Functional perceptions, barriers, and demographics concerning e-cargo bike sharing in Switzerland

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Abstract

To reduce greenhouse gas emissions low-carbon transportation innovations are needed. One recent innovation is e-cargo bike sharing, which links established elements: a cargo bike, an electric motor, and sharing infrastructure. Existing research on mode sharing suggests that sharing schemes face difficulties to move beyond a specific group of early adopters. To gain insights into the characteristics of and perceived barriers for those who adopt e-cargo bike sharing and those who do not, we investigated four groups: active members, inactive members, potential members, and uninterested non-members. We analyzed survey data (n = 301) from members and non-members of an e-cargo bike sharing scheme in the city of Basel, Switzerland, to explore differences in current transportation patterns and sociodemographic characteristics among the four groups. Using a mixed-methods approach, we employed a multilevel regression model to analyze quantitative data. We also applied a qualitative coding system to investigate open-ended survey questions. We found that the present scheme is more likely to attract men, cyclists, and young people; however, other groups were interested. Factors that inhibit wider adoption include safety concerns and the configuration of the sharing procedure. More effort that considers the links among infrastructure, road safety, and cycling competences is required to support the adoption of e-cargo bike sharing as a low-carbon transportation innovation.

Keywords: Bike sharing, Cargo bike, Electric bike, Low-carbon transportation innovation, Usage barriers, User groups

1. Introduction

Low-carbon transportation innovations can contribute to reducing greenhouse gas emissions. Cities, in particular, may be ideally placed to promote low-carbon transportation and reduce automobile use (ICLEI, 2017). Urban areas with high population densities and diverse land-use support slower modes of transportation as locations can be quickly and easily accessed (Schwanen et al., 2004).

Nevertheless, 40–50% of all car journeys within Swiss cities[1] are less than 5 km (Städtevergleich Mobilität, 2017), which shows that cars remain important, also for short

[1] Six cities in the German-speaking region of Switzerland were considered in this report: Basel, Berne, Lucerne, St. Gallen, Winterthur, and Zurich.

distances. For short distances like these, a viable alternative is the cargo bike (CB), also known as transport bicycle, box bike, long john, or bakfiets (Becker and Rudolf, 2018; Riggs, 2016). CBs can carry loads of up to 100 kg in large front-mounted boxes that are suitable to transport goods or children. A survey on the car-substitution potential of CBs in the United States (US) showed that 66% of respondents who had previously used a car as their primary mode of transportation switched to using their own CB after they purchased one (Riggs, 2016). The latest innovation, the electric CB, could become an even more competitive alternative to cars (Lovejoy and Handy, 2012).

CBs date back to the late 19th century, when they were mainly used by merchants and craftsmen (Kirkels, 2016). Recently these bikes have regained attention as an urban mode of transportation, particularly for families with children (Riggs, 2016). The use of CBs has grown, especially in countries and regions where cycling is common, such as the Netherlands and Denmark. For example, in Copenhagen, 17% of all families with children have a CB (Københavns Kommune, 2011). In Norway, the number of CBs more than doubled between 2015 and 2016, with 566 units sold in 2016 (Tronstad, 2017). Many Austrian and German cities, but also Oslo, have set up permanent or temporary programs for subsidizing the purchase of (e-)CBs to support the transition to low-carbon transportation (cargobike.jetzt, 2018; O'Sullivan, 2017). Nevertheless, CBs still belong to a niche market, and there is very little research on them. Furthermore, that CBs are not counted separately in bicycle statistics makes it hard to find exact figures, thus hampering research on them (Siegenthaler, 2017).

In addition to owning a CB, cargo bike sharing (CBS) has become increasingly popular in German-speaking countries (Becker and Rudolf, 2018). Since 2013, a network of CBS operators has evolved in Germany and Austria, providing free access to 40 electric and 94 non-electric CBs (Becker and Rudolf, 2018). In Switzerland, carvelo2go, a CBS platform that exclusively offers electric CBs, is expanding rapidly. It started in September 2015 and two years later it counted 5,500 users (carvelo2go, 2017). Sharing providers such as these, offer alternatives to existing bike- and carsharing schemes that may in some ways be superior. This is because of the higher load capacity of CBs compared to bikes and because CBs can access destinations that cars cannot, such as car-free city centers and rural footpaths. Furthermore, CBs make it possible for people without a driver's license to transport their own loads.

