (Microcensus 1996 and 2002 surveys are predecessor of the SILS surveys). In the SILC surveys, households are selected using random sampling and the size of its samples ranges between 4,300 to 11,300 households each year. We use household-level data for the years of 2005 to 2009 having in total 42,714 observations. Except housing expenditures on housing and energy, the SILC does not however include any information about expenditures of household, or more detailed

information about durables such the type of a car. Both datasets include special variable, PKOEF, indicating relative representation of each household in the entire Czech population.

We define 'having a car' when household owns at least one private car. Without weighting, there are 63% of households with a car in the HBS 1993-2009 dataset. About 57% of households have one car and this share remains relatively constant over whole period of 1993-2009, the share of those with 2 cars is increasing over time from about 3% to 8% to 9%, and the share of those with 3 cars remains small between 0.2% to 0.3%. In the CZECH-SILC 2005-2009 dataset, there are, on average 60% of households (without weighting by PKOEF) and the share is increasing over time from 57% in 2005 to 63% in 2009. Those households who cannot afford to buying a car comprises on average 13% and their share is decreasing especially in 2006-2007 most likely due to increasing overall economic wealth in the Czech Republic. Share of those who would not like to have a car for any reason remains constant over these 5 years and is about 26% to 28%. Next table displays descriptive statistics for all variables used from both our datasets.

3   Estimation Results

We model the probability to have at least one car in the household - based on the HBS data - binary logit. Table 2 reports then our results for the average marginal effects from binary logit estimations of each explanatory variable for whole period of 1993-2009 and for several sub-periods (1993-1998, 1999-2002, 2003-2005, 2006-2009). We find, similarly as other studies, positive effect of household income. We also support the declining income elasticity hypothesis for last two sub-periods during which the income was increasing greatly (on average it is 28% or 38%, respectively, larger than the 1993 level).

We observe the life-cycle effect on the having a car, when the younger and older have less cars with the peak at the age of 46 years of the head. We find another two tendencies of age effect; first, the peak is declining over time, as economic wealth is improving on average, from 47 years to 46, 44 and 43 years of the head; the second, the inverted U-shape of the curve is flattening and the marginal effect across ages is getting smaller over time (Figure 1).

Figure 1: The effect of age on probability to have a car, marginal effect from binar logit.
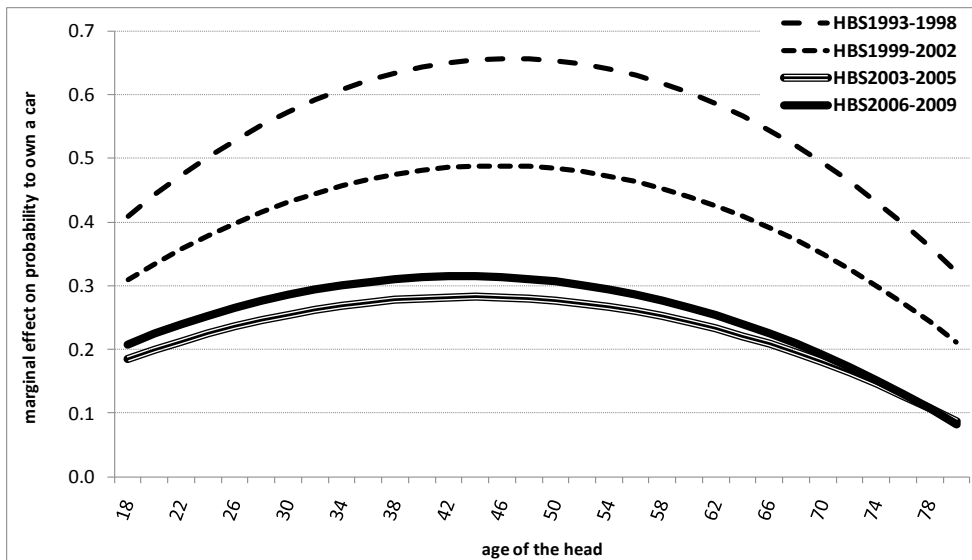
Source: own estimate by the author.

