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Carpooling in Hungary: can it reduce the GHG emissions of personal transport?

Csaba Toth [1*]

[1]*Central European University, Nador st. 9.1071, Budapest, Hungary*

Abstract

This paper addresses the potential of carpooling in GHG emission reduction in Hungary through two surveys conducted among carpoolers and the general public, respectively. Though it is widely claimed that carpooling reduces the total VKT by allowing car users to use a single car, it can be hypothesized that in areas well-supplied with public transportation primarily public transportation users rather than car users carpool as a passenger, in which case the total VKT and so the GHG emissions remain around the same. Besides testing this hypothesis, the paper also analyzes the barriers and possibilities of a more environmentally beneficially carpooling in Hungary.
The results suggest that in Hungary passenger carpoolers are indeed primarily public transportation users, and in some case carpooling even generates extra car trips by allowing less expensive driving due to carpoolers' contributions. These implications suggest that carpooling in areas well-supplied with public transportation is considerable less beneficial for the environment than it is widely thought. In addition, the results also indicate a discrepancy between the low number of carpoolers and the relatively high interest in carpooling that might be explained by the low awareness of carpooler schemes and the relatively low internet penetration. Finally the paper suggests that workplace carpooling schemes might be able to contribute to significant GHG emission reduction, particularly if the cost of commuting by car considerably increases.

Keywords: carpooling; ridesharing; public transportation; GHG emission reduction

1. Introduction

The environmental benefit of carpooling, interpreted in this paper as ridesharing organized through a medium, seems to be obvious at first glance: it improves the fuel economy of cars, since, when carpooling, cars carry more persons by using almost the same amount of fuel (Jacobson and King, 2009). As cars usually carry an average of 1.55 people in the U.S. and Western Europe (Transportation Energy Data Book, 2009; EEA, 2010) and 1.9 people in Hungary (EEA, 2010), i.e. far below the maximal capacity of four or five persons, a significant fuel saving possibility can be assumed if

* Corresponding author: Csaba Toth (csampala@gmail.com)

this untapped capacity is utilized. But in fact, it is not the fuel economy of cars that defines the total environmental benefit of carpooling, but the reduction in total vehicle kilometres travelled (VKT) attributed to it – which then can result in fuel savings and so in reduced GHG emissions. Therefore, if carpooling is not coupled with a VKT reduction of a different vehicle, it does not reduce the GHG emissions. This can take place when passenger carpoolers forgo public transportation by carpooling, provided that the level of public transportation remains the same. Moreover, the lower cost of car use due to the contribution of carpoolers can encourage motorists to travel by their cars (loaded with carpoolers) in cases when otherwise they would travel by public transportation or they would not travel at all; in these cases the total VKT and so the GHG emissions can even increase. However, these possibilities are usually not taken into consideration by the studies detecting significant fuel savings of carpooling (IEA, 2005; Jacobson and King, 2009; Caulfield, 2009), which take it for granted that all the additional persons forgo solo driving for the sake of carpooling. A good reason for this might be the fact that these studies were conducted in areas where access to private cars is evident and public transportation is not a real competitor for carpooling for some reason.

By contrast, where car use is not evident and public transportation is commonly used, it can be hypothesised that, instead of car users, public transportation users will provide the mass of carpooler passengers, if their economic interests suggest this shift. This can happen when the ratio of public transportation fees and cost of car use is high enough, so it provides the possibility to set the carpooler's contribution at a level that is at the same time low enough to benefit public transportation users and high enough to satisfy carpooler drivers. If the hypothesis is true, carpooling can provide much smaller environmental benefits, so its role as an efficient car use reduction means in these areas should be reconsidered.

This study primarily intends to test this hypothesis in Hungary, where less than half of the Hungarian households have a car (KSH, 2012a) and public transportation still constitutes a significant part of the Hungarian passenger transportation system. Therefore, it could be assumed that in Hungary carpooling is used by mainly public transportation users which can significantly reduce the potential fuel savings of carpooling, and so its GHG emissions reduction potential. Moreover, as evidently only the large-scale application of carpooling (as of any measure) could attain a significant GHG emissions reduction regardless the effect of public transportation on carpooling, the study also intends to reveal the current status, as well as the barriers and possibilities of a more widespread way of carpooling in Hungary.

1.1 Overview of carpooling in Hungary.

Organized carpooling has been present at least since 1991 in Hungary, when the Kenguru Lift Centre (kenguru.hu) started its operation, though this scheme has been organizing only international trips (Cs. Köbli András, pers. comm.). Later, as the internet became increasingly available and globalized, more and more Hungarian departure and destination points were added to Western European or international carpooling systems, such as mitfahrgelegenheit.de or hitchhikers.org; the latter was even translated into Hungarian. A real boost for a national system came in 2007, when oszkar.com started operating. It was soon followed by utazzunkegyutt.hu, telekocsi.eu and others. At present oszkar.com and utazzunkegyutt.hu, which are the most popular

schemes, have approximately 31,000 (Prácser and Gyűrűs, pers. comm.) and 27,000 (utazzunkegyutt.hu, 2012) users, respectively, though their user communities might significantly overlap.

2. Material and Methods

To investigate the effect of public transportation on carpooling, as well as the status, the barriers and the possibilities of carpooling, the results of two opinion surveys – which gathered the opinions of the users of the oszkar.com carpooling scheme and those of the general public–, and the database of rides offered and booked in the oszkar.com scheme were analyzed. In order to better understand the economic drivers behind carpooling, the costs of different transportation modes also were compared.

2.1 Carpooler survey

The opinions of carpoolers were surveyed by the author through an online questionnaire (hereinafter referred to as 'carpooler survey') between 1 and 24 June, 2012. The users of the oszkar.com scheme, the most popular carpooling site with 31,220 registered members on 19 May, 2012 participated in the survey, which included 24 questions regarding the demography, the travel purposes, the travel patterns and the experiences of carpoolers as well as the barriers which discourage them from carpooling more intensively and the reasons why they carpool. Two different questionnaires were designed for driver and passenger carpoolers, as some questions do not make sense for both groups (e.g. drivers might be unable to answer a question regarding their reasons to favour carpooling over public transportation as they might not use the latter).

In order to offer rides, drivers have to register their cars at oszkar.com, thus, those who registered at least one car were considered as drivers (9,101 users, 84.6% male), while the others were considered as passengers (22,119 users, 53.4% male). As some of those who registered a car may carpool only as a passenger, the drivers were asked to fill in the questionnaire only if they have already offered at least one ride. The links to the online questionnaires at first were sent by email to 2,074 randomly selected passengers as well as 1,981 randomly selected drivers but as drivers' response rate was low (235 of them responded within two weeks) 1,000 additional drivers were emailed about the driver questionnaire. In order to raise the response rate, USB memory sticks were offered for 3 randomly selected passengers and drivers in each group among those who filled in the questionnaires.

The questionnaires were filled in by 348 passengers and 468 drivers (a response rate of 17% and 15.6%, respectively). The margin of error was +/-2.6% in the case of passengers and +/-2.2% in the case of drivers, at a 95% confidence level. The representativeness of respondents was ensured by the random selection of those passengers and drivers who got the emails containing the link of the questionnaires. Nevertheless, the pattern may be biased towards those who are more interested in getting a memory stick (e.g. students, younger people, etc.), who have more time to spend on filling out questionnaires (e.g. students, ordinary employees), or who are more interested in carpooling (and so might use it more often).

The compulsory registration of gender at the oszkar.com site provided the possibility to test representativeness. In the case of drivers only four more male (400 versus 396) respondents filled in the questionnaire than it could be expected from the gender

proportion of the registered drivers. On the other hand, in the case of passengers thirty-two more women (196 versus 162) filled in the questionnaire compared to the expected value (Figure 1.), which is a significant difference (Chi-square=13.351, df=1, asymp. sig.<0.001). There was no considerable intersexual difference in the case of place of residence, age and (occupational) position – though female respondents are somewhat more likely to be from a large town, be older and have a higher occupational status - neither in the case of non-demographic variables, except the case of security concerns, which the female respondents considered as more important (see later). Therefore no weight for gender was applied during the analyses.

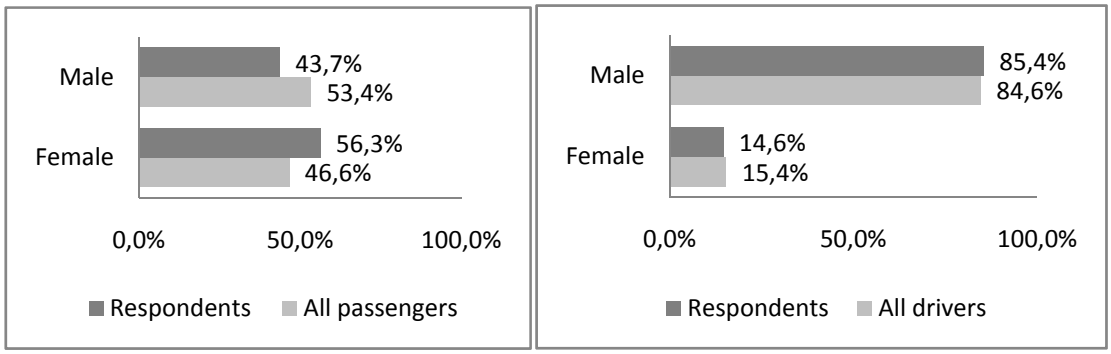

Figure 1: The gender distribution of respondents (passengers and drivers) compared to all passengers and drivers.

