



Why do people carpool? Results from a Swiss survey

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Abstract

A recent study aimed to estimate the potential of carpooling in Switzerland. Part of this study was a survey in which the attitude of the public towards this transport option was investigated using both multi-response questions and a stated preference (SP) experiment. This paper reports on the results of the multi-response questionnaire. The main contribution of this paper is to give an insight on the reasons that motivate Swiss people to consider car-pooling as a possible alternative to driving alone with their own private car. Additionally, a subset of the questionnaire was the basis for factor analysis and cluster analysis. Four different clusters were found which are supposed to represent the main orientations toward carpooling among the population. This analysis is valuable to figure out possible strategies in order to introduce carpooling at a larger scale in Switzerland. The results of the questionnaire show that some parts of the population would be ready to embrace this mode of transport, in some cases even enthusiastically. This is true in particular for well educated, relatively affluent people. However, the responses suggest also that in order to exploit this potential, a system able to address some of the typical issues related to carpooling should be set-up. Safety is important but not the most important issue for potential participants. Practical aspects, like the guarantee of being able to go back home as a passenger if pools are arranged on a one-way basis, are those which worry respondents the most and, therefore, the most critical for carpooling success.

Keywords

Carpooling– Survey – Factor Analysis – Cluster Analysis

1. Introduction

This paper reports on a recent study aimed to assess carpooling potential in Switzerland, a mode with a possibly large, but unrealized potential. Formal carpooling (also ride-sharing), in the following simply carpooling, is defined as two or more persons, not belonging to the same household, sharing a trip, or a part of it, with the passengers contributing to the driver's expenses. The trip should be one that the driver needs to carry out in any case. The idea of encouraging this form of mobility through formal pooling systems came up first during the "oil shocks" of the 1970's and has been attempted ever since taking various forms in different countries. Despite some success it is commonly believed that the potential of car-pooling is far from being fully exploited, letting unused a simple but possibly effective way to improve mobility efficiency and sustainability. In Switzerland, several web-based carpooling platforms are active – that is, platforms, where potential drivers and passengers can find potential trip mates – but none of them is large enough to guarantee a long term success of the system.

The research on carpooling has been relatively abundant, especially in recent years. It has investigated various aspects of car-pooling, users' behavior, users' preferences and motivations to participate in carpooling. Some recent works on carpooling are: Habib *et al.* 2011, Builund *et al.*, 2010, Vanoutrive *et al.* 2012. Nevertheless, there is still a knowledge gap about the dimension of the actual potential of carpooling. The study on which this paper reports aims to estimate the potential for carpooling in Switzerland and has been commissioned by ASTRA, the Swiss national authority for roads and conducted in collaboration with the software firm PTV Swiss, which developed one of the active Swiss carpooling platforms (*Rideshare*, 2012). Part of this study was a survey in which the attitude of the public towards this transport option was investigated using both multi-response questions and stated preference (SP) experiments. This paper reports on the multi-response part and its main goal is to provide an insight on individuals' preferences regarding carpooling. The results will be also the basis for further work in the modeling of carpooling complementing a previous effort which dealt with the stated preference part (Ciari *et al.* 2011).

The remainder of this paper is organized in three sections. Section two describes the whole data collection process. It involved the recruitment of participants and the design of the experiments. The section provides also information about the response rate and shows a

summary of the most important sample's statistics. Section three reports some tables and figures based on the responses of participants. This gives a general picture on how carpooling is perceived in Switzerland. Factor analysis and cluster analysis exercises are also part of this section, as well as an overall discussion of the results and the description of a possible strategy to involve a larger number of individuals in carpooling activities in Switzerland. The fourth and last section comprises a summary of the work and an outlook on future work on the topic.

2. Data Collection

The participants were recruited among respondents of a year-round continuously going survey commissioned by Swiss Federal Railways, known as KEP (Continuous Survey of Passengers, Swiss Federal Railway, 2001). This is a computer-assisted telephone survey, in which approximately 400 persons per week are interviewed. All trips exceeding 3 km length made by the respondent in the week previous to the interview are recorded with their attributes such as origin, destination, travel and waiting times, etc. Respondents' socio-demographic characteristics and mobility tools are recorded too. Eligible for our study were all interviewees owning a driving license and with at least one reported trip longer than 10 km. The minimum length criterion was introduced assuming that persons with a longer trip are more likely to consider carpooling as an option. Those accepting to participate in the study were asked the following additional questions:

- Exact origin and destination addresses of one of the trips longer than 10 km
- If the person carpoled on a regular basis in the last year
- Membership in a carsharing program
- Use of carsharing in the last year
- Original cost of the car (cost as new, if owns a car)
- Fuel consumption of the respondent's car, if any is owned

This additional information was used together with the information collected in the survey as a basis for the construction of the personalized and realistic mode choice experiments. The recruitment took place in two tranches, the first between August 23rd and October 25th 2010 and the second between January 1st and April 18th 2011. More than 2,000 potential participants were recruited for the study, but some of them, for various reasons, were excluded from the sample. The final sample's size of the SP experiment was 1,683 persons.

2.1 Response Rate

Despite being the questionnaire long and complex – the total length was 27 pages, the SP experiments accounted for 15 pages, the multi-response questions, on which this paper reports, accounted for the rest – the overall response rate was 51% (876 respondents). This is not only a satisfactory rate, but also higher than the expected rate given the a-priori assessed response burden as described in Axhausen and Weis (2009). The expected response rate was 45%, which is six points less than the response actually obtained.