Although being older reduces the probability to have a car, higher share of retired on family members has reverse effect. It means that a private car is more likely to be in the households of just retired such as couples of pensioners compared to family with older head and others younger. The effect of children is only significant if we control for their number or if we use several count variables measuring the number of children of different ages. Having children has negative effect on the probability to have a car, while having older children older 10 years old reduces likeliness the most. Having children younger than 5 years old reduces the probability by smallest magnitude. The more family members, the larger probability to have a car is. Similarly as in other studies, car ownership is greater for households headed by a man than by a women. Education has in general positive effect. The least number of cars are owned in a household with a head with only basic education *(eduP1)* and then in a household with a head educated in secondary schools without A-level *(eduP2)*. The highest number of cars is in a household with a head with A-level decree *(reference level)* and with after secondary education training *(eduP4)* where passenger cars are owned most.

Regarding the structural variables, the larger the municipality, the smaller probability to own a car. Indeed, the largest is in the smallest municipalities with less than 500 and the smallest in the biggest cities. Households living in rented house or flat have few cars that may indicate opportunity to par a car. One can intuitively expect that parking a car safe is more likely in detached and terraced houses. Indeed, we find that living in these houses increases likeliness to own a car. Having some expenditures on public means of transport, that signals on availability of public transport infrastructure, reduces the probability to have a car as one would intuitively expect. Price of fuel, recent or lagged, has negative but small effect. If

household can use a company car, it increases probability to have a private car during 1999-2005, but has reverse effect in more recent years.

Table 2: Estimation results: Ownership of a private car, marginal effects

	HBS 1993-2009		HBS 1993-1998		HBS 1999-2002		HBS 2003-2005		HBS 2006-2009	
	ME	*signif*	*ME*	*signif*	*ME*	*signif*	*ME*	*signif*	*ME*	*signif*
inc000	0.0009	***	0.0008	***	0.0009	***	0.0009	***	0.0007	***
hhsize	0.0259	***	0.0246	**	0.0320	***	0.0043		0.0516	***
shretired	0.0323	***	0.0512	***	0.0515	***	0.0300		0.0029	
child5	-0.0124		-0.0316	**	0.0105		0.0307		-0.0183	
child69	-0.0223	***	-0.0087		-0.0504	***	-0.0004		-0.0367	**
child10	-0.0332	***	-0.0299	***	-0.0402	***	-0.0152		-0.0572	***
male	0.2589	***	0.2944	***	0.2813	***	0.2457	***	0.2306	***
age	0.0201	***	0.0282	***	0.0214	***	0.0129	***	0.0146	***
age2	-0.0002	***	-0.0003	***	-0.0002		-0.0001		-0.0002	
city2000	-0.0706	***	-0.0716	***	-0.0860	***	-0.0640	***	-0.0613	***
city5000	-0.0935	***	-0.1082	***	-0.0929	***	-0.0598	***	-0.0916	***
city10k	-0.1112	***	-0.0984	***	-0.1085	***	-0.1098	***	-0.1049	***
city50k	-0.0920	***	-0.0713	***	-0.0951	***	-0.0752	***	-0.0942	***
city100k	-0.1115	***	-0.1073	***	-0.1413	***	-0.0898	***	-0.0748	***
city1000k	-0.1284	***	-0.1093	***	-0.1512	***	-0.1013	***	-0.1296	***
eduP1	-0.0919	***	-0.0683	***	-0.0801	***	-0.0916	***	-0.1326	***
eduP2	-0.0455	***	-0.0381	***	-0.0362	***	-0.0465	***	-0.0741	***
eduP4	0.0890	***	-0.0350		0.0969	**	0.2444	***	0.0649	**
eduP5	-0.0189	***	-0.0238	**	-0.0045		-0.0056		-0.0188	
familyhouse					0.0532	***	0.0560	***	0.0609	***
terraced					0.0273	**	0.0218		0.0401	***
rental	-0.0498	***	-0.0381	***	-0.0125		-0.0359	***	-0.0206	**
pfuel	-0.0044	***	-0.0002		0.0034	**	-0.0055		-0.0169	***
FAUTOma					0.8821	***	0.9959	**	-0.2389	***
MHDma	-0.0571	***	-0.0327	***	-0.0387	***	-0.0669	***	-0.0810	***
No. of obs.	43 674		12 070		11 534		8 520		11 550	
LogLikelihood	-20 105		-5 842		-4 949		-3 614		-5 119	
McFadden's LRI	0.300		0.287		0.347		0.328		0.312	
Adj, Estrella	0.373		0.365		0.425		0.389		0.379	

