

## *Unravelling the determinants of carpool behaviour in Flanders, Belgium: Integration of qualitative and quantitative research*

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**Abstract:** *The goal of this study is to identify those factors that trigger carpoolers to share their rides and the barriers that restrain non-carpoolers from doing so. To this end, four focus group sessions were organized. In addition, information from the 2009-2010 Flemish household travel survey was analysed. From the focus group discussions, it can be concluded that the concept of carpooling is generally well known, but that the media attention and stimuli for the topic seem to have faded away over time. The main motivations to carpool are the social aspect, the financial benefit or a combination of both. The quantitative analysis underlined for the difference between the distinct types of employees. Furthermore, the finding that the home-work distance increases the likelihood to carpool emphasizes the importance of the financial benefits of carpooling. Financial stimuli are thought to have the most potential to increase the share of carpooling in the modal split.*

**Keywords:** carpooling, focus groups, determinants, qualitative research, OVG 4.2

### **1. Introduction**

Carpooling or ride-sharing is commonly proffered as one of the potential strategies to reduce the adverse external effects of the transportation system on our society. An enhanced share of carpooling could provide an important opportunity to reduce congestion and to increase urban liveability and attractiveness (see e.g. Tischer and Dobson, 1979; Chan and Shaheen, 2012). Although the long-term effect of carpooling and rideshare programs on traffic reduction is likely to be minor and often overestimated (Bonsall, 1981; Concas and Winters, 2007), carpooling can definitely play a part in achieving a long-term congestion relief. After all, a long-term congestion relief will require an integrated package of reforms, and efforts to promote transportation alternatives and to improve the existing road network will be much more effective if implemented in concert with strategies for managing the demand for peak-hour automotive travel through the proven mechanism of pricing (Sorensen, 2008). Thus, it is recommended to integrate the promotion of carpooling in a bundle of policy measures rather than using it as a single policy measure.

Sorensen (2008) assessed various carpooling initiatives on a selected number of aspects. He found that there are several major arguments pleading in favour of carpooling. First, there are only minor implications on cost-revenue issues since additional infrastructure is generally not required. Furthermore, carpooling does increase the mobility of people that are not in the possession of a car and allows car-owners to reduce their car-related costs. In addition, a mode-shift to ride-sharing can have a positive effect on economic efficiency in the sense that it promotes more efficient use of existing infrastructure and capacity of vehicles. Besides, this mode-shift entails a reduction in the emission of pollutants and greenhouse gases and it can improve equity for low-income households and individuals by lowering commuting expenses and providing additional transportation options. Finally, some travellers enjoy the benefit of not having to drive themselves, even if they have the resources to do so. In addition,

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stakeholders' opposition to carpooling programs and initiatives are fairly low since increased carpooling generally does not induce competition for private businesses.

The effectiveness of carpooling in reducing congestion is however considered to be relatively low when compared to other travel demand management (TDM) measures, but the low (societal) cost entailed, justify the attention for these initiatives.

Despite the seemingly moderate required investment and the numerous small and large scale attempts to promote the share of carpooling in the modal split, the number of ride-sharers remains fairly small. For example, where an estimated 18 to 20% of US workers used to have carpooling as their commuting mode in the early 1980's, this number has dropped to 12.2% in 2000 and to 10.4% in 2007 (Teal, 1987; Wang, 2011). Exact numbers of carpool-trips and additional objective information on persons sharing a ride are not easily available. One explanation hereof is the absence of a uniform, standardized definition of the concept. Descriptions vary from being very strict (e.g. considering only commuting trips with non-relatives to be carpooling trips) to very broad (e.g. the sharing of a single car by multiple users together) (Habib et al., 2011; Wang, 2011). The authoritative Victoria Transport Policy Institute considers carpooling to be a trip carrying additional passengers using participants' own automobiles, usually used for commuting or attending special events (VTPI, 2010). In the framework of this paper, the authors will adopt this definition.