2.2 Route Database

The database of rides offered and booked in 2011 (hereinafter referred to as 'route database') was provided by the oszkar.com operators. The database contained the number of rides offered as well as booked for each route in 2011, and the number of rides offered on different days of the week. It should be noted that in some (especially commuting) routes a considerable proportion of offers might be attributed only to a few drivers, as they might offer rides every weekday on those routes; oszkar.com even facilitates this by allowing the declaration of a ride as 'regular', and such an offer appears in the database as if it was offered separately each day. Another important issue is that a match can be arranged without booking if the passengers contact drivers directly by email or phone. Moreover, in the case of regular rides, certain drivers and passengers might arrange carpooling outside the oszkar.com site, and so these rides do not appear in the databases. Therefore, the actual number of realized rides generated by oszkar.com site is somewhat larger than what the databases show.

To compare the popularity of different routes among passengers, the booking rate (the rate of rides booked and offered on a certain route) was calculated for each route. It should be noted that one ride can be booked by as many passengers as the number of free places - which is indicated by the driver of each ride. Therefore, the booking rate is not identical with the proportion of those offered rides when actual carpooling was realized but somewhat larger. In addition, the temporal distribution (within a week) of offers and bookings was analyzed.

2.3 National survey

Beside the carpooling habits of oszkar.com users, the attitudes of the general public towards carpooling to the workplace were analyzed, too. These attitudes were monitored in a survey (independently from the author's research) designed by Clean Air Group (Levegő Munkacsoport). The survey on a representative sample of 1,200 persons over 18 in Hungary in 18-22 May, 2012 (hereinafter referred to as 'national survey') was performed by Policy Solutions with help of Median Public Opinion and Marketing Research Institute. The data of the survey were provided by Clean Air Group for the author. Apart from demographic data, the level of willingness to carpool to work and arguments for and against it were gathered.

The data of this survey were analyzed in order to get an insight into who are potential carpoolers as well as what are the barriers and potential drivers of carpooling in the case of the general public. However, it should be noted that the aim of this survey was to identify people's attitude to carpooling only in the case of travelling to work, which might be different from the attitudes to carpooling in general. For example, carpooling to work might be preferred more than carpooling for other purposes, as it is a regular activity on a certain route, thus it is likely to occur that the same group of people carpool every day (so after a while people will not be strangers anymore). On the other hand, carpooling to work might be disfavoured as lot of people are in a hurry when they travel to work, thus they do not want to adapt to others. These differences can limit the extrapolation of the result of the national survey to general carpooling.

It should be noted that the sample size of one of the most important groups, those who travel to work by car, is quite small (153 persons), which entails a rather large margin of error (3.95%) at a 95% confidence level.

2.4 Cost comparison

The costs of different personal transportation modes were compared for the most popular long (Budapest – Pécs, 238 km by car) and short (Budapest – Veresegyház, 31 km by car) carpooling routes. The full prices of train and bus tickets (note that in Hungary students and pensioners have 50% fare reduction) were obtained from the homepages of the main operators, http://www.mav-start.hu/english/index.php and http://www.volan.eu/tariff.html, respectively. In the case of the long route, extra charge for train seat reservation (655 Ft) was considered, too.

The carpooling contribution was defined as the most frequently indicated amounts in the www.oszkar.com page, while car use cost was calculated by considering the fuel cost of a petrol car which consumes 7 l petrol per 100 km (1 l of petrol is 431 Ft according to the National Tax and Customs Administration of Hungary). On the long route the half of the motorway fee (1,487 Ft; the full price is 2,875 Ft but it is valid for a week) was included in the case of car use cost, too. All prices were collected on 1 March, 2013.

3. Results

This chapter presents the results obtained by analyzing the carpooler and the national surveys, the route database, the cost calculations and by performing estimations for the reduction potentials in GHG emissions. First, the question of 'what does carpooling substitute' is addressed. Then the results are aligned in order to the following questions: who carpools (demography), where (carpooling routes), for which purposes (travel purposes), how (travel patterns and experiences), why not (barriers) and why (motivations and possibilities)?

3.1 What does carpooling substitute?

According to the survey, only 31% of carpooler passengers have steady access to a car, compared to half the households in Hungary which own a car (KSH, 2012a). As a consequence, the majority of passenger carpoolers travel mainly by public transport, 21% travel mainly by car, while the rest travels either by car or public transport, when not carpooling (Figure 2.). On the other hand, the majority of drivers still go by car even if they do not manage to find passengers while the rest travel in another way (mainly by public transportation) or forgo the trip (Figure 3.).

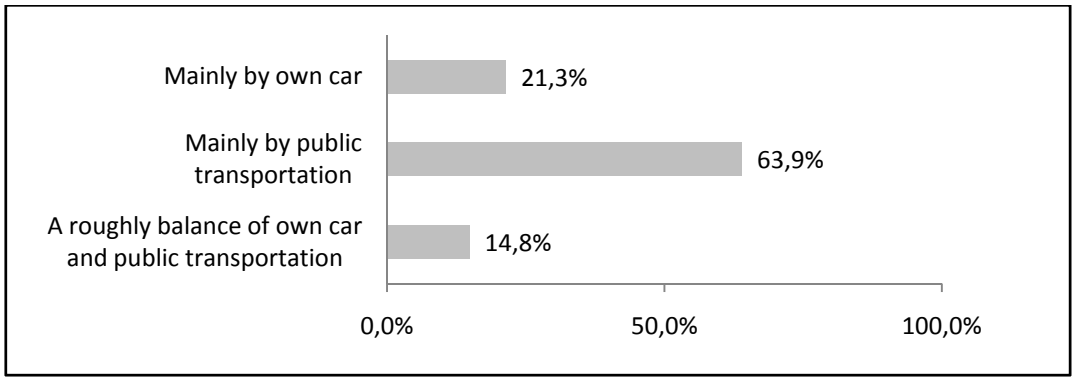

Figure 2: Transportation modes of passengers when not carpooling.

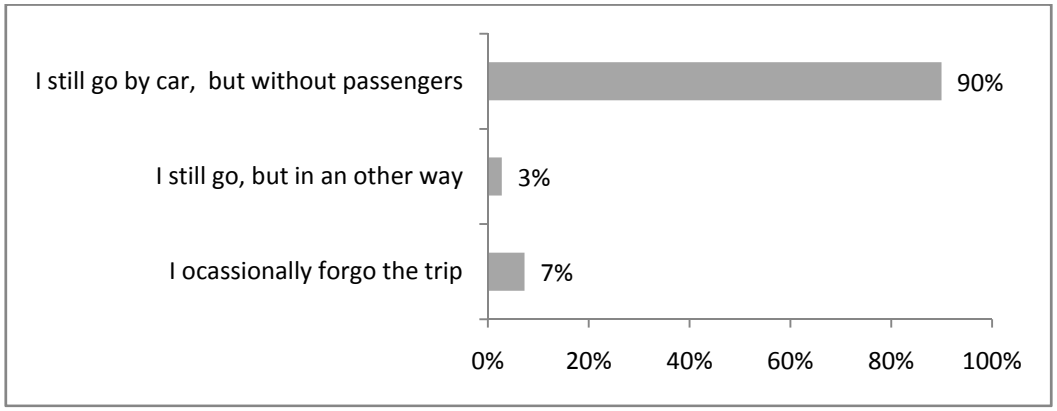

Figure 3: Answers for the question what drivers do if they do not find passengers.

Assuming that those passenger carpoolers who travel otherwise mainly by car (21%) or public transportation (64%) always carpool as a passenger instead of driving or public transportation, respectively, and those who otherwise use their own car and public transportation roughly equally (15%) carpool as passengers in half of the cases, 28.7% of carpooling rides redeem car use. Therefore the GHG emissions reduction

potential of carpooling is 71.3% less than it could be if all carpooling rides redeemed car use.

In addition, carpooling also generates extra trips in the case of 10% of drivers who occasionally forgo the trip or would travel by another way (e.g. public transportation) if no carpooler joins them. As there is no data about how much more these drivers drive due to the possibility of carpooling I will not try to estimate the impact of these extra trips. However it must be noted that if carpooling generates lot of extra trips in this way then GHG emissions reduction potential of carpooling can be even significantly lower.

3.2 Demography

According to the membership data provided by the *oszkar.com* operators, the number of carpoolers has been growing dynamically since the beginning of the operation (Figure 4.).

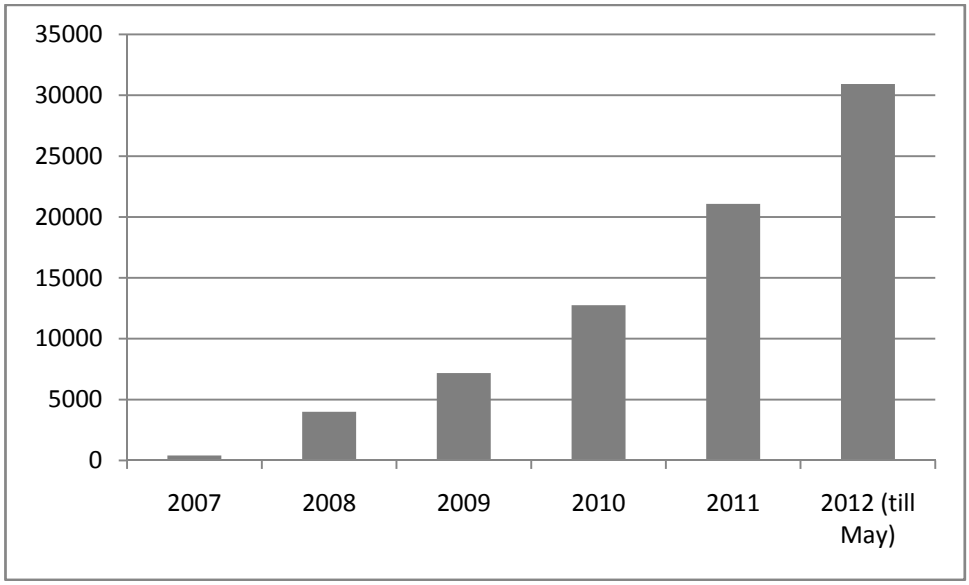

Figure 4. Number of registered users at oszkar.com scheme.
Source: oszkar.com operators.