2.2 Sample Summary Statistics

Some key socio-demographic attributes allow for a qualitative evaluation of how much the respondents are a representative sample of the Swiss population. In Table 1, a comparison is made among the respondents, the recruited participants and the population in the 2005 Swiss National Travel Diary Survey (Are and BfS, 2007).

First of all, one needs to remember that one precondition for the recruitment of participants was a driving license ownership. The figures for respondents and recruited individuals are compared with all respondents of the Swiss mobility census owning a driving license. The comparison between respondents (those who sent the questionnaire back at least partly filled) and recruited (those to who the questionnaires were sent) allows to evaluate if the response rate depended on some particular socio-demographic attribute. Apparently, this was not the case, since the figures are fairly similar for almost all the variables considered. The comparison with the Swiss mobility census shows if the sample used is representative for the part of the Swiss population (adults with a driving license) which the study targeted. Moreover, it gives an idea which categories of individuals were more motivated to participate in (and respond to) the study. From the simple observation of the table some noticeable facts are:

- Males were more likely to participate
- Younger individuals (18-35) were less likely to participate
- Wealthier people were more likely to participate
- Participants belong to comparatively large families
- Participants live in households with comparatively many cars
- Participants are above-average public transport discount cards owners

The higher share of male participants is typical of Swiss SP survey work. Wealthier and better educated individuals and public transport users are usually keener to participate in such studies. Apparently, such categories of people are more interested in, but also have a higher awareness of, transport related subjects.

Table 1: Summary of some key statistics. All values are expressed as percent.

			Recruited	MZ 2005
Gender	Male	55.0	56.4	50.0
	Female	45.0	43.6	50.0
Age	18-35	15.9	19.6	25.3
	35-50	39.9	38.4	32.4
	51-65	30.2	29.8	26.7
	> 65	14.0	12.2	15.9
Education	Compulsory Education or less	5.6	7.0	11.2
	Professional School	48.6	48.6	61.7
	College/University	44.5	44.5	27.1
Cars in the Household	0	4.0	4.5	9.1
	1	47.4	47.3	55.3
	2	39.7	38.5	28.9
	>2	8.9	9.7	6.7
Persons in the Household	1	10.6	10.8	27.7
	2	41.0	37.6	36.0
	3	15.4	17.0	11.7
	4	23.4	24.9	17.6
	> 4	9.6	9.7	7.0
PT Season Ticket	None	44.6	46.5	56.4
	Half Fare	40.9	39.8	30.3
	GA	10.8	9.9	5.8
	Other Discount Card	3.7	3.7	7.4
Income	< 2,000	3.6		2.7
	2,001 – 4,000	7.5		15.7
	4,001-6,000	22.1		27.6
	6,001 – 8,000	21.3		22.2
	8,001 – 10,000	16.1		14.3
	10,001 – 12,000	12.7		7.8
	12,001 – 14,000	5.3		4.1
	14,001 – 16,000	3.7		2.2
> 16,000	7.6		3.3	

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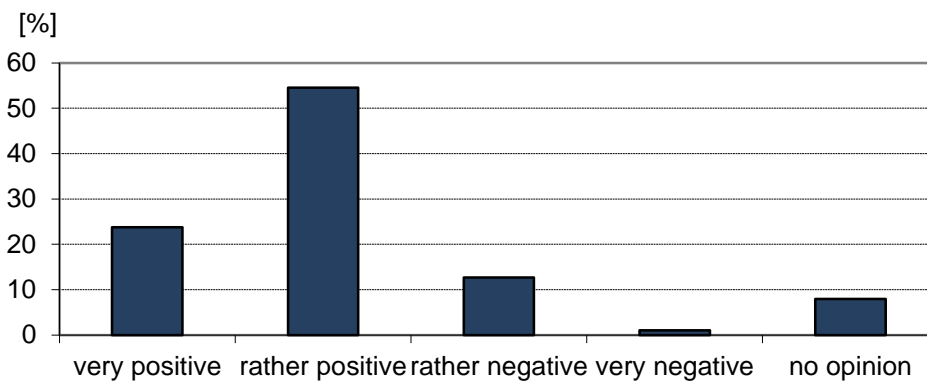
3. Attitude toward Carpooling

In the present section the attitude of the public toward carpooling is evaluated. First, responses are showed in order to derive a general impression of sample's attitude. Second, a combination of factor analysis and cluster analysis is used to classify respondents in lifestyle groups having different attitudes toward carpooling.