The goal of this study is to identify those factors that determine people's willingness to share a ride to their destination. In particular, it will be investigated how different target groups are to be addressed, to which attributes they are likely to respond and what parts different actors have to play in order to further increase the share of carpooling in car use.

Section 2 provides a literature review focusing on the determinants and policy related aspects of carpooling and sets the scene of carpooling in Flanders, Belgium. Consequently, the research strategy, which combines qualitative and quantitative research, is described in Section 3. Thereupon, the results are presented and discussed in Section 4. Finally, some conclusions and policy recommendations are formulated in Section 5.

## **2. Literature review**

### **2.1. Determinants of carpooling success**

According to Chan and Shaheen (2012), the evolution of carpooling is characterized by five key stages: (i) World War II carpooling clubs, (ii) major responses to 1970s energy crises, (iii) early organized carpooling scheming, (iv) reliable carpooling systems, and (v) technology-enabled carpool matching. An important trigger for carpooling are the changes in gasoline prices, as the sensitivity of modal commuting with respect to changes in gasoline prices appears to be relatively large (DeLoach and Tiemann, 2012). Thus carpooling is more likely to be considered as an alternative when the costs of driving (alone) are relatively high (Abrahamse, and Keall, 2012).

A significant portion of the travel demand management literature discusses the development of incentives to encourage carpooling and identifies reasons for the success and failure of carpooling (Buliung et al., 2009). Cost savings and pricing of SOV (single occupancy vehicle) use are generally found to be factors that persuade travellers to carpool (Tischer and Dobson, 1979; Abrahamse, and Keall, 2012). Other key factors are safety, congestion reduction, the reduction of scheduling conflicts, environmental awareness and poor existing transit service (Collura, 1994). Flanking (financial) measures such as taxation, the elimination of free parking and cashing out employees instead of giving them a parking subsidy possibly provide new tracks to promote carpooling (Correia and Viegas, 2011). Incompatible work schedules, the need for independence, and lack of convenience and flexibility are generally found to be barriers to carpooling (Koppelman et al., 1993; Abrahamse and Keall, 2012).

With regard to carpool adoption, socio-demographic, spatial, temporal, attitudinal and workplace-related drivers can be identified (Buliung et al., 2010; Vanoutrive et al., 2012). Concerning the socio-demographic effects on carpooling behaviour, literature highlights only a limited influence (Ferguson, 1997). Notwithstanding, carpooling is more common among commuters with low incomes and among younger age groups (Tischer and Dobson, 1979; Teal, 1987). The lower car ownership rates and vehicle availability of these commuters are the most important factors influencing carpool outcomes (Buliung et al., 2009; Correia and Viegas, 2011). Concerning gender effects, studies have found that females are more like to have the intention to switch to carpooling (Koppelman et al., 1993). With respect to spatial determinants, the degree of urbanization and proximity to carpool lots does not seem to play a role (Buliung et al., 2010). Nonetheless, proximity of carpool matches and longer travel distances to work appear to have a stimulating effect on carpooling (Teal, 1987; Buliung et al., 2010). Concerning the temporal dimension, especially a fixed work schedule increases the likelihood of carpooling. With reference to attitudinal effects, several researchers suggest that attitudinal factors are more important in describing carpooling behaviour than socio-demographic variables (Bonsall et al., 1984; Koppelman et al., 1993). Finally, regarding workplace-related factors, firm size appears to positively influence carpool adoption (Vanoutrive et al., 2012). This effect is often denoted the pool-size effect, implying that more employees coincides a larger number of possible carpool partners.