In this paper, we focus on the Swiss market, in particular on Basel, a city in northwestern Switzerland, bordering France and Germany, where carvelo2go started operating in April 2016. We investigate CBS as an innovation, defined through links between new and established elements (Shove and Pantzar, 2005). We specifically focus on the connections among CBs, the electric motor, and the professional sharing platform. In addition, we advance the understanding of the role of users in this constellation. We do so by analyzing differences in characteristics and perceived barriers for four groups: members, both active and inactive, and non-members, both potential and uninterested non-members of the CBS scheme. These findings may guide policy makers and sharing providers in developing strategies to transition to low-carbon urban transportation.

2. Literature review and theoretical framework

2.1. Research on CBS

To our knowledge, only one study has investigated CBS. In researching German and Austrian CBS users (n = 931), Becker and Rudolf (2018) found that a large proportion of CBS users were men (63%). Most users (71%) cycled on a daily basis, compared to 6% who mainly used a car, which suggests that cyclists are the early adopter target group (Becker and Rudolf, 2018). Regarding the sharing potential of CBs, 93% of CBS users

reported that they would like to use a CB again, but only 35% planned to purchase one. Furthermore, 45.6% of CBS users would have used a car in the absence of a CBS system, but of these users, 25% would have used carsharing instead (16.1% would have used a private car, 4.3% a privately borrowed car, and 0.2% a taxi) (Becker and Rudolf, 2018). This reflects peculiarities in sharing a mode of transportation, which might make it easier for those who have experience with carsharing to switch to CBS.

2.2. Research on bike- and carsharing

There is considerable literature on user characteristics, on drivers and barriers, as well as on the impacts of bike- and carsharing schemes. The demographics of bikeshare users differ from those of the general population. Bikeshare users are more likely to be male, white, have higher average incomes, and have higher levels of education (Fishman, 2016; Ricci, 2015). In particular, in countries with low bicycle use, women are underrepresented among bikesharers (Fishman, 2016). Convenience is a major motivator; the distance to a docking station is a predictor of bikeshare membership (Fishman, 2016). Fishman et al. (2012) found that motivators for and barriers to bikeshare use comprise three themes: accessibility/spontaneity, road safety, and weather/topography. Regarding mode substitution, bikeshare users are more likely to switch to bike sharing if they use public transportation and walk, rather than if they use cars (Fishman et al., 2013; Ricci, 2015; Fishman, 2016). A bike sharing scheme is likely to encourage cycling among residents who both live and work within the service area (Hosford et al., 2018).

Similarly, carsharing users differ from the average population. Carsharers, like bikesharers, are also more likely to be younger, male, and highly educated with higher income (Becker et al., 2017; Clewlow, 2016; Le Vine and Polak, 2017). However, user characteristics differ, depending on the region and type of carsharing scheme (free-floating/one-way vs. station-based/two-way carsharing) (Becker et al., 2017; Cervero et al., 2007; Giesel and Nobis, 2016; Namazu et al., 2018). Carsharing users own significantly fewer cars or shed more cars compared to the general population (Becker et al., 2017; Clewlow, 2016; Le Vine and Polak, 2017). Similar to bike sharing, a major motivator for carsharing is convenience (Namazu et al., 2018; Schaefers, 2013). Namazu et al. (2018) suggested that if more vehicles were available and easier to access, carsharing would likely to be taken up beyond the group of early adopters. This diffusion is likely to have the highest impact on car-shedding (Namazu et al., 2018).

2.3. Theoretical framework

A combination of factors explains the use of a bike- or carsharing sharing scheme. The empirical literature on one hand, explains adoption of sharing schemes with sociodemographic factors such as age, gender, education, and income. On the other hand, infrastructure and road safety affect how convenient it is to use a scheme. In social practice theory, these factors are conceived as materials, meanings, and competences (Shove et al., 2012; Shove and Walker, 2010). Materials comprise the technology and infrastructure; meanings consist of symbolic significance and aspirations; and competences include skills and know-how (Shove et al., 2012). Social practice theory focuses on the practice itself. Practices emerge when materials, meanings, and competences interlink; practices shift or disappear when the links between the elements are redefined or dissolve (Shove et al., 2012). For example, the practice of riding an electric CB links materials (such as the electric motor), meanings (associated to low-carbon urban mobility), and competences (such as knowing how to ride an electric bike). Fig. 1 shows the elements of the CBS practice and the links among these elements. Understanding how practices such as CBS emerge, evolve, and are redefined could help develop strategies that support low-carbon practices.