3.1 Questions and responses

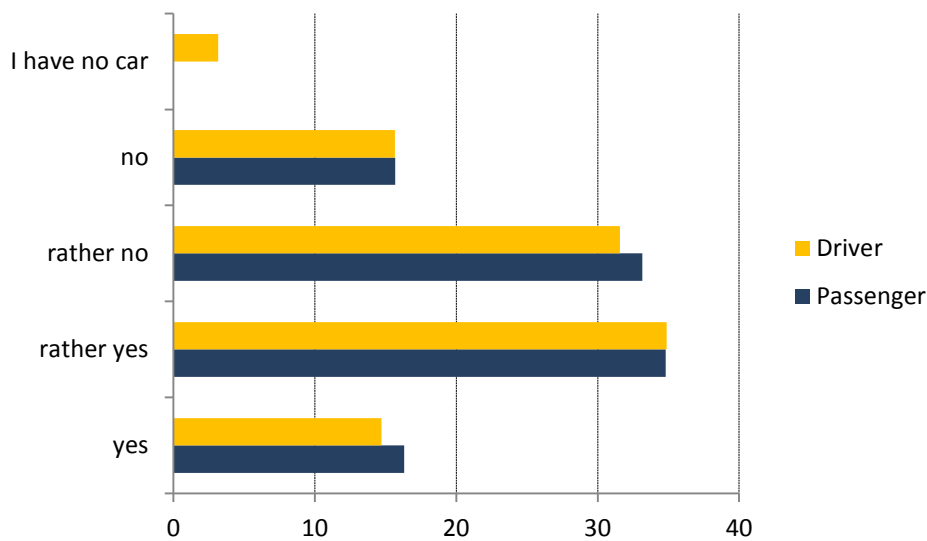
The qualitative part of the questionnaire is divided in three parts. The first is composed of general questions on carpooling, the second includes questions on existing platforms and on the characteristics an ideal platform should have, the third deals with carpooling for commuters, which is typically considered the best target group for this mode of transport. Figure 1 reports the general opinion of respondents on carpooling.

Figure 1: Opinion on carpooling



Most of the respondents (78%) have a positive opinion on carpooling while only a few (1.1%) have a very negative opinion. The low share of respondents without opinion (8.8%) suggests that carpooling is a familiar concept, although not widely used. Individuals willing to carpool actively are a slight majority in the sample (Figure 2).

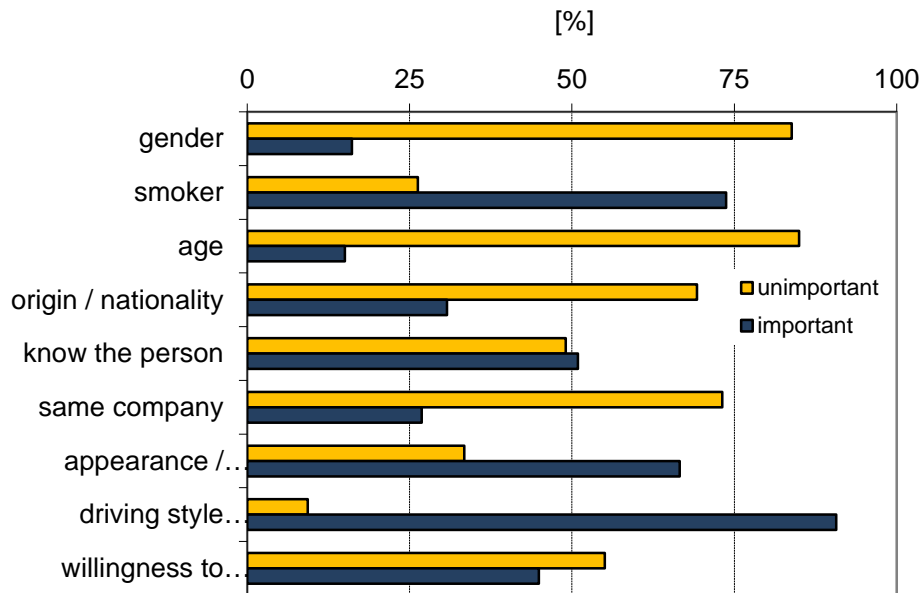
Figure 2: Willingness to carpool



The fact that more than the half of respondents is willing to carpool, or consider this at least likely to happen, suggests a large unexploited potential in the Swiss context. However, there is a relatively large difference between the number of those having a positive opinion on carpooling and that of those ready to put it in practice. Apparently, some respondents have an approach of the kind “this is good but this is not for me”.

One question aimed to find out which characteristics of an eventual ride-mate, assigned through a platform, were important. The driving style of the ride-mate results as the most important characteristic, with good manners and not smoking following and being also cited by more than half of respondents. The complete chart is reported in Figure 3.

Figure 3: Relevance of certain characteristics of ride-mates



A question on the importance of some characteristics of carpooling as a mode was aimed to give a hint on motivations to join. The frequency of the responses is reported in Figure 4. Environmental issues seem to be dominant and, more in general, altruistic aspects are, on average, more important than utilitarian ones. The possible barriers for using formal carpooling were also investigated. The most frequent issue reported is being tied to a particular departure time. Safety is also an issue but comes after a few other aspects of practical nature which are considered more important. This is in contrast with some previous literature (Raney, 2009) and might reflect the low crime rate in Switzerland: security is definitely important but not the very first thing that comes up as a possible barrier. The complete response frequency is reported in Figure 5.