Based on the carpooler survey, carpoolers are strongly overrepresented among those who live in Budapest or in large cities of more than 50,000 inhabitants, while people in villages are strongly underrepresented (Figure 5.).

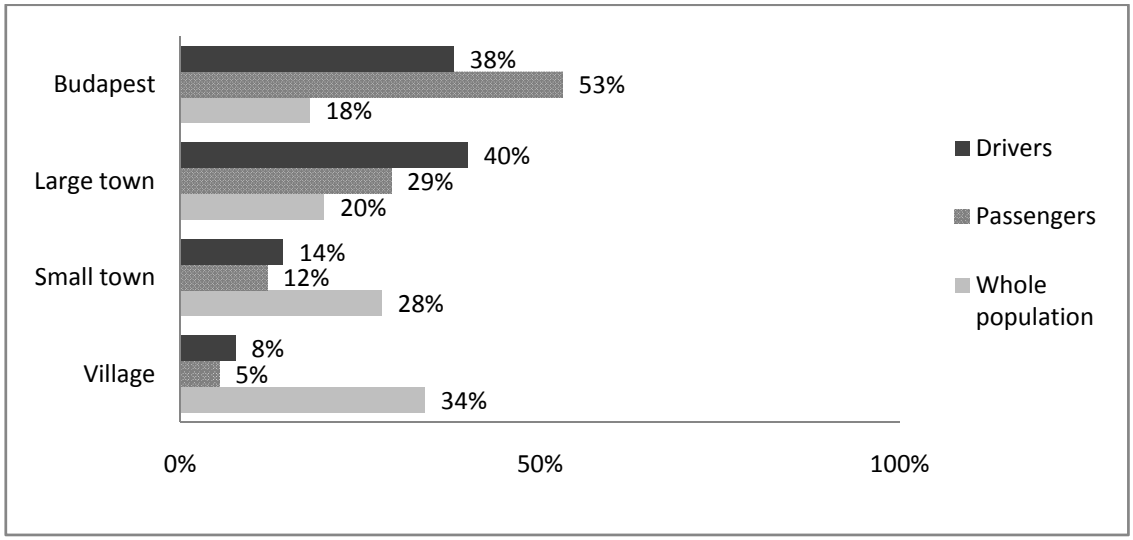

Figure 1. Respondents' place of residence compared to the whole population of Hungary.

According to the national survey, 13% of the population over 18 travel to work by car; note that according to the survey, in Hungary 49% of the population over 18 do not work; this is consistent with the national statistic data (KSH 2012b). Nearly half of those who travel to work by car might be engaged in carpooling as a driver, while 43% might do so as a passenger (Figure 6.). Altogether 58% of those travelling to work by car might be engaged in carpooling either as a driver, as a passenger, or both (16% only as a driver and 8% only as a passenger). On the other hand, 51% of those who travel to work by means other than car might carpool as a passenger. Surprisingly enough, 25% of those who would surely carpool to work would certainly not use a service which organizes carpooling. It may be assumed that a potential high price attributed to such a service by those respondents might be the reason for such a high level of rejection (the gratuity or the price of the service was not specified in the question).

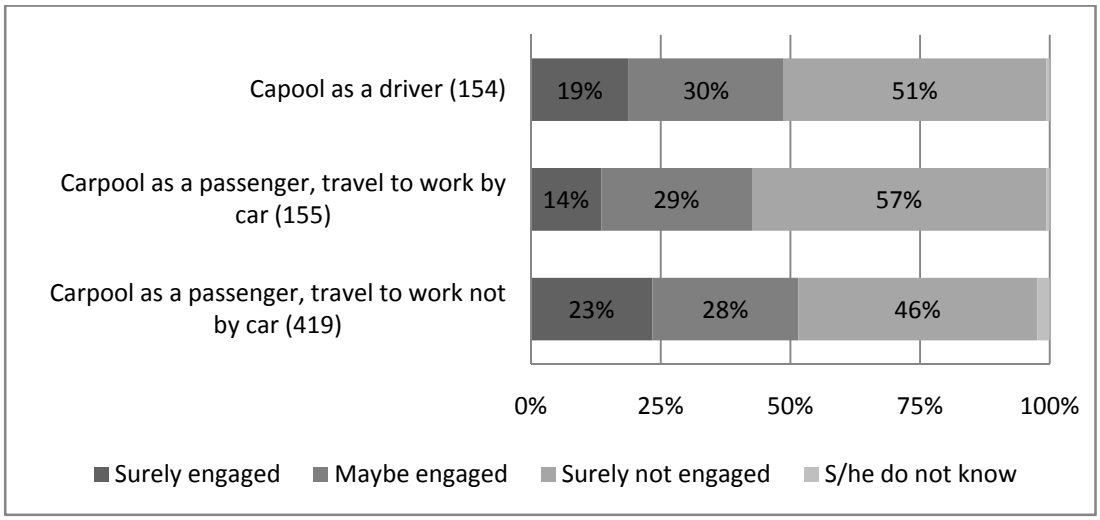

Figure 6. Level of engagement in carpooling (number of respondents).
Source: Policy Solutions 2012.

As far as the demography of potential carpoolers (those who maybe or certainly would be engaged in carpooling to work) is concerned, the national survey suggests that potential carpoolers are not underrepresented at all among those who live in a village (Figure 7.).

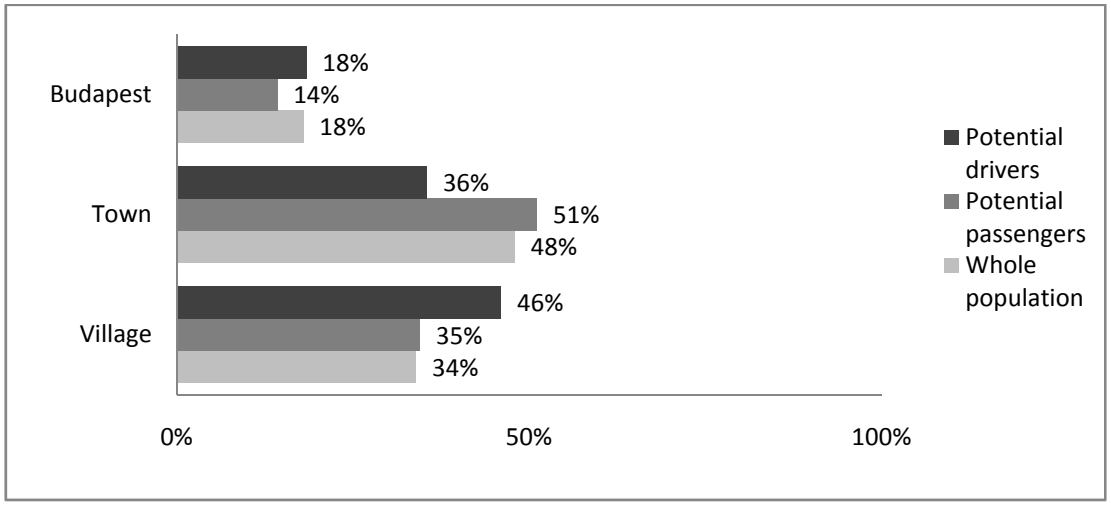

Figure 7. Potential carpoolers' place of residence compared to the whole population of Hungary.
Source: Policy Solutions 2012.

3.3 Carpooling routes

According to the databases of rides in 2011, 194,362 rides were offered in 15,820 routes (in 54% of routes there was only one ride offered). 10,870 bookings were realized, which means that less than 6% of rides were booked (as one ride can be booked by more than one user, the exact number of realized rides could not be specified). The most rides were offered between Budapest and Pécs and within Budapest, followed by routes between Budapest and other large towns (e.g. Miskolc), Balaton resorts (e.g. Siófok), or Budapest's agglomeration (e. g. Veresegyház) (see Figure 8.and Table 1. for details). Between Pécs and Szekszárd and within Győr were the most often offered routes not including Budapest (though as Szekszárd is on the route between Budapest and Pécs, a considerable part of offers on this route might be offered as a part of the Budapest-Pécs route).

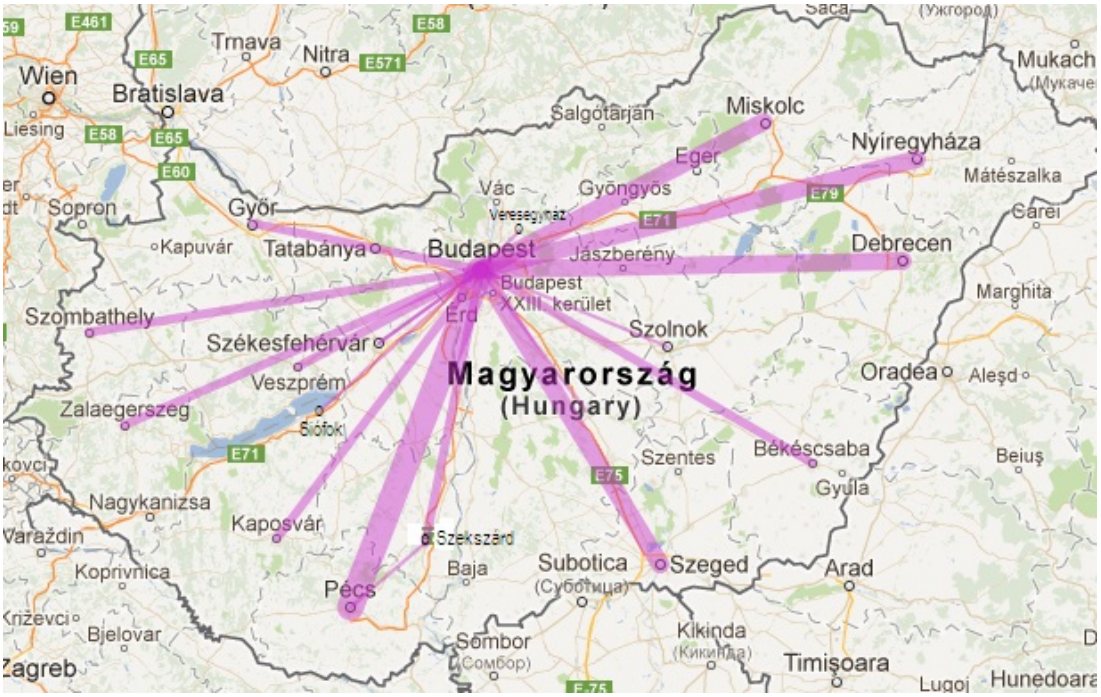

Figure 2. Some of the routes most often offered in 2011. The width of the line indicates four different categories of booking rate (rate of booked and offered rides): 0-0.1; 0.1-0.3; 0.3-0.6; >0.6 from the thinnest to the widest.
Source: googlemaps.com.