## **2.2. Policy-related aspects of carpooling**

### **2.2.1. Traditional versus dynamic carpooling**

The increasing complexity of work and social schedules, together with the evolution in information and communication technology caused a shift from traditional to dynamic carpooling (Chan and Shaheen, 2012). Traditional or conventional carpooling implies that participants schedule a round-trip in advance, implying the necessity of fixed travel times (and thus fixed working hours) for all participants. In addition, the carpoolers have to know or at least get in touch with each other beforehand, which reduces the group of potential co-riders drastically. In a response to these drawbacks, recent initiatives such as dynamic casual carpooling have organically grown. Dynamic ridesharing is a newer way to share rides, with matches made on the fly or up to several days in advance, using cell phone or computer messaging to make arrangements. The potential riders' profile and preferred route are inputted into a database and a match is sought based on similar origin, destination and arrival time.

Between traditional and dynamic carpooling lays 'casual' carpooling. This is the phenomenon where travellers wait at formal or informal pickup points in order to find a ride to their destination. The ridesharing is thus coordinated at the spot. The motives behind this behaviour are usually the benefits that can be enjoyed from being allowed to travel in HOV (high occupancy vehicle) lanes and is commonly referred to as 'slugging'. Slugging is mostly encountered in the US (Washington DC, Houston and San Francisco) and seems to be an increasing component of the carpool market, particularly as more lane management projects (e.g. HOV-lanes) are brought online. It is clear that taking away the inflexible nature of pre-arranged carpool may trigger the members of today's real-time society to reconsider their ideas of ridesharing, although matters of increased insecurity and privacy cannot be neglected (Deakin et al., 2010).

### **2.2.2. Government interests**

Recall that the share of carpooling in the modal split proves to be highly dependent on energy prices and the relationship between carpooling and income is also fairly strong. These findings suggest that financially stimulating carpooling may be an effective tool for the government increase the share of travellers who carpool (MIT, 2012). Other instruments that authorities frequently apply are promotional campaigns (billboards and audio-visual advertising) and coordinating carpool databases. The European ICARO-project on increased

car occupancy measures stressed the importance of the involvement of employers and other relevant actors, the coordination of individual measures and the continuous evaluation and follow-up of these policy initiatives (ICARO, 1999). The most visible and investment-intensive measures are infrastructural works such as the development of dedicated carpool parking lots at strategic sites and the introduction of HOV-lanes (Li et al., 2007).

### 2.2.3. Employers' Contributions

Next to the government, employers may play a key role in enhancing carpooling because of their privileged positions: they have direct contacts with a large number of potential ride sharers that in many cases share the same destination. Employers can stimulate carpooling by means of soft and hard measures. Soft measures include participation in promotional campaigns, setting up a designated service that coordinates the process (matching potential riders, registering carpool trips, etc.), guarantee a return in case of unforeseen circumstances (taxi-service) and providing financial incentives or benefits in kind (e.g. free car-wash). Hard measures are mostly oriented at providing reserved advantageous parking spots. Benefits of carpooling that may be induced and are favourable to the company are the positive external image, improved interpersonal relations and reduced infrastructure costs. Internal drivers for employers to stimulate carpooling are infrastructural pressure (parking capacity) and motives of sustainable entrepreneurship. Carpool-databases could be set up at an inter-organizational level and the development of company travel plans can be encouraged (Li et al., 2007).

## 2.3. Carpooling in Flanders

In Flanders, the northern Dutch-speaking part of federalized Belgium, the regional government has set up several attempts to promote carpooling and to increase its use in the modal split. In its Mobility Policy Plan (Dutch: 'Mobiliteitsplan Vlaanderen') of 2001, promoting carpooling and car sharing was put forward as a direct initiative to reduce traffic volumes and 'car-solism'. This was to be achieved by providing fiscal stimuli and setting up interactive marketplaces, by developing attractive facilities and flanking measures, by setting up an information campaign and a platform to bring potential carpoolers together, and by stimulating employers to sensitize their employees (Ministerie van de Vlaamse Gemeenschap, 2001). Specifically for home-to-work traffic, a number of concrete initiatives were launched in 2006 by means of a Commuting Plan (Dutch: 'Pendelplan'). As a result of this policy plan, three major instruments have been developed: a carpool database ('Vlaamse Carpoolbank'), the construction of designated carpool parking lots and frequent mass-media sensitization campaigns. Despite the regional stimuli for carpooling, it should be stressed that national fiscal policies such as abatement for car drivers in the income taxes most likely play a countering effect.