Figure 4: Importance of some characteristics of carpooling as a mode

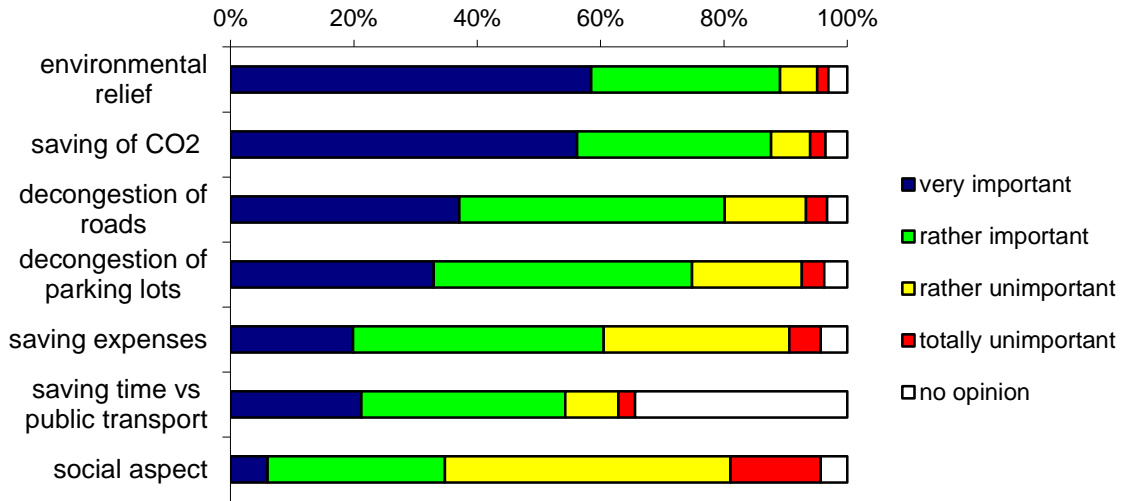
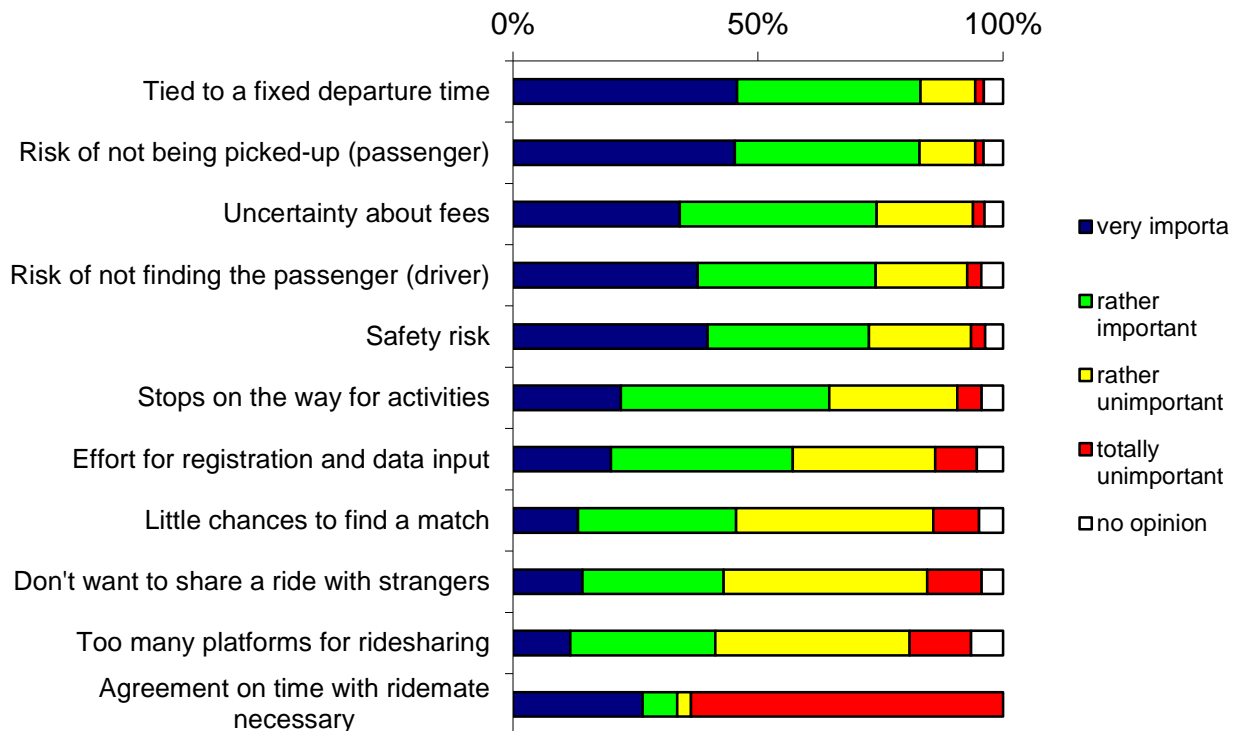
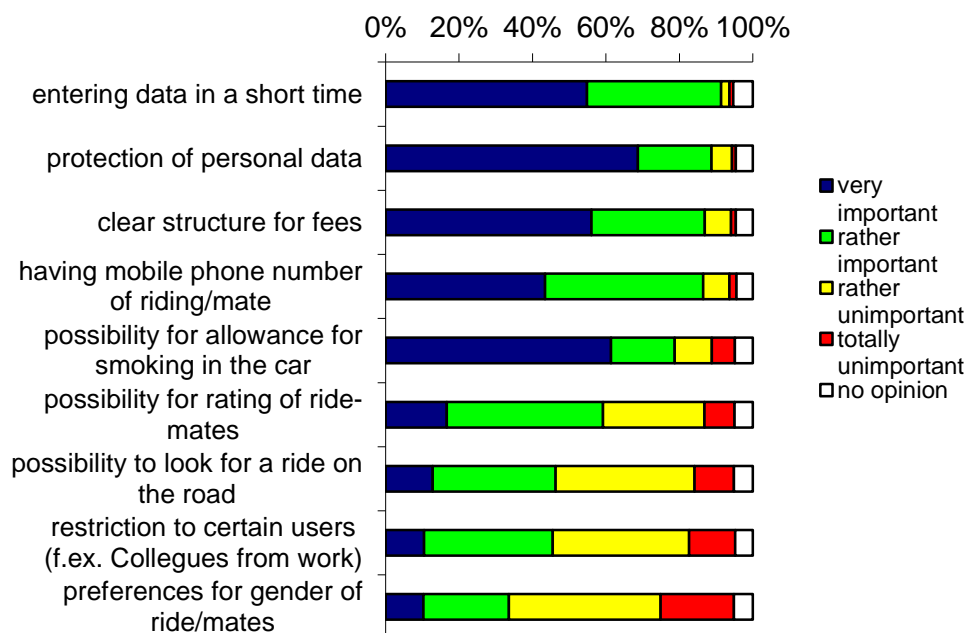