	Number of offers			Booking rate (aggregated for the two direction)
	Outward	Return	Total	
Budapest – Pécs	1,904	2,036	3,940	0.94
within Budapest			3,714	0.01
Budapest – Miskolc	1,125	1,177	2,302	0.54
Budapest – Siófok	1,193	997	2,190	0.08
Budapest – Debrecen	986	1,093	2,079	0.49
Budapest – Győr	1,070	920	1,990	0.17
Budapest – Veresegyház	863	882	1,745	0.01
Budapest – Szeged	776	813	1,589	0.42
Budapest – Gödöllő	528	860	1,388	< 0.01
Budapest – Nyíregyháza	628	625	1,253	0.49
Pécs – Szekszárd	509	456	965	0.01
within Győr			732	0

Table 1: The routes where rides were most often offered in 2011 and their booking rate (rate of rides booked and offered on a certain route).

The booking rate in 2011 showed a large variability even on routes where more than 100 rides were offered. Apart from a few individual routes (Budapest-Pécs, Budapest-Kaposvár, Budapest-Veszprém), the booking rates of routes between Budapest and other towns correlated surprisingly well with the towns' population size and especially their distance from Budapest (Table 2.). The booking rate was relatively high between Budapest and other large towns further than 150 km from Budapest, while in the case of closer and smaller towns it reduced sharply. It was even lower (less than 0.02) within

cities, large towns and agglomeration of large towns (Veresegyház and Gödöllő are small towns in Budapest's agglomeration). A highly concentrated distribution of bookings is also indicated by the fact that 70% of all bookings took place on routes where the offers represent only 6.3% of all rides offered; these routes are between Budapest and the largest towns of Hungary (Pécs, Miskolc, Debrecen, Szeged, Nyíregyháza).

Population size	Distance from Budapest (km)	Towns	Booking rates
Over 100,000	Over 150	Debrecen, Miskolc, Nyíregyháza, Pécs, Szeged	0.42 – 0.54 (except Pécs: 0.94)
	100-150	Győr	0.17
	Less than 100	Kecskemét, Székesfehérvár	0.02 – 0,05
Less than 100,000	Over 150	Baja, Békéscsaba, Eger, Hajdúböszörmény, Hódmezővásárhely, Kaposvár, Sopron, Szombathely, Szekszárd, Zalaegerszeg,	0.16 – 0.32 (except Kaposvár: 0.08)
	100 – 150	Siófok, Szolnok, Veszprém	0.03 – 0.1 (except Veszprém: 0.21)

Table 2: The effect of population size and distance from Budapest on the booking rate.

The number of offers and bookings also shows an uneven temporal distribution: there are approximately twice as many offers and four times as many bookings on Fridays and Sundays than on other days (Figure 9.).

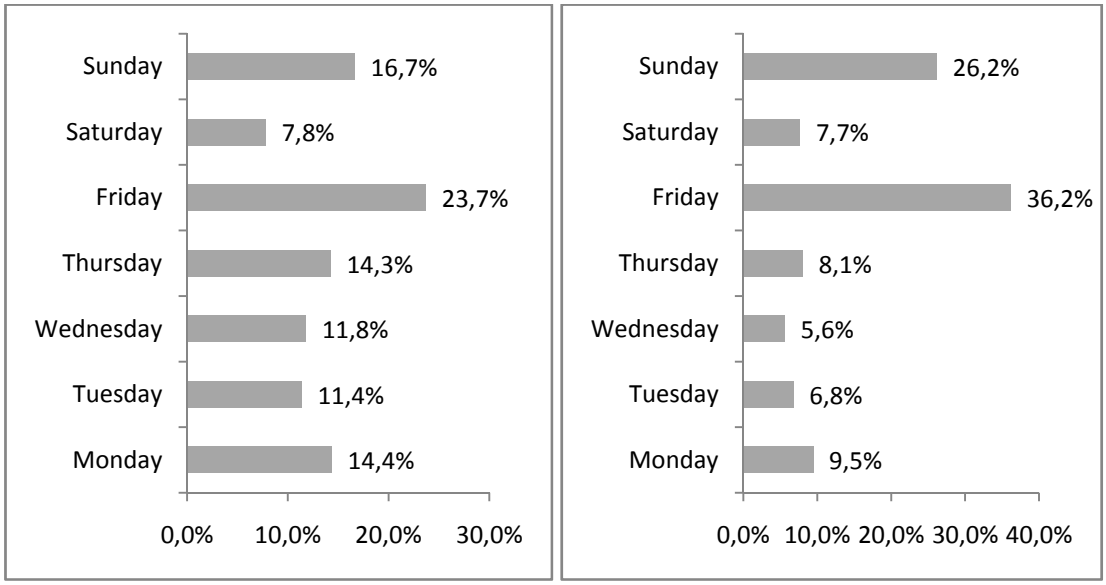

Figure 9: The temporal distribution of offerings (left side) and bookings (right side) in the percentage of all offerings and bookings in 2011.

3.4 Travel purpose

The most important purpose of carpooling is weekend trip home (see in details in Figure 10.) both for drivers and for passengers. This result is consistent with the uneven temporal distribution of carpooling (most bookings takes place on Fridays and Sundays), as it came to light from the analysis of the route database (see 3.3 chapter). In spite of the large number of passengers who never use carpooling for commuting, carpoolers still consider carpooling as a potential means of commuting: 21% of drivers offer rides almost exclusively for commuting, the majority (69%) of commuting passengers would carpool to work/school if there were rides offered on their routes (Figure 11.), and 62% of commuting drivers either regularly offer rides or used to do it but stopped due to the lack of any match (Figure 12.).

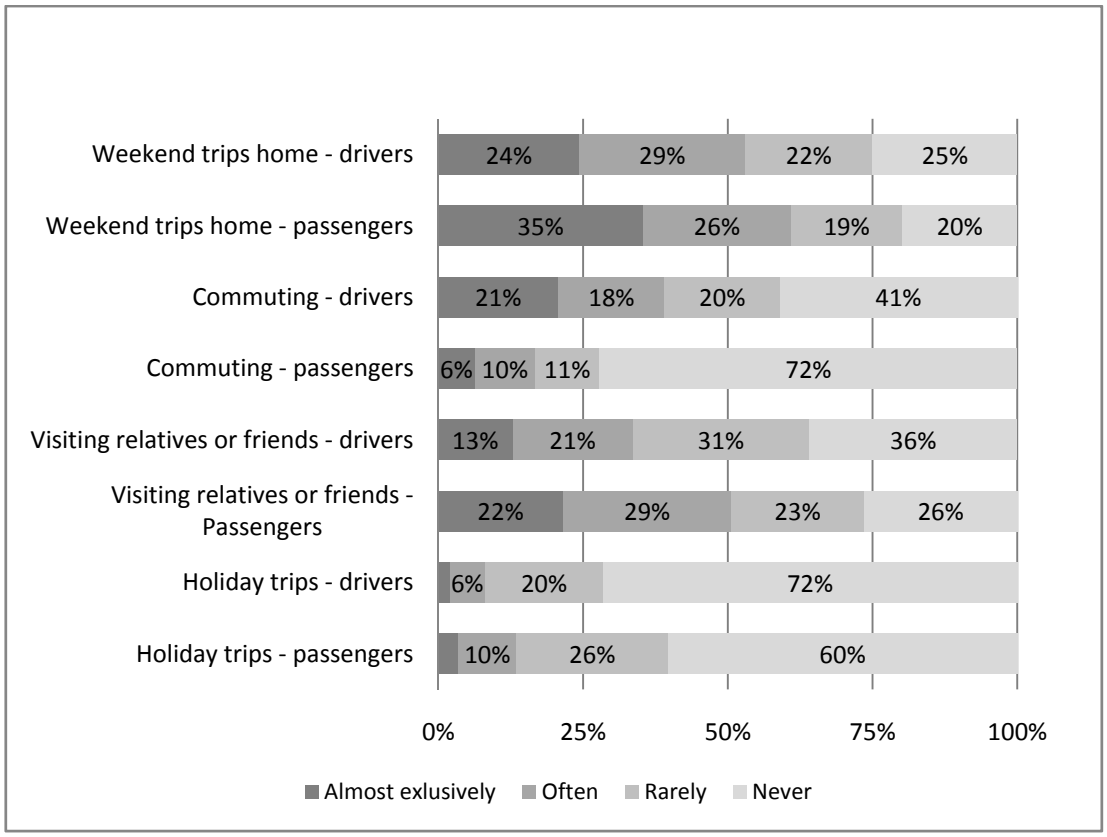

Figure 10: Answers for the question how often passengers carpool and how often drivers offer rides for different purposes.