The share of carpooling in Flanders can be quantified using the Flemish household travel survey (OVG 4.2 (in dutch: Onderzoek VerplaatsingsGedrag Vlaanderen) (Cools et al., 2011). From the travel diaries, it can be derived that at trip level - adopting the strict definition of carpooling in the context of commuting trips - carpooling represents only 19.58% of the 527 car trips. At person level, 11.27% of the 662 professionally active respondents participate in carpooling. The latter percentage is derived directly from a question in the person questionnaire of the OVG which explicitly focused on commuting-related carpool behaviour.

## 3. Research strategy

From the literature review, it was clear that different segments of the population might have diversified interests that play in their decision whether to carpool or not. Therefore, the goal of this research project is to identify the factors that trigger carpoolers to share their rides and the barriers that restrain non-carpoolers from doing so. The selection of socio-demographic variables used for segmentation is not straightforward, as the reported effects in literature are

not always in correspondence. Nevertheless, since income has a significant impact on car ownership and use, it can be assumed that motives for white-collar workers, blue-collar workers, inactives (unemployed or retired) and students to rideshare may be very different (Ferguson, 1990).

### 3.1. Qualitative assessment

To identify the factors that are of importance in each of these segments, four focus group sessions of approximately three hours each were organized in early 2011: one for each defined segment. These focus groups – i.e. planned discussions among a small group (4-12 persons) of stakeholders facilitated by a skilled moderator and designed to obtain information about (various) people’s preferences and values pertaining to a defined topic by observing the structured discussion of an interactive group in a permissive, non-threatening environment - were oriented around fourteen themes and discussions were triggered by means of a suggestive statement (Elliot et al., 2005).

Table 1 represents the composition of the four focus groups. The sessions of the blue-collar workers and the inactives consisted of male participants only, which is to be considered as a limitation of this study.

	White-collar workers	Blue-collar workers	Inactives	Students
Number of participants	8	8	8	8
Age	25-54	19-52	18-66	18-22
Gender (F/M)	5/3	0/8	0/8	4/4
Driver’s license	100.0%	100.0%	87.5%	100.0%
Car availability	100.0%	100.0%	87.5%	100.0%
Bicycle availability	87.5%	62.5%	75.0%	100.0%
Average yearly mileage (km)	12,250	26,250	14,400	10,850
Remark	3 participants form carpool team		7 participants have no degree of higher education	

**Table 1 : Focus Group Composition**

The themes addressed were general knowledge of the concept of carpooling, carpooling as an answer to the pressure on the environment, the role the government and the employers have to play, the effect of working regimes on carpool potentials, the importance of travel costs, insurance-issues, privacy concerns, safety, security, prior promotional campaigns, trip chaining, travel distance and infrastructural projects. The discussions were held in an informal atmosphere and had a very open scope. Only in the case of extreme diversion from the subject or in the case of falling silent, a guiding statement was launched to reinitiate the discussion. The moderator and secretaries held track of the subjects that were discussed in order to ensure that every subject was passed in review. The different themes and suggestive statements are listed up in Table 2. Participants were recruited by means of personal invitations.

Aspect	Statement
Overall knowledge	“I know what carpooling is and what it entails”
Environment	“I can reduce pollution and combat global warming by carpooling”
Government	“The government is responsible for promoting carpooling”
Employers	“My school/company stimulates carpooling”
Working regime	“My working regime is unsuitable for carpooling”
Travel costs	“Sharing a ride implies sharing the costs”
Insurance	“Am I insured while carpooling?”
Privacy	“I don’t want anyone to disturb my private space”
Safety	“I don’t feel safe when driving with someone else”

Security	“I will not share a ride with a complete stranger”
Promotional campaigns	“I know these campaigns and they affected me” [billboards were shown]
Trip chaining	“I can’t carpool because I have some other things to do before I go home”
Travel distance	“Carpooling increases my mileage dramatically!”
Infrastructural projects	“I know the solution: HOV lanes!”