Figure 5: Possible barriers for using carpooling



A question on the main existing platforms in Switzerland revealed that most of the platforms are not known, only one of them is a familiar name for more than 10% of respondents, and also that most of the respondents (73%) does not know any platform. A possible interpretation is that existing carpooling platforms are too small and not adequately advertised among potential users. The answers to a question about the most important characteristics that a platform should have are reported in Figure 6. An effective personal data protection is the characteristic most frequently rated as very important. Responses give the overall impression, that practical aspects are much more important than social aspects. From the same figure, looking at the answers at the bottom, it is clear that respondents are not particularly interested in very advanced features, like looking for a ride on the road, or in a platform with “social-network like” features, as a reputation rating system or restrictions on the participants.

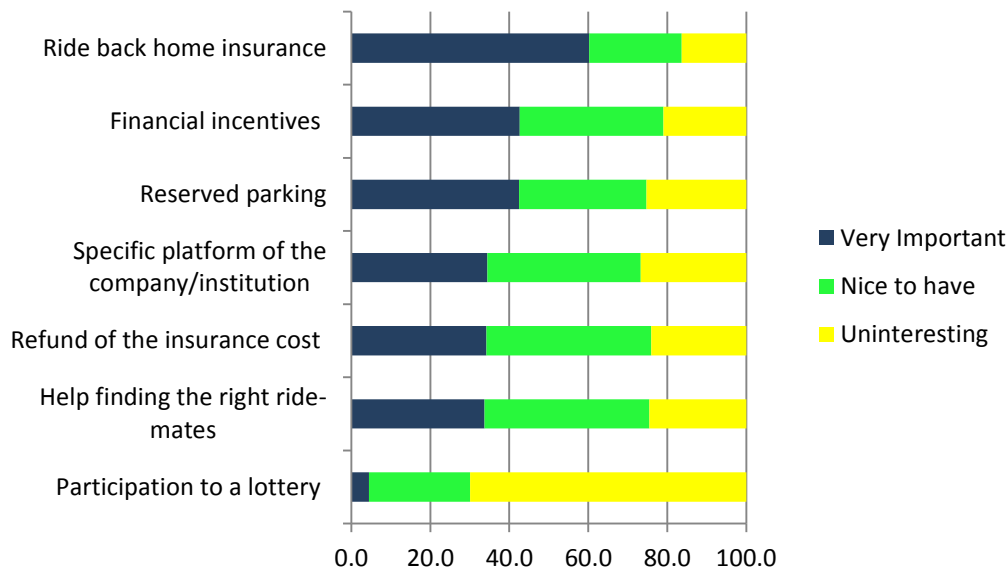
Figure 6: Most important characteristics for a carpooling platform



From other questions it has been possible to find out that most of potential participants (70%) would be willing to use gasoline costs as a basis for sharing the cost of the trip and that, for a large majority (83%), potential drivers would consider a deviation of 10 minutes to pick up a passenger as acceptable. A final question was about which incentive potential carpoolers

would appreciate the most. The responses are reported in Figure 7. It is interesting to observe that an insurance to have a lift on the way back home, which is obviously relevant in case a one-way matching is proposed, is the most appreciated incentive. Financial incentives and a reserved parking are also very important incentives for more than 40% of the respondents.

Figure 7: Importance of some proposed incentives to carpool



Overall, the sample has a very positive attitude toward carpooling. Slightly more than the half of the sample would be ready to carpool, either as a driver or as a passenger. To this respect it is important to note that the large majority of the respondents were consistent in asserting their availability to carpool. Out of the 89 respondents who gave different answers – affirming that they would participate in one role and not in the other – 74 answered “rather yes” for one role and “rather no” for the other (see Figure 2). Those with very contrasting opinions for the two roles are strictly an exception and, in general, people are available to take either role or none. The general good disposition toward carpooling, however, should not hide the evidence that respondents are well aware of some issues pertinent to carpooling. To make the use of carpooling possible well beyond the actual small scale such issues should be addressed.

3.2 Factor analysis and cluster analysis

The results reported in the previous paragraph are useful to have a general idea on respondents' attitude toward carpooling. It is to expect, however, that the attitude of single individuals, or of a particular group of individuals, can diverge from this general attitude even substantially. In fact the charts presented do not give any hint on how the different responses correlate among them. If it would be possible to find a sort of a pattern in the answers, this might be used to describe different groups of people with similar opinions on carpooling. The concept of homogeneous groups having similar tastes or behaviors is widely used in sociology and in marketing science. The group of methodologies used to this purpose is known as cluster analysis. The application of cluster analysis to a large number of variables can produce results which are hard to interpret. For this reason, we use first another statistic technique known as factor analysis. The idea behind factor analysis is that groups of variables exist that are correlated to each other and assumes similar values for particular individuals. It is a way to reduce the dimension of the dataset in terms of variables. A similar procedure for a transport related study has been used in the Swiss context in Ohnmacht *et al.* (2009), a thoroughly coverage of the methodology can be found in Härdle and Simar (2012). The factor analysis has been carried out using the software SPSS. A total number of 6 factors out of 25 variables has been extracted. These factors explain 42% of the variance.