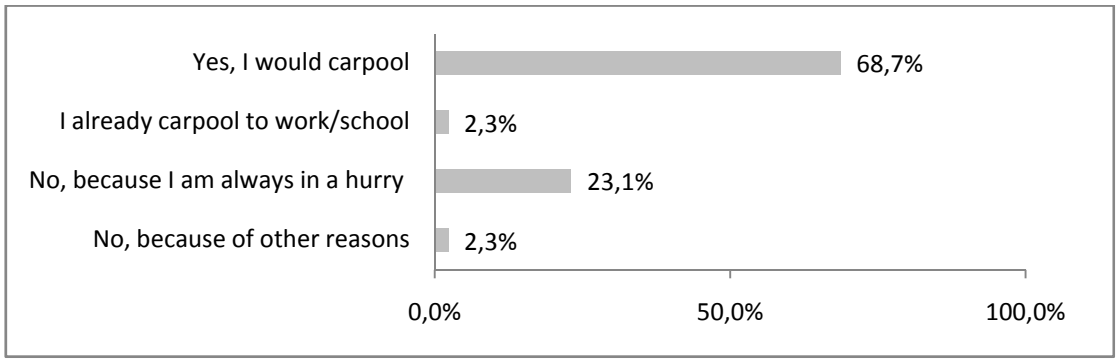

Figure 11: The answers of commuter passengers for the question if they would use carpooling for commuting (195 respondents, the others do not commute).

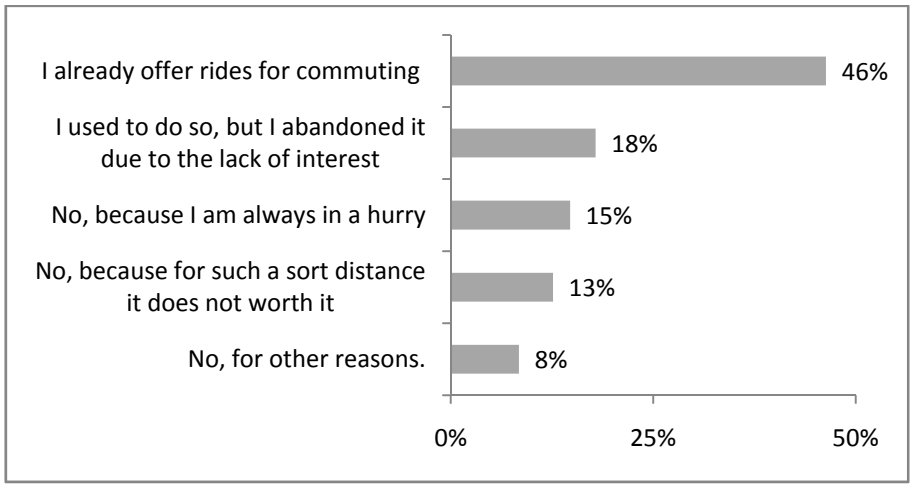

Figure 12: The answers of commuters for the question if they would offer rides on commuting routes (190 respondents, the others do not commute).

3.5 Carpooling success and experience

The majority of passengers manage to find a match quite easily, especially those who use carpooling exclusively for home trips at the weekends (Figure 13.); in contrast to the drivers, the majority of who have difficulties in finding a match, especially those who offer carpooling almost exclusively for commuting (Figure 14.).

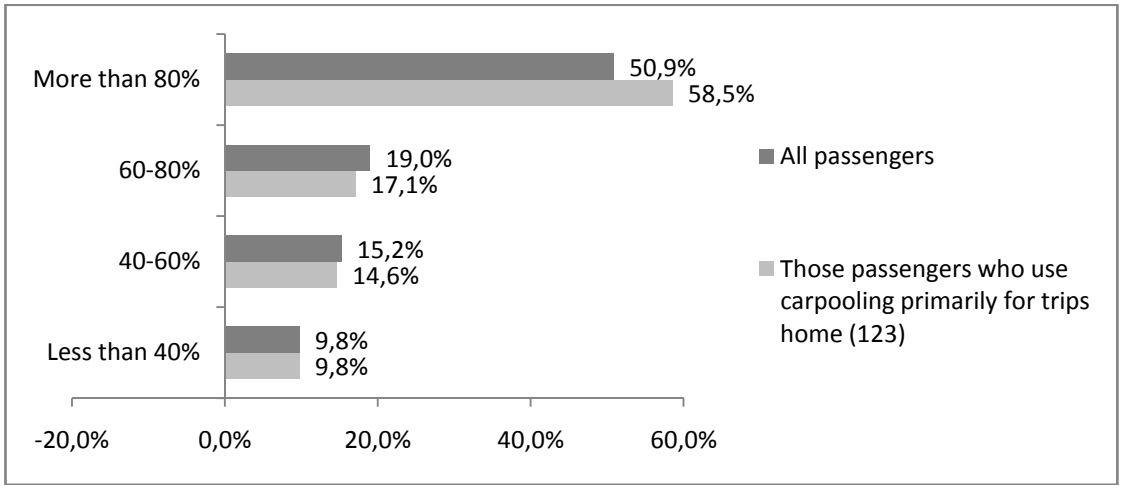

Figure 13. Answers for the question in what percentage of cases (in which they have planned to carpool) passengers actually manage to find a match?

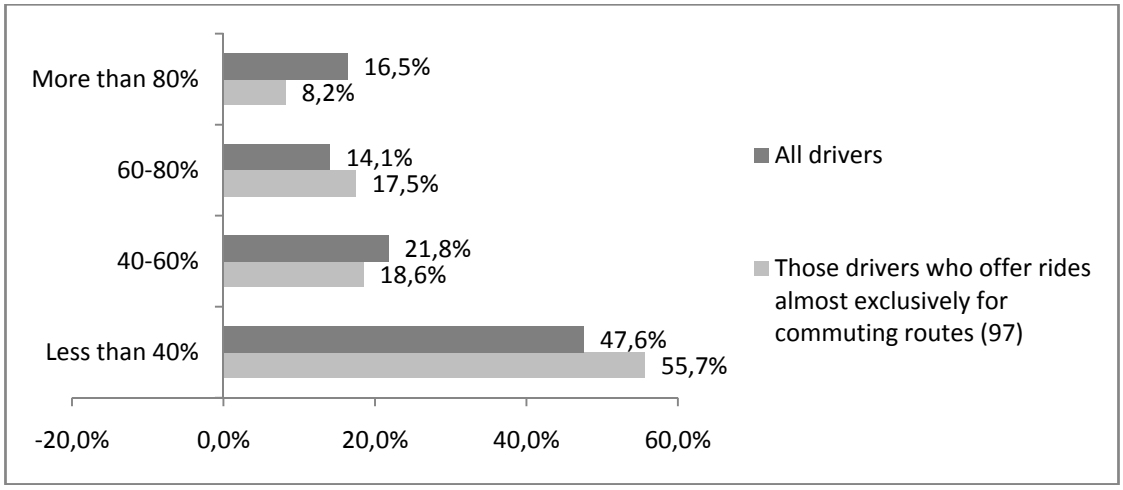

Figure 14. Answers for the question in what percentage of their offered rides drivers actually find a match.

The experiences of carpoolers regarding the journeys are very positive for both drivers and passengers, though it is slightly more positive in the case of the latter (Figure 15.).

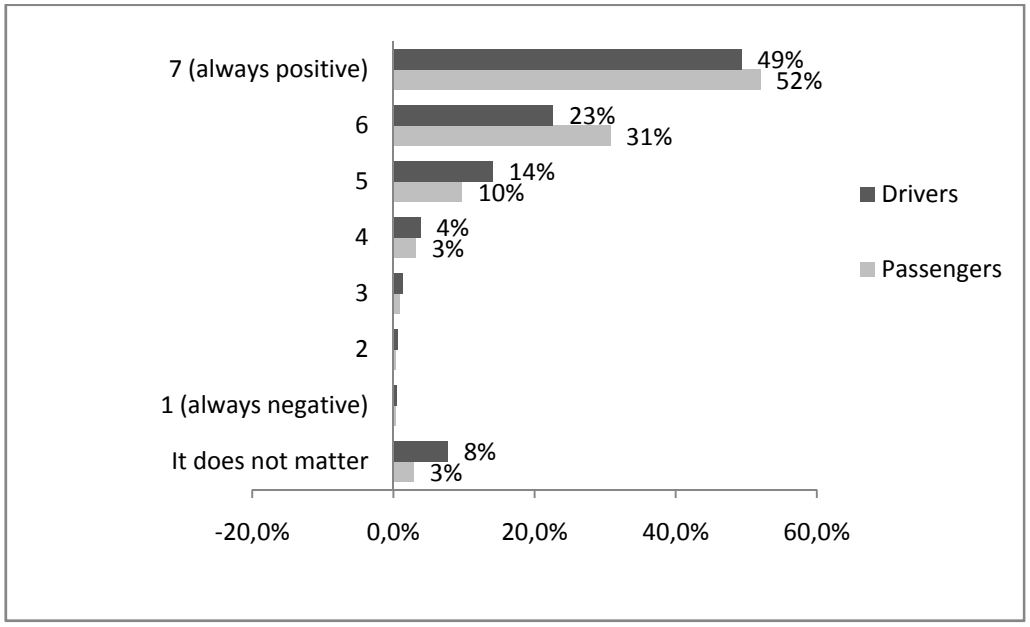

Figure 15. The experiences of carpoolers regarding the carpooling trips.

3.6 Barriers

The barriers of carpooling were surveyed through the carpooler and the national survey. According to the carpooler survey, the most important factor discouraging passengers from carpooling more often is the lack (or rarity) of rides offered (Figure 16.) even among those who successfully find a match in more than 80% of the cases (42% of the latter considered the lack of rides offered as a main factor). Safety concerns (e.g. that the passengers do not know the driver) were considered as a main reason by 7% of all respondents, though it played a slightly more important role in the case of female passengers (9%). Flexibility of own car use, potential cancellation of rides and complexity of arranging rides were the least important factors, though those who mainly drive their own car when not carpooling considered the flexibility of own car use more important (15% of them considered it as a main reason) compared to all respondents. The high price of carpooling (overpricing by drivers, its higher price compared to student tickets for public transport, etc.) was given most frequently when other potential factors were asked (3% of all respondents).