**Table 2 : Guiding Statements**

Prior to the focus group discussion, every participant was requested to fill out a personal questionnaire. This allowed the researchers to gain insight in the specific composition of each focus group. This questionnaire included questions on the participants’ personal and household background and on their gender, age, marital status, drivers’ license, yearly mileage, education level, personal and household income, household composition, vehicle ownership, travel behavior, working regime and activity patterns.

### 3.2. Quantitative Analysis

Besides the qualitative approach to identify the incentives and barriers to carpool by means of focus groups, the carpool information (i.e. the likelihood to carpool) extracted from the person questionnaire of the Flemish household travel survey (OVG 4.2) was analyzed using logistic regression. Note that these data come from a representative sample of the population different from the respondents in the focus group, and the sample size was considerably larger (662 professionally active travellers). Algebraically, the logistic regression model considered in this study is given by the following formula:  $\text{logit}(\pi) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k$ , where  $\text{logit}(\pi)$  is the natural log transformation of the odds of carpooling ( $\pi$ ) to not doing so ( $1 - \pi$ ),  $\alpha$  the regression constant, and  $\beta_k$  the parameter estimates associated with  $k$  independent variables,  $X$ .

## 4. Results and discussion

### 4.1. Results and discussion of the qualitative assessment

#### 4.1.1. Focus group 1: white-collar workers

The first focus group was composed of brain workers: i.e. office workers, officials and executives. The members of this focus group have a clear view on what the concept of carpooling embraces: elements of ‘driving together’ and ‘common destination’ were mentioned by all participants. The white-collar workers also tend to carpool for non-work activities. When asked to stipulate their motivations to carpool, the social aspect of ridesharing and to a minor extent the financial benefits prevail. Carpooling creates a tighter bond between colleagues and driving together with acquaintances decreases the feeling of insecurity. An important drawback of carpooling is the strict schemes in terms of timing that have to be respected. Ride sharing also occurs for going out and for sporting activities, but only in case of larger distances. Environmental issues are considered to be a favourable side effect of carpooling, but are not a motivation on their own. Participants are not aware of the fact that the employer’s insurance also covers the detour to pick up and drop off carpoolers.

Governmental initiatives are known, but not considered to be very fruitful. Designated carpool parking lots are welcomed, but their current capacity and facilities are insufficient. Safety is not considered to be a major issue. Current promotional campaigns (billboards) are not very effective and financial stimuli are suggested as a future strategy (e.g. a reduction for carpoolers in the potentially upcoming cordon tolls). The introduction of congestion charging could be a trigger to promote carpooling itself, since the cost of car-solism will become apparent to the commuter immediately. The biggest relief is believed to lay in the introduction of infrastructural measures such as HOV lanes.

According to the participants, employers should consider providing more flexibility in working hours in order to stimulate carpooling. Many carpoolers do so without officially

notifying their employer. Small scale measures such as designated and favourable parking spaces make employees feel respected for their efforts. Most employers that actively stimulate ride sharing do so because of cost-related motives: increasing parking capacity can be very expensive. It is mentioned that it is primarily the government's responsibility to change people's travel behaviour, but that it could be considered to do so through the employer who has a much more direct connection to his staff.

The white-collar workers seem to be very anxious when it comes to carpooling with strangers. Even ride-sharing with colleagues they do not know well proves to be a significant barrier. Nevertheless, it has to be kept in mind that this declared fearfulness may be more distinct because of this group's lower cost sensitivity and more relaxed working schedule. Existing large scale initiatives and pro-carpool organizations are not known to the employees.