In order to ease the interpretation of the factors a Varimax rotation with Kaiser criteria was used. The rotated factors matrix is reported in Table 2. The variables are the answers to questions about carpooling modal characteristics, barriers to use carpooling and platform characteristics previously discussed and presented in figures 4, 5 and 6. These questions were chosen because of their common set of possible answers: „Very important”, “Rather important”, “Rather unimportant” and “Totally unimportant”. The use of other questions, with different sets of possible answers, would imply a normalization of the answers. This is a somewhat arbitrary procedure that can bias the results in a way hard to interpret, which is the reason why this was not attempted. The numbers in bold characters in the table are either numbers above the 0.5 threshold or are the highest on a given row. The corresponding variables are those supposed to characterize the extracted factor. Using this interpretation approach a label was given to each of the factors. Labels are reported in Table 3.

Table 2: Rotated factors matrix

	Factor					
	1	2	3	4	5	6
Cost reduction	.221	.199	.190	-.034	.054	.331
Time saving	-.001	.062	.014	.009	.072	.191
New contacts	.203	.069	.151	-.081	-.007	.291
Traffic reduction	.822	.021	.055	-.021	.023	.105
Parking pressure reduction	.705	.052	.121	-.049	.049	.177
Environmental benefits	.860	.142	.000	.065	.000	-.034
CO2 - reduction	.849	.175	-.012	.034	.005	-.005
Short sign-up time	.118	.550	.004	.228	.054	.126
Data protection	.042	.656	.151	.073	.218	-.017
Rules for sharing costs	.027	.737	.252	.030	.100	.165
Cellphone number	.118	.523	.096	.137	.086	.185
On-the-fly search for ride-mates	.086	.307	.018	.011	.138	.378
Gender preferences	.051	.254	.073	-.012	.562	.201
Smoker/Non Smoker	.151	.374	-.012	.145	.136	.166
Reputation rating system	.060	.362	.015	.055	.531	.203
Restriction to certain group	.017	.163	.115	.183	.480	.119
Time matching	.015	.210	.202	.661	.078	-.018
Fixed departure time	.004	.132	.157	.556	.149	-.049
Traveling with strangers	-.056	-.044	.343	.199	.547	-.082
Safety	.065	.036	.601	.138	.339	.011
Reliability of the driver	.045	.176	.664	.172	.102	.128
Reliability of the passenger	.104	.053	.704	.159	.029	.148
Possibility for an intermediate	.002	.052	.357	.288	.122	.181
Doubts about costs	.030	.287	.514	.204	.031	.257
Low matching probability	.054	.060	.287	.300	.042	.434
Registration effort	-.060	.123	.237	.470	.072	.277
Too many platforms	-.009	.082	.188	.314	.053	.406

Table 3: Factors Interpretation

F1	Altruism / Environmentalism
F2	Convenience / Usability of the platform
F3	Reliability / Safety
F4	Temporal restrictions / Waste of time
F5	Community / Social Network
F6	Egoism / Scepticism

A cluster analysis has been conducted based on the six factors found and using the K-means algorithm (Härdle and Simar, 2012). This algorithm is considered more reliable than hierarchical clustering algorithms, but the necessity to fix the number of clusters before to run the analysis is an obvious drawback. To overcome this, some diagnostic checks have been run, with both K-means and hierarchical clustering. This led to the definition of four clusters. The cluster centres are reported in Table 4.

Cluster centres give a measure of the affinity of a group with a given factor. A positive value means high affinity, a negative value means low affinity. Based on this it is possible to describe the clusters. In order to have a more detailed picture, we can also look at how much average socio-demographic characteristics of the clusters deviate from sample averages. This can be seen in Table 5.

Table 4: Cluster centres

	Cluster			
	1	2	3	4
F1	-.449	-1.358	.407	.353
F2	-2.739	.272	.123	.114
F3	-.138	.066	.564	-.816
F4	-.708	.189	.059	-.084
F5	-.544	.059	.172	-.190
F6	-.467	.036	.223	-.260

Table 5: Average socio-demographic attributes for the clusters and the whole sample