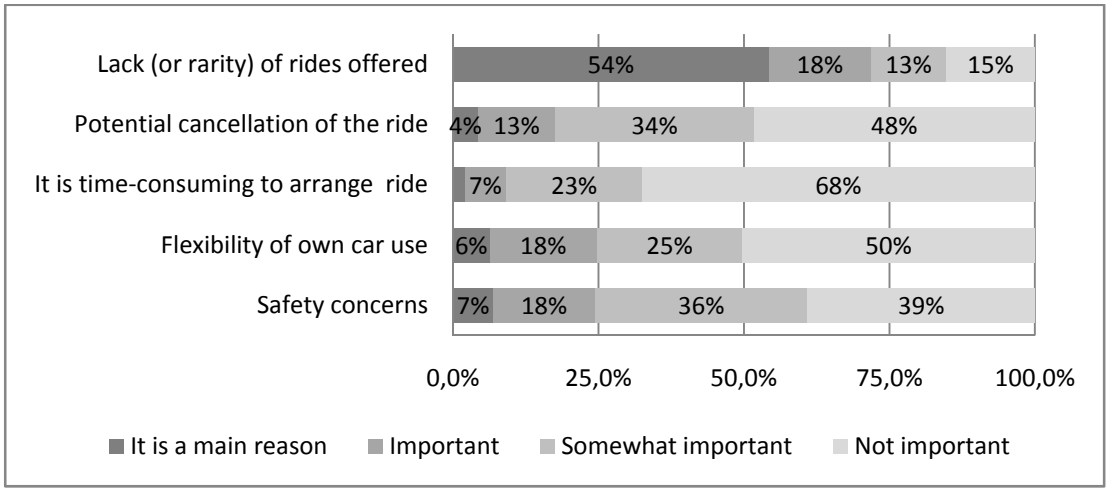

Figure 16. The importance of different factors discouraging passengers from carpooling more often.

In the case of drivers, the most important factor discouraging them from offering more rides is the uncertainty of their trip, for example, that respondents do not know in advance what time they will leave and therefore cannot advertise the ride (Figure 17.). Also, many respondents consider it worthless to advertise rides for short distances where the benefits and likelihood of a successful match are small. Preference for solo driving, complexity of arranging rides and safety concerns played considerably less important roles.

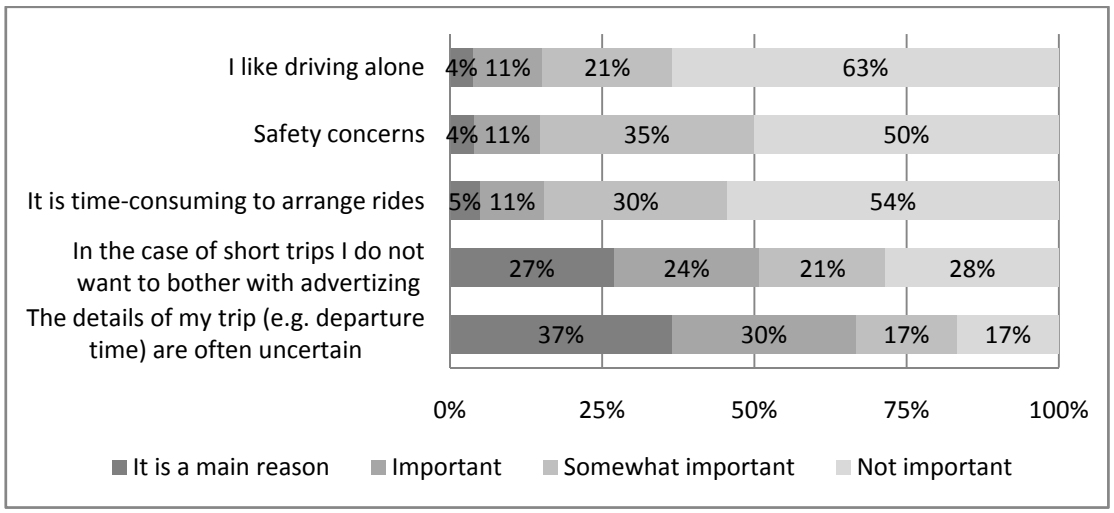

Figure 17. The importance of different factors discouraging drivers from carpooling more often.

The difficulties of adapting to others, which can be perceived as a reflection of the lack of ride offers or the uncertain trip details (the most important barriers among carpoolers), was the most important barrier both for potential drivers and passengers (Figure 18. and Figure 19.). Distrust toward strangers, which can be perceived as a reflection of security concerns, was also a frequently mentioned argument against carpooling, especially in the case of drivers. Finally, the feeling of dependence and the high cost of carpooling appear as a somewhat important barrier for prospective

passengers (the former both for those who travel to work by car and by means other than car, while the latter only for those who travel to work by other means than car).

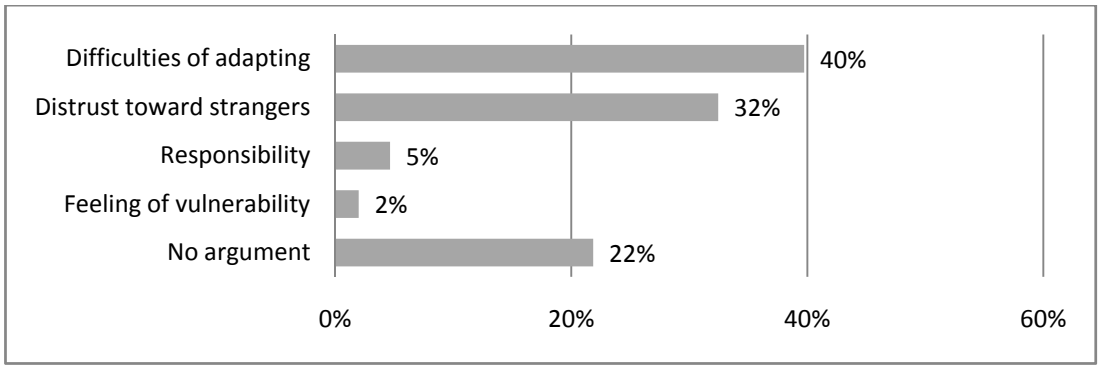

Figure 18. Arguments against carpooling as a driver (in percentage of those who travel to work by car (151 respondents), one or two arguments could have been selected).

Source: Policy Solutions 2012.

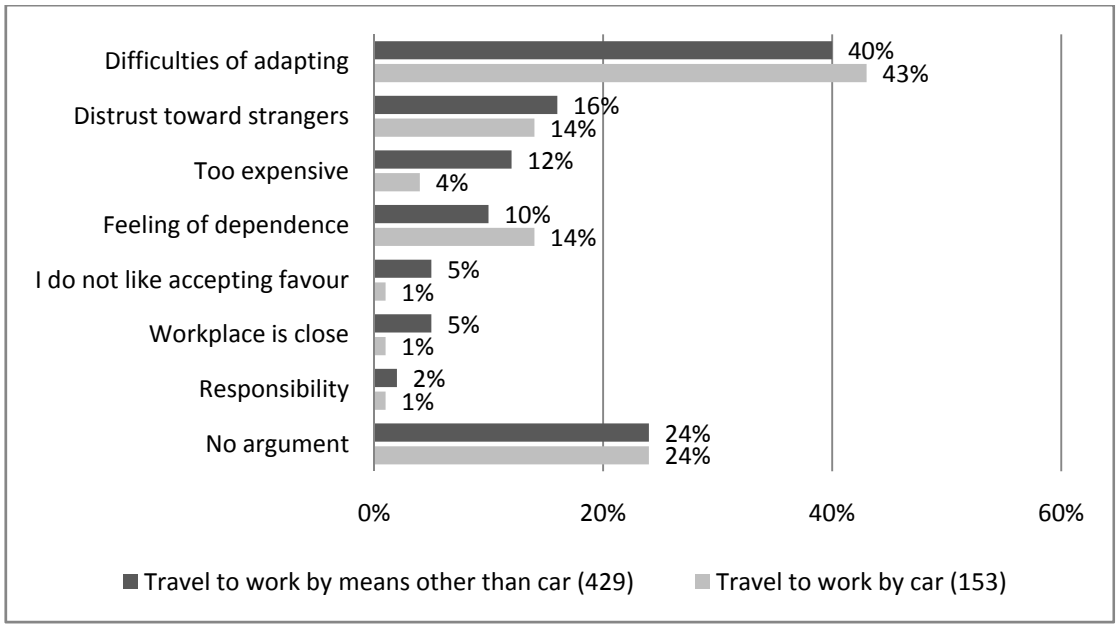

Figure 19. Arguments against carpooling as a passenger (in percentage of those who travel to work by means other than car and by car, one or two arguments could have been selected).

Source: Policy Solutions 2012.

3.7 Motivations and possibilities

According to the carpooler survey, for passengers, the main motivation for favouring carpooling over both public transportation and solo driving is its lower cost (Figure 20. and Figure 21.). In the case of those passengers who usually travel by public transport, the speed of carpooling also counts as an important advantage, while rare public transport, disliking public transport, carpooling being environment-friendly and the claim that "it is a good way to get to know others" played significantly less important roles (Figure 20.). In the case of those passengers who usually travel by car the claim

that "carpooling is environment-friendly" was somewhat more important, while the claims that "it is a good way to get to know others" and "I do not like driving" played the least important roles (Figure 21.).