#### 4.1.2. Focus Group 2: Blue-Collar Workers

The second focus group consisted of blue-collar workers or labourers. These persons usually have more stringent labour-hours that make it potentially easier to organize carpool-teams. The share of work-related trips is smaller than for the participants in the first focus group, whereas the number of recreation-trips is larger.

When asked to define the concept of carpooling, not only the predictable aspect 'driving together' and 'common destination' are mentioned, but also the existing infrastructural measures such as the designated carpool parking lots pop up. In addition, it seems evident for these participants that carpooling is not to be restricted to commuting traffic. The financial benefits and congestion reduction are considered to be the most important triggers for ridesharing for this group, whereas the potential effect on the environment is a minor concern ("other traffic related measures such as frequent technical check-ups would be much more effective"). The necessity of having similar working hours and regimes is brought up, but it is concluded that these issues can easily be overcome by making good arrangements. An issue stressed by the blue-collar workers is the fact that carpooling can extend the duration of social activities (going out). It is brought up that it is curious that ridesharing seems evident for sport activities (e.g. away games), whereas this is not the case for commuting trips.

The members of this focus group stated that the government's efforts to support carpooling are insufficient. They know about the existence of designated parking lots, but they are unaware of any government supported promotional campaigns. Financial stimuli of workers and employers would be the most effective way to increase ridesharing. The government should create a framework in which it stimulates employers to motivate its workers to carpool. The parking lots are greatly appreciated because they limit the necessity of making detours to pick up all carpoolers and they allow commuters to combine their carpooling with bring-get and shopping activities before and after work. A major drawback of the designated carpool parking lots is the security at these remote sites. Especially after the late working shift (ending at 10 p.m.), this group feels unsafe in these carpool parking lots. Decent lighting and (camera) surveillance are indispensable. The provision of a caretaker or a manned 24-hour shop would also considerably improve (subjective) safety.

The blue-collar workers do not see a major role to be played by their employers: primarily because they do not believe that enterprises will directly benefit from ameliorating their co-workers' travel behaviour and secondly because the labour-hours are mostly outside peak-hours in traffic. Workers that want to carpool should arrange this by themselves. If a company decides to stimulate carpooling, its best strategy would be to ensure a guaranteed homecoming in case of unforeseen overtime hours. Since carpoolers already receive a financial benefit from carpooling by saving on direct costs, an extra financial incentive from the employer is not expedient.

The barrier of ridesharing with strangers seems less apparent in this focus group. An initial contact by phone or through the Internet generally suffices to make an appointment with a potential carpool-partner. The risk of a 'no-show' of this partner seems more perturbing than

not having met this person before. Carpooling is considered to be an interesting way to encounter new people.

#### 4.1.3. Focus Group 3: Inactives

The third focus group consisted of unemployed and retired persons. These participants are currently not employed [7] or have retired [2]. Their opinions on carpooling seem more diverse (less uniform) than was the case in the other focus groups. Themes such as congestion, parking problems, financial issues and (most importantly) the environment are all taken into consideration, whereas the social aspect of carpooling is less important. When asked to define carpooling, recurring concepts are limited to 'driving together'. Carpooling for recreational purposes comes naturally to the participants, making carpool-organizations redundant for this target group. The inactives are not confronted with the drawback of the tight time-restrictions that workers are generally dealing with. Carpooling with a stranger is out of the question for the participants of this focus group.

The inactives do not believe that employers have a major part to play in promoting carpooling. The government on the other hand should give the good example by maximizing carpooling by its officials. The creation of designated parking lots is appreciated to a large extent, but their number and capacity is insufficient. Small installations of catering or convenience stores could improve the attractiveness of the parking lots. The carpool parking lots should also facilitate the possibility for rideshares to execute bring-get, shopping and recreational activities. It is not believed that mass media promotional campaigns will have a major influence on the share of carpooling in the modal split.