		Clusters					
		1.00	2.00	3.00	4.00	All	
Gender (Male)		63.64	64.03	50.90	62.39	57.59	
Age	18-29	3.03	9.35	6.33	8.97	7.59	
	30-39	3.03	22.30	12.65	20.09	16.40	
	40-49	15.15	30.22	31.63	30.34	30.22	
	50-59	21.21	23.74	21.39	24.79	22.90	
	60+	57.58	14.39	28.01	15.81	22.90	
Income	<2000	0.00	5.04	3.92	2.99	3.66	
	2001-4000	27.27	6.47	8.43	2.56	7.05	
	4001-6000	21.21	15.83	27.41	16.67	21.54	
	6001-8000	18.18	20.14	20.78	23.50	21.41	
	8001-10000	12.12	21.58	13.86	17.52	16.40	
	10001-12000	6.06	15.83	11.45	14.53	13.01	
	12001-14000	0.00	6.47	3.31	8.55	5.42	
	14001-16000	3.03	2.88	3.31	5.13	3.79	
	>16000	12.12	5.76	7.53	8.55	7.72	
Education	Primary	15.15	5.04	5.42	4.27	5.42	
	Secondary	45.45	51.80	56.02	35.90	48.37	
	Tertiary	39.39	43.17	38.55	59.83	46.21	
HH Dimension	1-2	72.73	48.20	55.72	47.44	52.44	
	3-4	24.24	43.88	35.54	41.45	38.48	
	>4	3.03	7.91	8.73	11.11	9.08	
Language	German	81.82	79.86	61.45	73.93	69.78	
	French	12.12	16.55	17.77	15.81	16.67	
	Italian	6.06	3.60	20.78	10.26	13.55	
Cars	0	0.00	1.44	1.81	3.42	2.17	
	1	54.55	37.41	53.61	46.58	48.37	
	2	39.39	48.20	37.95	41.45	41.06	
	>2	6.06	12.95	6.63	8.55	8.40	
Season Tickets		57.58	48.92	51.51	64.10	55.28	
	GA	5.26	12.31	17.16	20.27	16.96	
	HF	84.21	67.69	72.78	63.51	69.08	
Carsharing		0.00	4.32	3.92	3.42	3.66	
Work	Full time	21.21	66.19	41.57	61.97	51.76	
	Part time	24.24	19.42	28.92	23.93	25.34	
	No	54.55	14.39	29.52	14.10	22.90	
CP Driver	Very Likely	9.09	9.35	17.47	19.23	16.12	
	Fairly Likely	15.15	31.65	35.54	46.15	37.26	
	Fairly	18.18	36.69	34.34	26.92	31.71	
	Very Unlikely	57.58	22.30	12.65	7.69	14.91	
CP Passenger	Very Likely	6.67	11.11	18.54	18.35	16.57	
	Fairly Likely	20.00	26.19	35.43	44.95	36.09	
	Fairly	16.67	45.24	32.78	27.98	32.84	
	Very Unlikely	56.67	17.46	12.91	7.80	14.05	

3.2.1 The negative / non-interested type

This type is characterized by negative values for all the factors, meaning that none of the factors is important to members of this group. The cluster is the smallest with only 33 members, equivalent to 4.5% of the sample. More than the half of the members is above the age of 60 and most of the members live in small households and tend to have low levels of income. It is also the group with the lowest level of education and the only group in which all members have at least one car in the household. The type is predominantly diffused in the German speaking part of Switzerland and male gender is more frequent than in the overall sample. As expected, the large majority of members think that their participation in a formal carpooling would be unlikely both as a driver (78%) and as a passenger (75%). Overall, this type is not open to carpooling and, likely, to new mobility forms in general either. Moreover, the high motorization and the low percentage of people employed suggest that carpooling might simply not really fit the needs of this group. Arguably, they don't make trips on a regular basis and they consider a matching on-the-fly ride too complicated to be an option.

3.2.2 The pragmatic type

The members of this group find the convenience and the features of the platform of utterly importance. They are also concerned about reliability issues which might arise, but not particularly about safety. In principle they seem ready to participate but only if "it works". They are not ideologically motivated, environment is not a concern for them, but if carpooling can give them some kind of benefit, of economic nature or other, they could join. This cluster, which contains 18.8% of the respondents, is the one with the largest percentage of male members and of young people (31% are between 18 and 39). Members are predominantly in the central part of the income scale while education levels' distribution is fairly close to sample average. Additionally, this type is overrepresented in the German speaking part of Switzerland, has the highest rate of persons living in a 3 or 4 persons household and is the group whose households have the most cars. The group has also the highest rate of full time employed persons but also the lowest rate of season ticket owners. The number of respondents who state they are likely to participate in carpooling is higher than for the previous cluster, but still below the sample average. This group seems to be mainly composed of young professionals with a busy daily life who could be convinced to use carpooling only if this would not hinder their daily life and clear benefits would be ensured.

3.2.3 The sceptical environmentalist type

This type gives a high importance to altruistic and environmental aspects of using carpooling but also shows a good degree of scepticism and is particularly concerned about safety. About 45% of the respondents belong to this group. Not surprisingly, this group is the one with the highest female component. They are a bit older than average, but mostly still working. Low income households are overrepresented as well as individuals with secondary school, while tertiary education has the lowest rate among all types. The group is overrepresented in the French and, more pronounced, in the Italian speaking part of Switzerland. Both the household and the number of cars are under the sample average, the first substantially and the second only slightly, with a predominance of households with only one car. About half of the respondents of this group report they would likely participate in carpooling. This is almost exactly as the overall sample average. All in all, it seems that this group of individuals is convinced that carpooling is a good thing and its implementation is meaningful and could help solving some transportation and environmental problems, but a substantial part thinks it is not something that could work for them or they are scared about it.