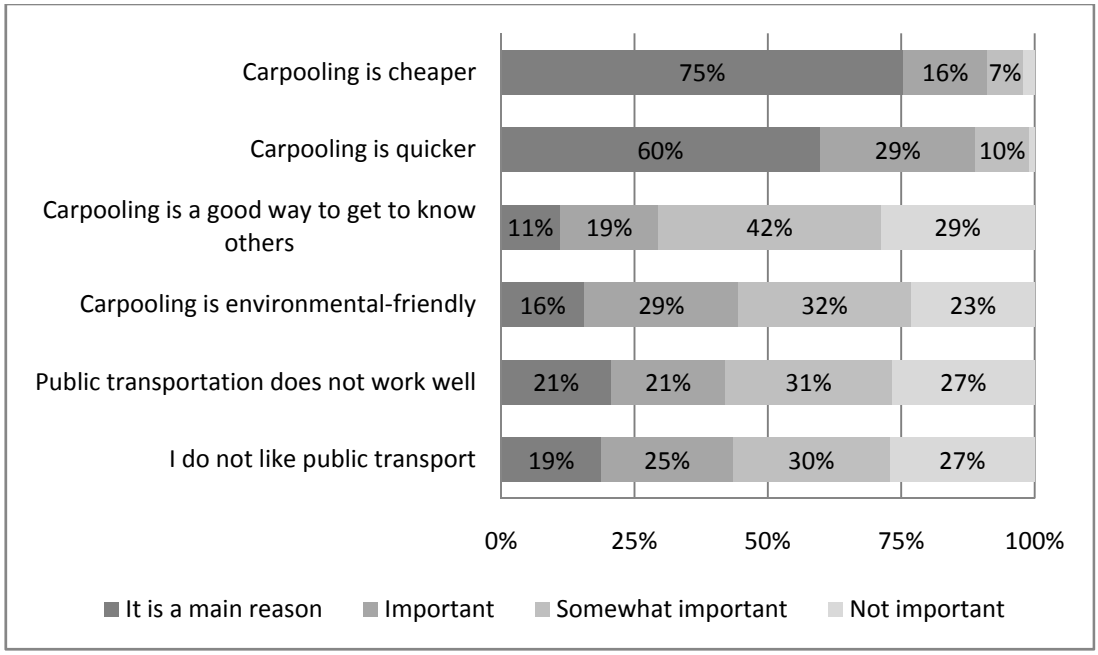

Figure 20. The importance of different motivations regarding why carpoolers favour carpooling over public transportation (281 respondents).

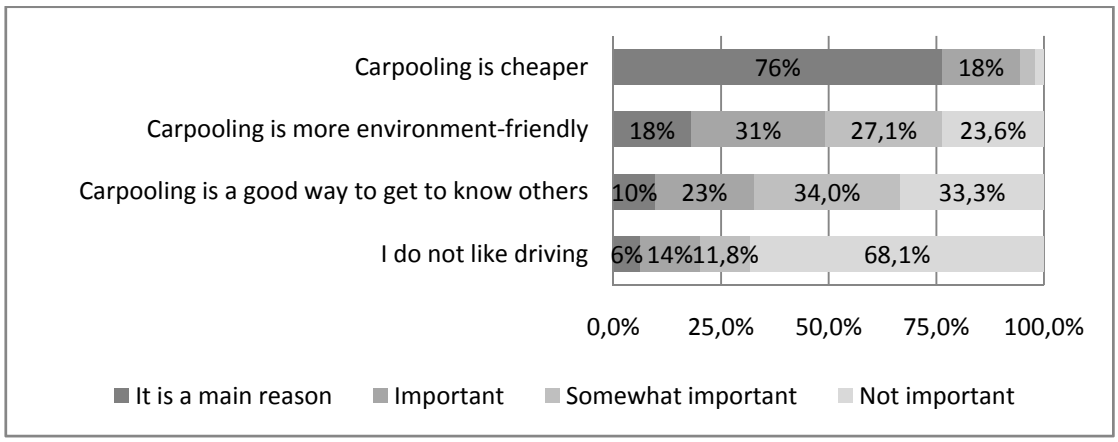

Figure 21. The importance of different reasons why passenger carpoolers favour carpooling over solo driving (144 respondents).

For drivers, the main reason for favouring carpooling over solo driving was its lower cost, too (Figure 22.). The claims that carpooling is more environment-friendly and "it is a good way to get to know others" played significantly less important roles.

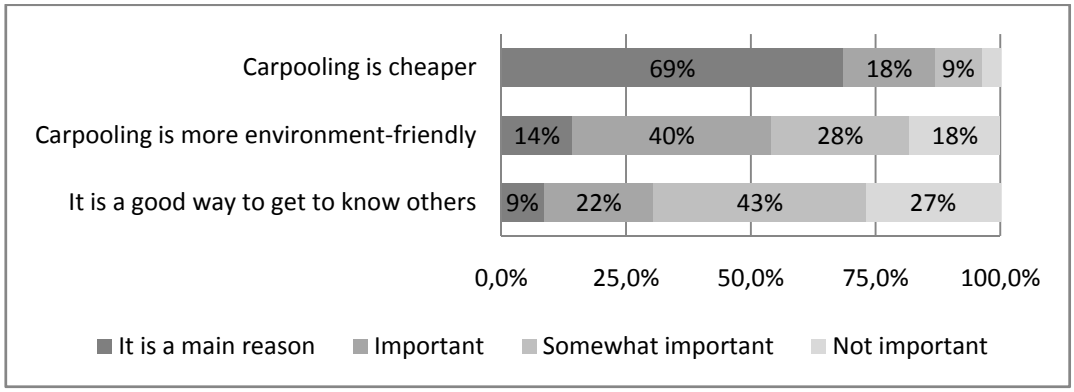

Figure 22. The reasons why driver carpoolers favour carpooling over solo driving (144 respondents).

The arguments for carpooling surveyed in the national survey reflect the potential motivations of the general public. Cost saving, especially in the case of drivers, appears as the most important potential motivation in this case, too, while travelling with others, helping others and environment protection are considered as somewhat less important arguments by drivers (Figure 23.). To carpool as a passenger cost saving and comfort (no limitation to a schedule) are nearly equally important among those who travel to work by other means than car, followed by time saving. Those who travel to work by car value cost saving the most, too, when considering carpooling as a passenger (Figure 24.).

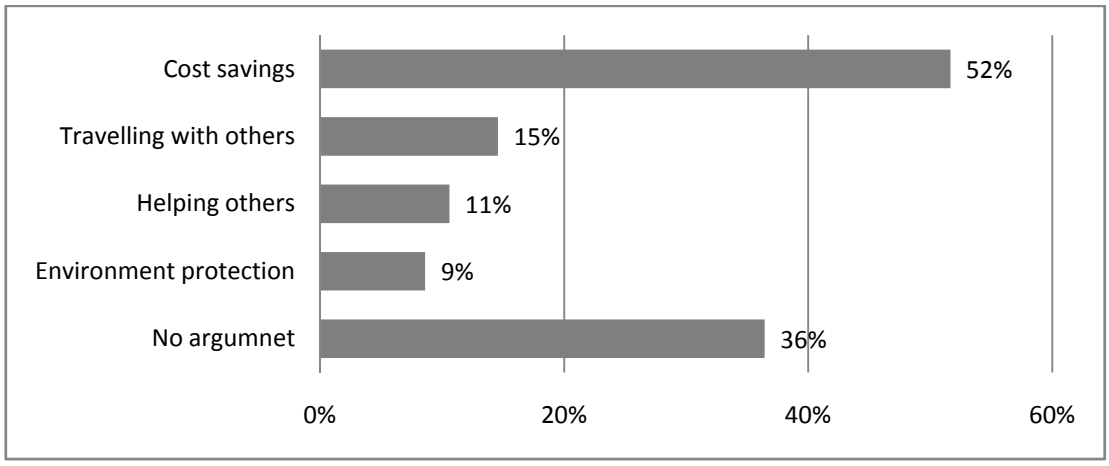

Figure 23. Arguments for carpooling as a driver (in percentage of those who travel to work by car (151 respondents); one or two arguments could have been selected).
Source: Policy Solutions 2012.

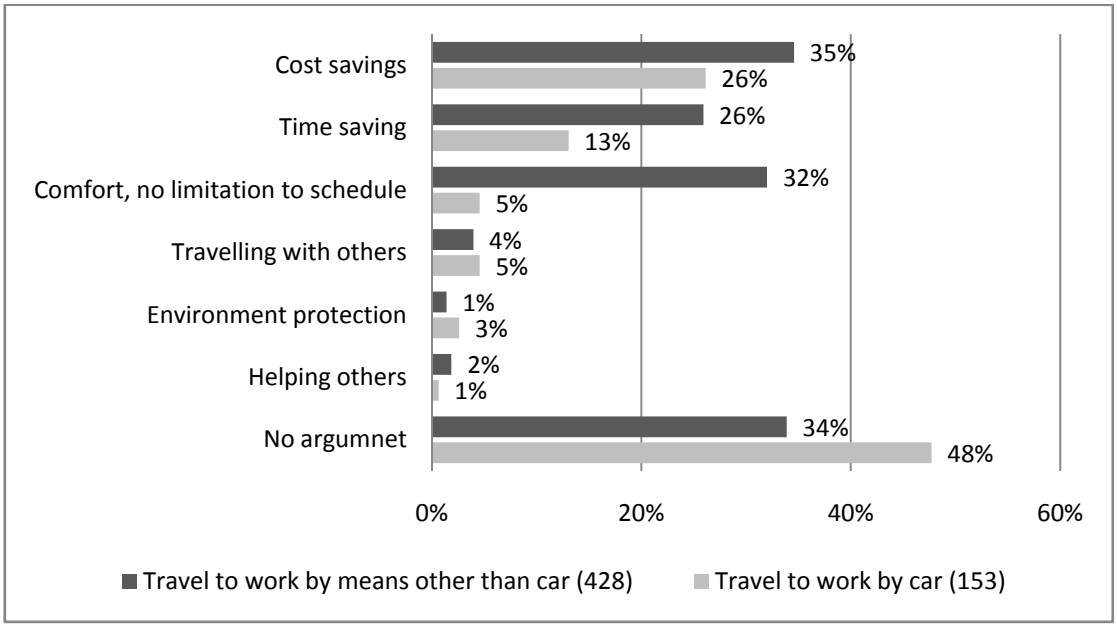

Figure 24. Arguments for carpooling as a passenger (in percentage of those who travel to work by means other than car and by car (number of respondents); one or two arguments could have been selected).
Source: Policy Solutions 2012.