Note: Significance level (***)<0.01; (**)<0.05; (*)<0.1.   Source: own estimate by the author.

Table 3: Estimation results for car ownership, multinomial logit model, HBS data

| | HBS 1993-2009 | | | | | | HBS 1993-1998 | | | | | | HBS 1999-2009 | | | | | |
| | 1 car | | 2 cars | | 3 cars | | 1 car | | 2 cars | | 3 cars | | 1 car | | 2 cars | | 3 cars | |
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
Intercept	-4.363	***	-4.412	***	-17.494	***	-7.306	***	-11.729	***	-21.845	***	-2.803	***	-8.853	***	-26.344	***
inc000	0.005	***	0.009	***	0.010	***	0.005	***	0.010	***	0.011	***	0.005	***	0.008	***	0.009	***
hhsize	0.227	***	0.101	**	1.176	***	0.210	***	0.483	***	1.467	***	0.246	***	0.232	***	1.326	***
shretired	0.270	***	0.054		-1.200		0.354	***	0.473		-39.7502#		0.256	***	-0.024		-0.387	
child5	-0.175	***	0.124	*	-1.667	***	-0.257	***	-0.425	**	-1.915	**	-0.034		0.134		-1.768	***
child69	-0.152	***	-0.218	***	-2.271	***	-0.068		-0.471	***	-1.097	*	-0.242	***	-0.368	***	-3.347	***
child10	-0.240	***	-0.260	***	-1.813	***	-0.231	***	-0.659	***	-2.000	***	-0.264	***	-0.380	***	-2.013	***
male	2.010	***	1.376	***	3.268	***	2.299	***	2.060	***	0.861		1.886	***	1.359	***	10.8111#	
age	0.154	***	0.144	***	0.396	***	0.228	***	0.260	***	0.326		0.116	***	0.123	***	0.373	***
age2	-0.002	***	-0.001	***	-0.004	***	-0.002	***	-0.003	***	-0.003		-0.001	***	-0.001	***	-0.004	***
eduP1	-0.623	***	-0.879	***	-1.281	*	-0.538	***	-1.643	***	-8.8685#		-0.700	***	-0.796	***	-0.464	
eduP2	-0.329	***	-0.306	***	-0.920	***	-0.275	***	-0.313	***	-0.537		-0.360	***	-0.354	***	-0.982	***
eduP4	0.587	***	0.864	***	0.646		-0.168		-1.404		-5.8295#		0.673	***	0.994	***	0.687	
eduP5	-0.089	**	-0.381	***	-0.302		-0.151	**	-0.428	***	-10.2339#		-0.017		-0.260	***	-0.058	
city2000	-0.466	***	-0.653	***	-1.818	***	-0.537	***	-0.635	***	-0.792		-0.441	***	-0.671	***	-1.999	***
city5000	-0.674	***	-0.687	***	-0.847	**	-0.836	***	-0.793	***	0.890		-0.554	***	-0.657	***	-1.292	***
city10k	-0.771	***	-0.904	***	-1.549	***	-0.781	***	-0.910	***	1.063		-0.694	***	-0.944	***	-2.139	***
city50k	-0.592	***	-0.893	***	-0.945	***	-0.534	***	-0.654	***	1.521		-0.497	***	-0.904	***	-1.397	***
city100k	-0.747	***	-0.976	***	-1.270	***	-0.793	***	-1.060	***	0.036		-0.596	***	-0.993	***	-1.566	***
city1000k	-0.854	***	-1.254	***	-2.106	***	-0.794	***	-1.494	***	-0.476		-0.789	***	-1.271	***	-2.889	***
familyhouse													0.375	***	0.393	***	0.599	*
terraced													0.292	***	-0.005		0.795	**
rental	-0.277	***	-0.732	***	-1.929	***	-0.280	***	-0.711	***	-2.247	***	-0.094	**	-0.446	***	-1.164	***
pfuel_1	-0.012	***	-0.059	***	-0.022		0.017	**	0.005		0.088		-0.041	***	0.128	***	0.041	
MHDma	-0.392	***	-0.485	***	-0.703	***	-0.284	***	-0.156		0.278		-0.441	***	-0.511	***	-0.913	***
FAUTOma													-0.205	**	0.713	***	2.432	***
No. of obs.	46596						14992	SRU9398					31604	SRU9909				
-2LogLik	72131						18425						51325					
Converg grad	4.54E-09						5.69E-12						1.345E-13					