#### 4.1.4. Focus Group 4: Students

Eight students participated in this study. As could be expected, the majority of their trips are trips to home and to their schools. Financial motives and necessity are the main triggers for students to carpool. Although all students' households possess a car, it is very often not available to them. A third factor that comes into play when carpooling is considered is the aspect that by sharing a ride, only one passenger (the driver) has to maintain the alcohol limit. A major drawback of carpooling is the necessity of making prior arrangements. Students usually do not lead much structuralized lives and therefore are very often not able to make and come up to appointments very strictly.

The students are not familiar with any of the promotional campaigns of the government. This may be one of the reasons why carpooling is not very popular with this group. The existing carpool parking lots are perceived to be overfull and unsafe. The authorities face a vast challenge according to the students: the students are not at all tempted to carpool.

It seems that the students are pleased by the initiatives taken by their colleges. One of the most prevalent initiatives is to compose classes based on the students' origin. This leads to matching college-hours and facilitates carpooling to a large extent. A database to which potential carpoolers can subscribe is considered to be a very good idea, given that individual privacy is safeguarded. Minor initiatives such as competitions and gadgets can also be very effective in persuading students to change their travel behaviour. Students seem less averse to executing activities on the way "... as long as it does not take too long". Ride sharing with total strangers seems to be a no-go, but carpooling with fellow-students or members of the same sports club is more feasible (even if the partner is not known in person).

## 4.2. Results and discussion of the quantitative assessment

Next to the qualitative approach, the carpool information from the OVG 4.2 was analyzed using logistic regression. The dependent variable indicated whether persons were carpooling or not. Recall that 11.27% of the 662 professionally active respondents indicated that they participated in carpooling. Table 3 displays the significance of the investigated parameters. These parameters include socio-demographic variables, work related attributes and modal habits. Only four factors appeared to have a significant influence (at the 10% level of



significance) on carpool behaviour, supporting the literature that market segmentation based on objective factors might be a challenging task (Koppelman et al., 1993; Ferguson, 1997). The non-significant factors were removed from the final model. The type III analyses of these factors are also displayed in Table 3 and should be interpreted as the type III effect when the corresponding variable was added to the model of the four significant factors.

Effect	DF	Chi <sup>2</sup>	P-value
<i>Significant effects</i>			
Blue- vs white-collar worker	1	3.439	0.064
Home-work distance (in km)	1	12.034	0.001
Car need during job (Yes/No)	1	4.499	0.034
Parking difficulty (Easy/Difficult)	1	3.948	0.047
<i>Non-significant effects</i>			
Age (18-34/35+)	1	2.202	0.138
Sex	1	0.129	0.720
Partner (Yes/No)	1	0.355	0.552
Children (Yes/No)	1	0.289	0.591
Higher education (Yes/No)	1	0.838	0.360
High personal income (Yes/No)	1	0.960	0.327
Fixed day working schedule (Yes/No)	1	0.537	0.464
Urbanization residence (Urban/Rural)	1	0.351	0.553
Frequent cyclist (Yes/No)	1	0.248	0.619
Frequent public transit user (Yes/No)	1	1.155	0.283
Parking (Free/Payable)	1	0.378	0.539

*McFadden's LRI: 0.52*

**Table 3 : Type III Analysis of Effects**

The four significant effects are the distinction between blue and white collar workers, the distance from home to the work location, the fact whether a car need is needed for executing the job (not for getting to the work location) and whether it is difficult or not to find a parking spot nearby the work location. The significant difference between blue collar workers and white collar workers underlines the importance of having separate focus groups for these distinct types of employees, as was adopted in the qualitative approach of this study. When the maximum likelihood estimate for this difference is investigated (table 4), one can observe that blue-collar workers have a higher probability to carpool than their white-collar counterparts. Expressed in odds, the odds to carpool are 65% ( $\exp(0.499)-1$ ) higher for blue-collar workers in comparison to white-collar workers.