3.8 Cost comparisons

The costs of different personal transportation modes are compared in **Errore. L'origine riferimento non è stata trovata.**. (1 euro was 295 Ft on 1 March, 2013). The cost of public transportation is considerably (by 48-87%) more expensive than carpooling regardless of the length of the routes, though it is relatively more expensive on the short route. Note that drivers typically require around the one third of the direct costs of their car use; thus, if more than two passengers join them, the contributions can even exceed their car use costs.

	Train ticket price		Bus ticket price		Carpooling contribution		Car use cost	
	Ft	Euro	Ft	Euro	Ft	Euro	Ft	Euro
Budapest – Pécs	4,455	15.1	3,690	12.5	2,500	8.5	8,667	29.4
Budapest – Veresegyház	560	1.9	465	1.6	300	1	935	3.2

Table 3: Costs of different travel modes in two routes.

4. Discussion

The results presented in chapter 3.1 suggest that public transportation users provide the majority of passenger carpoolers in Hungary and so only less than 29% of carpooling rides actually redeem car use. In addition, the possibility of carpooling is likely to generate (at least in some cases) additional car use for 10 % of drivers: those who occasionally forgo the trip or travel by public transportation if they do not find passengers for their rides. These two ways of carpooling is likely to significantly reduce the GHG emissions reduction potential of carpooling, at least by 71%.

Further results of this study suggests that carpooling in Hungary is primarily a less expensive and quicker alternative of public transportation for long-distance trips between the working place (usually Budapest) and the place where carpoolers spend weekends (their hometown, the residence of their relatives or friends, etc): (i) the carpooling contribution is considerably cheaper than public transportation price, (ii) the low cost and the speed of carpooling are the most important motivations to carpool, (iii) carpooling is mainly practiced on Friday and Sunday (62% of rides were booked on these two days in 2011), on routes where the trains tend to be overbooked or overused, i.e. between Budapest and the five largest cities of Hungary (70% of rides were booked on these routes in 2011), and (iv) the most frequent purpose of carpooling is to travel home at the weekends. Interestingly enough, the roots of the idea for the oszkar.com scheme are to be found in the crowded journeys by train between Budapest and the operators' hometown, where they often had to travel standing on the long trips during their university years (Prácser and Gyűrűs, pers. comm.). These insights raise the possibility of an indirect benefit of carpooling: by providing a less expensive and quicker travel mode or by reducing the overload of public transportation on Fridays and Sundays and so contributing to more convenient public transportation trips it may reduce the motivation for public transportation user to buy a car or may delay its realization.

Nevertheless, the results described in chapter 3.2 indicate a discrepancy between the low level of carpooling and the large interest associated with it. That is, based on the results of the surveys, although the majority of people would seemingly be willing to carpool (at least when they travel to work) and the majority of carpoolers had rather positive experiences with carpooling, only a very small fraction of them actually carpool, and even they do it rarely. Why? Although this question was not directly addressed in the national survey, the results have provided some hints. The contradiction that a quarter of those who are willing to engage with carpooling would certainly not use a service which organizes carpooling suggests that many people are unfamiliar with the concept of carpooling schemes. In addition, the finding that carpoolers are strongly underrepresented among the residents of smaller settlements, where internet usage is typically lower, suggest that the lack of internet access or the inexperience with internet services are also responsible for the low number of carpooler scheme members. As a result, the small size of carpooler scheme population, which entails the low number of offered and booked rides, hinders carpooling of the scheme members by being unable to provide rides or passengers on the right routes at the right time. This was also confirmed by the carpooler survey, where the most important barrier to carpooling was the lack (or rarity) of rides offered on the desired routes. However, the steady growth of the oszkar.com membership (Figure 4) and the presumably considerable reserves in the population who probably would be willing to carpool suggest that this barrier could significantly decrease in future. While seemingly there are approximately one million people (13% of the adult population) who travel to work by car and 19% of these people (190,000 drivers) are likely to be surely willing to carpool as a driver, there were fewer than 10,000 drivers registered in oszkar.com (Prácser and Gyűrűs, pers. comm.), the most popular carpooling scheme in May, 2012. From the passengers' point of view, 23% (660,000 passengers) of those who travel to work by means other than car is likely to be surely engaged in carpooling as a passenger, as opposed to the approximately 22,000 registered passengers of the oszkar.com carpooling scheme in May, 2012 (Prácser and Gyűrűs, pers. comm). The

largest reserves of potential carpoolers are among the inhabitants of villages, who, though equally or even more strongly willing to carpool, are strongly underrepresented among the carpoolers.

5. Conclusions

The results of this research suggest that in Hungary, where public transportation is widely used, the majority of passenger carpoolers substitute public transportation with carpooling. This phenomenon, together with the fact that a considerable fraction of drivers drives more due to the cheaper car use as a result of carpooling, suggests that the GHG emission reduction potential of carpooling can be much smaller than it is widely assumed. Therefore, while potential estimations focusing on carpooling in regions where public transportation is undeveloped or disfavoured (such as most regions in North America) may assume rightly that each carpooling passenger substitutes travel with another car, estimations in regions where public transportation is well-supplied and favoured (such as in Europe, especially in the Eastern part) should consider the impact of public transportation. On the other hand, the results also suggest that relative to the high willingness to carpool and the good experiences related to carpooling the carpooler population in Hungary is very small and the level of carpooling is low probably due to the low awareness of carpooling schemes and the relatively low internet penetration, particularly in small settlements.

These findings raise the question how carpooling could be more beneficial to the environment in terms of GHG emission reduction in Hungary (or in other regions well-supplied with public transportation). I think, in order to reflect on this question, it is important to distinguish the direct and indirect impact of carpooling on GHG emissions. Direct impact refers to the smaller VKT that might result from car users carpooling as a passenger rather than drive a car, while indirect impact refers to the smaller car owner population that might result from less motivation to own a car due to the quick and relatively inexpensive travel provided by carpooling.

The results suggest that the direct impact in Hungary is rather limited as car owners have little incentive to carpool as a passenger. Car owners have two options if they want to reduce their travel costs through carpooling: they can drive their own cars and take passengers, or they can carpool as passengers. The former option is likely to be more convenient and more flexible than the latter in most cases, and at current circumstances it can be also less expensive (when the carpoolers' contributions exceed their share of car use costs). This can be rather frustrating for those car owners who give up much of their comfort and freedom and carpool as a passenger (e.g. for the sake of environment). Therefore it can be assumed that car owners will insist on driving their cars and rely on public transportation users by offering to take them for a contribution significantly lower than the public transportation fares.

However, the current direct impact of carpooling could be significantly higher (though still rather limited) if the carpooler population was much larger. The development of oszkar.com membership in the previous years and the presumably large reserves in the non-carpooler population who are interested in carpooling suggest that a considerable growth of the carpooler population is rather likely in the close future. Nevertheless, given the likely low awareness in carpooling in Hungary, the promotion of carpooling is likely to facilitate this growth as was proven in the beginning of 2012, when the registration of new users significantly increased after the oszkar.com scheme

was presented in the evening news as a possibility to reduce travel costs by carpooling (Prácser and Gyűrűs, pers. comm.).

The indirect impact of carpooling seems to be a much more complicated issue. Though significantly reduced car ownership is likely to result in significant emissions savings, the extent to which carpooling can contribute to smaller car ownership is rather questionable. While a comprehensively used, real-time carpooling scheme presumably could facilitate a carless lifestyle through providing quick and inexpensive travel to many places (including places poorly served by public transportation), its role much less limited when one needs a car to carry heavy loads or to signal his/her status or, etc. Therefore the indirect impact of carpooling is much more difficult to assess.

Finally, it is worth mentioning that the literature and the results of this research suggest that carpooling could gain a significant position in commuting in Hungary if workplace carpooling schemes would facilitate it; and in that case carpooling could have considerably larger direct and indirect impact on GHG emissions. First, the need to get to the workplace is the most important reason why people travel in Hungary (as probably elsewhere), generating approximately 33% of all trips (KTI, 2012). Secondly, the occupancy of cars on the way to work is rather low, around 1.1 - 1.2 (EEA, 2001), which assumes a lot of solo drivers, who are presumably more willing to share rides compared to those cases when the occupancy of the car is higher, i.e. drivers travel with family members or with friends. Thirdly, travelling to work is usually time-bound to some extent, which makes arranging rides easier (note that for drivers the most important barrier to carpooling is the uncertain details of the trip). Fourthly, people prefer to carpool with someone they already know or to whom they are socially bonded, such as workmates (Amey, 2010). Fifthly, it is often beneficial for companies if their employees use less cars through carpooling, as then they have to provide fewer parking places or they can get higher points for example in the increasingly recognized environmental assessment methods and rating systems for buildings (BREEAM, 2012). Finally, the surveys also found a rather high interest in using carpooling for commuting (71% of commuting carpooler passengers and 64% of commuting carpooler drivers consider carpooling as an option for commuting) as well as a rather high willingness to carpool to work in general (half of those who travel to work would be maybe or surely engaged in carpooling and 43% of those who travel to work by car might consider carpooling as a passenger).

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