Note: Parameters marked with '#' are regarded to be infinite. The finite results for MNL with 3 levels are in line with those presented here for MNL with 4 levels.

(***)<0.01; (**)<0.05; (*)<0.1.

Source: own estimate by the author.

Then, we analyse the number of cars. Score test for the equal slopes assumption reject using ordered probit or logit model. We use therefore Multinomial Logit to analyse occurrence of one, two and three cars with none of them as reference. The MNL results are in line with those from the binary logit; see Table 3 for the details. The effect of household income increases with the number of owned cars. Households with retired persons are more likely to have one car, but not more cars that shows on its level of saturation. Having the smallest children, below age of 5, increases the probability to have two cars. The strongest effect of male head is on having three cars. We support again the life-cycle effect of age with the peak at age of about 45 for 1 car and 3 cars and at 50 years for 2 cars. Education has similar effect as in the binary choice model when negative effect of lower education levels is stronger for more cars. Price of fuel has effect on first and second car but not on the third one. Availability of public means of transport, here measured by binary variable on expenditures, has negative effect on having cars and its effect is getting stronger with increasing number of cars.

In the CZE/SILC dataset, except binary information about having a car we can utilise more information about two reasons of not having a car: affordability to buy a car and preference rather stay without a car. As we report earlier, there are on average 13% of the formers and 27% of the latter. We model the segmentation of household into three groups by a multinomial logit for two specification differing by using either fuel price (model SILC1) or fixed effect of years (model SILC2); see Table 4.

We find that wealth has the significant and negative effect on both affordability of a car as well as willingness to stay without a car, when the effect of income is stronger for the former, i.e. the less income household have, the more likely household cannot afford have a car. The effect of income is even strengthened by unemployment; i.e. when there are more unemployed persons in the family; the probability not having a car negative. The larger family, the less likely they would not like a car and, on the contrary, the more likely they cannot afford the car. Retired would not like to have a car, rather than they cannot afford it. Regarding the age, we again support the life-cycle hypothesis with an inverted U-shape of its effect on having a car and U-shaped form of the age effect on two reasons not to have a car. Middle-aged families are particularly less likely to do not like a car. Family headed by a male is more likely to afford a car and even more to do not like a car.
Head with university decree but also the head with basic and secondary level of education without A-level are more likely would not like to have a car. The latter group is however also less likely to not be able to afford a car.

Table 4: Multinomial logit to model household segmentation into 'would not like have a car' and 'cannot afford a car', CZE-SILC data