3.2.4 The enthusiastic environmentalist type

For the members of this type, who are 32% of the respondents, the supposed benefits of carpooling for the transportation system and the environment are the only really important aspect. The convenience of the platform is considered of some importance, all other factors are not. Younger people are slightly more likely to belong to this type while, on the contrary, persons over 60 years of age have a slightly lower chance being in this group. Low income levels are underrepresented and all levels over the average income (the average income is 8,900 SFr. which falls, therefore, in the 8,000-10,000 category) are slightly overrepresented. This is the group with the best education level, more than 59% have a tertiary education, and the type is distributed close to overall sample average in terms of language groups, with a little predominance of German speaking. The household dimension is in average large, having the individuals of this cluster the highest chance of living in a household of 5 or more persons (11%). Motorization is fairly consistent with the sample overall, except for having the highest rate of carless people (3.4%) and, accordingly, by far the highest rate of season tickets for public transport. The group has also the highest rate of people employed; only 14% of the members are not employed. The percentage of respondents of this cluster who would be ready to participate exceed 60% for both possible roles, while only a very small minority (about

7%) would consider his or her participation in formal carpooling very unlikely. This group is the one with the most positive attitude toward carpooling. They have a strongly ideological approach; the benefits that carpooling should provide for the transportation system and the environment are the driving factors to join, and members seem persuaded that the system would function properly and are not particularly concerned of possible practical issues.

3.2.5 How to use the clusters

The use of cluster analysis is widespread in sciences where qualitative data is prevalent, like certain domains of medicine or marketing. In marketing, in particular, it is typically used to find out the right selling strategy for each of the customer segments. A particular group might be sensitive to a particular advertisement campaign because interested in specific features of one product. Cluster analysis is also useful to find out if there are any groups which are not targets at all, allowing to focus on those who really are potential customers, saving resources.

The cluster analysis above gives some hints on the attitude of Swiss people toward carpooling. If carpooling is to be used at large scale, it is important to understand who would be interested in using it and under which conditions this would actually happen. The assignment of respondents to different groups of homogeneous characters offers the opportunity to elaborate specific strategies. The first group considered here is the *Enthusiastic environmentalist*. Those belonging to this group are likely early adopters of the system and their enthusiastic approach to carpooling, and probably to everything what they consider to be good for the environment and the society, might make a substantial advertisement effort superfluous. The carpooling platform should be set up and advertised enough to capture those enthusiasts, but, from that point on, the best advertisement strategy would be to avoid, or fix quickly, all the possible dysfunctions of the system. Keeping the early adopters happy with the functioning of the platform would have the double function of avoiding their concern about the practical aspects of the system to emerge and cause a disaffection which might prevent other types to join carpooling. The *Sceptical environmentalist* type, in fact, seems ready to participate in large numbers if the functioning and the security of the system are demonstrated. This is the largest group in the sample and to transform their positive opinion into an active participation might be the key of a long term sustainable program. Finally, the *Pragmatic* type could be also interested in joining once the hypothesized personal benefits of participating would be supported by solid evidence. It is important to note that the pragmatic type is likely to be far more diffused among the population than it was in the sample. Socio-

demographic characteristics of this type are closer to those of the whole Swiss population than those of other groups are (Compare with Table 3). This is consistent with the effects of a self-selection process which could have biased the recruitment toward particularly carpooling friendly participants. Therefore, the participation of the members of this group might be crucial for the long term success of formal carpooling and, in a later phase, they might be the most important target of an advertising campaign. The individuals belonging to the *Non-interested* type are the smallest of the groups but they might have also been under-sampled in the recruitment process. They seem to be such unwilling carpoolers that it is hard to imagine a strategy to convince them to buy into the system. The picture might change once that the numbers of carpooling will substantially rise and the perception of carpooling of this group improved likewise. The setup of a meaningful strategy for this group would necessarily pass, therefore, through another survey to be made if and when these conditions will actually happen.

4. Summary and Outlook

Formal carpooling programs do exist in Switzerland but, as in many other countries, they are all very small and the concept is not even close to be a mainstream one. This is reflected by a substantial lack of a specific Swiss literature on the subject. It is evident that any attempt to extend the use of carpooling substantially beyond the actual scale implies an effort understanding the preferences and the inclination of the public toward this mode.

The work presented is aimed to provide this understanding for the Swiss context. A large survey has been performed with more than 2000 participants and a response rate of about 45%. The survey included both a multi-response questionnaire and a stated preferences exercise. In this paper the results of the multi-response part of the survey have been presented and discussed. It has been shown that the general attitude toward carpooling is overwhelmingly positive with 78% of respondents having a positive opinion on this mode and with 51% of them being “very likely” or “fairly likely” to use formal carpooling as a mode if a concrete opportunity would be available. The benefits that carpooling is supposed to bring for the environment and the transportation system are considered the most important features while the main concerns are of practical nature. Some concerns about security are also present, especially among elderly people and women. In order to figure out a strategy which would help deploying carpooling to a large scale in Switzerland, a factor analysis, followed by a cluster analysis, has been performed. The factor analysis confirmed that altruistic factors, together with a convenient and easy to use platform, are of primary importance for the public. Cluster analysis was used to find homogeneous groups of respondents with similar preferences and concerns regarding carpooling. Four groups were formed and named after the factors which appeared to be most important to them, if any. We ended up with a group of *Enthusiastic environmentalists*, one of *Sceptical environmentalists*, one of *Pragmatics* and one of *Non-interested*. Based on these groups a strategy to implement a large scale carpooling system has been proposed. The future work is planned to bring together the two parts of the survey which have been analysed separately so far, the qualitative part in the present paper and the stated choice experiments in a previous one. In a future effort it will be attempted of make use of the largest possible part of the qualitative information in order to improve the discrete choice models estimated. The cluster analysis was already a first step in this direction. The types can be used as variables in the models providing a straightforward way to include latent structures in the respondent’s preferences. Additionally, it is possible to estimate separate models for the different clusters, obtaining much more refined behavioural models. It will avoid all the odds of having one single model for the whole population which implicitly means to assume a common behaviour for possibly very different types.

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