With respect to the home-work distance, one could observe that this distance increases the likelihood that employees carpool. The odds increase with 2% for each additional kilometre. This can be explained by the fact that the financial benefits become more pregnant when commuting distances are considerably larger, as was also indicated in the participants' benefits and restraints section of this paper. With regard to the necessity of using the car for the job, it can be concluded that when employees do need their car for executing their job, this decreases the odds by 48%. This can be accounted for by the fact that the jobs that require a car for performing the job involves more flexibility from the employee, and consequently more uncertain working hours. Consequently, the possibility to find matching carpool partners is considerably more difficult.

Finally, the perceived difficulty in finding a parking spot has a counter-intuitive effect. When employees find it difficult to find an available spot, this decreases the odds to carpool by 62%. Although, one generally would expect an increase in the likelihood to carpool, this decrease can be explained by the main mode these employees use: when finding available parking spots is perceived as too difficult, these employees will switch to other transport modes such

as public transport. This certainly underlines the importance of accessibility by public transport when making location decisions for new office locations.

Parameter	Estimate	S.E.	P-value
Intercept	-2.387	0.243	<0.001
Blue-collar worker	0.499	0.269	0.064
Home-work distance (in km)	0.020	0.006	0.001
Car need during job: Yes	-0.644	0.304	0.034
Parking difficulty: Difficult	-0.971	0.489	0.047

**Table 4 : Maximum Likelihood Estimates**

## **5. Conclusions and policy recommendations**

The goal of this study was to identify those factors that determine people’s willingness to share a ride to their destination. Based on the quantitative study, four objective factors were identified that had a significant on carpool behavior: the distinction between blue and white collar workers, home-work distance, car necessity for executing the job and parking difficulty. The significant difference between blue collar workers and white collar workers validated the methodology of the qualitative approach to define separate focus groups for these distinct types of employees.

The qualitative approach was especially fruitful in tailoring future carpooling interventions. Based on the discussions that were held in the four focus groups, it can be concluded that the concept of carpooling is generally well known, but that the media attention and stimuli for the topic seem to have faded away over time. Designated carpool parking lots are the only tangible aspect of ridesharing related initiatives that the participants are familiar with. Other initiatives such as the existing carpool database or employers’ incentives are known to a much lesser extent.

The main motivations for participants to carpool are the social aspect (white collar-workers), the financial benefit (blue-collar workers and non-actives) or a combination of both (students). External benefits such as reducing pressure on the environment and congestion-related motives only play a supporting role. The necessity of making good appointments and the incompatibility with today’s flexible working regimes are the major barriers that withhold participants from carpooling. Carpooling seems to come naturally for recreational activities, whereas it is uncommon for working trips.

The existing carpool parking lots are greatly appreciated by all focus group members. An expansion of the capacity and minor modifications (lighting, basic security, small shops) could further improve its success. Additional infrastructural measures in the form of HOV-lanes are considered to be potentially very fruitful and have to be further investigated. Recent promotional campaigns are unknown to the participants and are considered to be ineffective. Financial stimuli (e.g. congestion charge reductions for carpoolers) are thought to have the most potential to increase the share of carpooling in the modal split. It is unclear to many participants whether or not the regular employer’s insurance for commuter traffic covers the detours made to pickup carpool passengers.

Employers can play an important part in convincing their employees to carpool (e.g. by suggesting the composition of carpool teams by means of a database or by providing the opportunity to work in fixed regimes; hereby especially focusing on workers that live at a considerable distance from their working place), but they have to be incited to do so by the government since they merely have no direct benefit of an improved travel behavior of their workers. On the other hand, they are considered to have more impact on their staff than the authorities, making them a privileged partner. Employers that promote carpooling should also

take care of a guaranteed homecoming of their employees in case of unforeseen circumstances.

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