	Model SILC(1)				Model SILC(2)			
	would not like to own a car		*cannot afford a car*		*would not like to own a car*		*cannot afford a car*	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
Intercept	0.6241	**	-0.3540		1.6764	***	-0.4945	**
income	-0.0023	***	-0.0088	***	-0.0023	***	-0.0087	***
hhsize	-0.2789	***	0.5818	***	-0.2795	***	0.5739	***
shretired	0.4547	***	0.1852	***	0.4549	***	0.1941	***
unempl	0.2897	***	0.4463	***	0.2882	***	0.4528	***
child05	0.0351		-0.4369	***	0.0365		-0.4262	***
child69	0.2774	***	-0.3814	***	0.2783	***	-0.3731	***
child10	0.0641		-0.3798	***	0.0647		-0.3729	***
male	-1.3738	***	-1.1737	***	-1.3746	***	-1.1759	***
age	-0.1036	***	-0.0312	***	-0.1034	***	-0.0306	***
age2	0.0012	***	0.0002	***	0.0012	***	0.0002	***
eduP1	0.8646	***	1.2633	***	0.8648	***	1.2673	***
eduP2	0.4064	***	0.5470	***	0.4065	***	0.5470	***
eduP4	-0.0164		-0.3388		-0.0163		-0.3440	
eduP5	0.2392	***	-0.0655		0.2384	***	-0.0751	
familyhouse	-0.3639	***	-0.6471	***	-0.3640	***	-0.6505	***
terraced	-0.1835	***	-0.3338	***	-0.1832	***	-0.3357	***
rental	0.4527	***	0.5034	***	0.4520	***	0.5019	***
city2000	0.2102	***	0.3986	***	0.2104	***	0.3986	***
city5000	0.2339	***	0.4863	***	0.2339	***	0.4858	***
city10k	0.2583	***	0.3795	***	0.2579	***	0.3798	***
city50k	0.3345	***	0.5123	***	0.3346	***	0.5111	***
city100k	0.5269	***	0.7319	***	0.5272	***	0.7293	***
city1000k	0.6141	***	0.7171	***	0.6136	***	0.7101	***
Praha	0.3511	***	0.7601	***	0.3489	***	0.7477	***
pfuel	0.0428	***	0.0064					
r2006					0.0029		0.1046	***
r2007					0.0124		0.1444	***
r2008					0.0651	**	0.1590	***
r2009					0.1086	***	0.1130	***
No. of obr.	42689				42689			
-2LogL	56426.564				56390.26			
Convergence gradient	9.95E-12				9.67E-12			

Note: (***)<0.01; (**)<0.05; (*)<0.1.
Source: own estimate by the author.

Living in family house or terraced house reduces the probability to be in the 'would not like' or 'cannot afford' type of household segment. Tenants are on the other hand more likely to consent with this reasoning for not having a car. The positive and significant coefficients are continuously increasing especially in the case of for 'would not like a car' that indicates the larger city, the more likely households would not like to have a car or cannot afford it while the effect on the latter is stronger than on the former. We find the highest share of those who cannot afford a car, i.e. they would like to have a car when available resources, in Prague. Price of fuel increase probability for not like to have a car, while this price does not have statistically significant effect on affordability.

4   Conclusions

We identify several important socio-demographic and housing structural factors that determine the choice on having a private car in Czech households. Income, larger family, family headed by male and living in detached or terraced house increase probability to have a car. Tenants are less likely to have a car that may indicate fewer opportunities to park a car safely. We support the life-cycle hypothesis, i.e. younger and older have few cars than the middle-aged household. However if the household include more retired period, it is then more likely the household owns a car. The effect of children is less clear. First we find that the more children, the less likely car is owned by a household. However, this effect is less prominent in the households with the youngest, younger than 5 years old, children. Moreover we also find that occurrence of children in family increases the probability for do not like to buy a car rather than the probability that household cannot afford to buy the car.

Shall the household spent something on public means of transport, it is less likely the household possess a car. These spending may be considered a sign of developed public transport infrastructure, i.e. better availability of transport alternatives. Interestingly enough, when household can use company car it is also more likely that this household owns a private car as well. This might indicate social status of the family. This however does not hold for later years of our analysis. Since 2006, during when we experienced economic recession, the possibility to use a company car has opposite effect. Increase in price of fuel brings disincentives for having own car, however this effect is quite small. One should be also aware of the fact the fuel price in real terms remained almost constant over whole period we analysed.

In many cases our results hold across dataset and time-periods we analysed in this paper. Our results are also in line with empirical literature. Although, this analysis can provide useful information for transport policy and physical planning, we acknowledge more comprehensive research on car ownership analysed jointly with car use, working and housing locations and attributes of land could provide more useful and policy-relevant information. This analysis however remains for our further research.

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