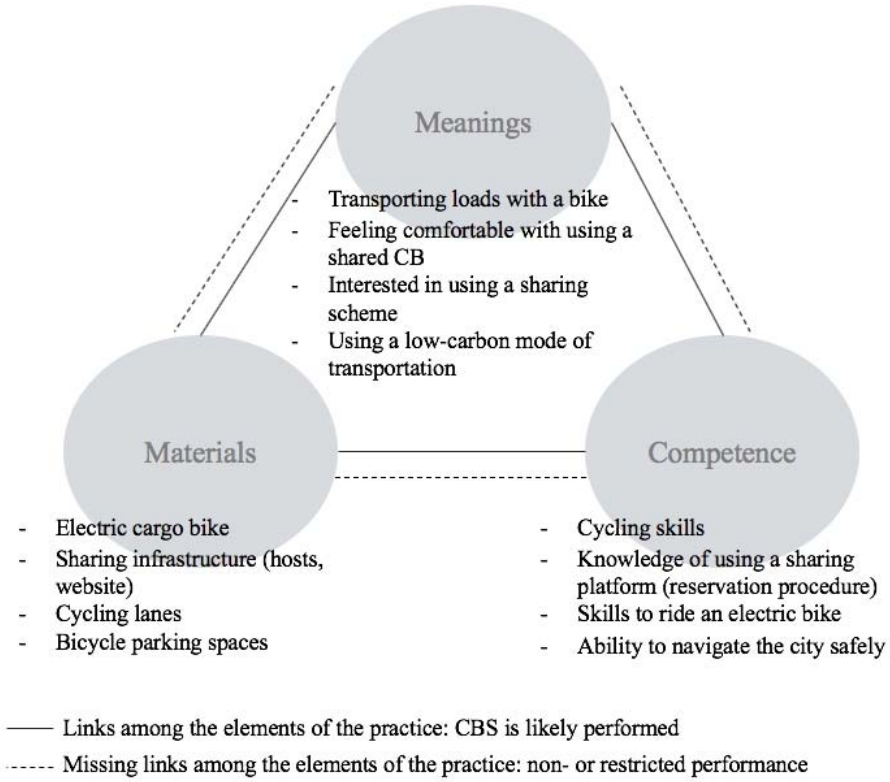

Fig. 1 *Elements of the CBS practice and links among the elements*

The empirical literature suggests that people often switch from other sustainable modes of transportation to bike sharing (Fishman, 2016). A modal shift (i.e., the shift from one mode of transportation to another) constitutes a substitution of practices (Spurling and McMeekin, 2015; Spurling et al., 2013). Such a shift is more likely between practices with similar elements (such as the cycling infrastructure common to both bikes and CBs), or if individuals carry specific competences and meanings that can be transferred among practices (Nash et al., 2017). The resemblance between practices might explain why individuals are more likely to switch from using bikes to CBS than from using cars to CBS. Practices with a similar purpose compete directly with each other for the time and money of those individuals performing the practice, as well as for finite space on roads and parking spaces (Watson, 2012). Therefore, individuals who take up one practice, might abandon or adjust others (Watson, 2012). For example, using CBS requires similar skills as carsharing (e.g., the reservation procedure and pick-up) and might have similar meanings (e.g., an inclination toward sharing). Thus, these two practices may compete directly.

Some of the papers presented in sections 2.1 and 2.2 raised the question how bike- and carsharing can be promoted among a wider population. Fishman et al. (2012) referred to social learning theory according to which it is important for non-users to observe others using a bike sharing scheme. Seeing more people using it can help promote the practice beyond the group of early adopters (Fishman et al., 2012), or can help to encourage cycling among a wider population (Hosford et al., 2018). However, non-users and users seem to have different needs and desires (Schaefers, 2013). Followers (i.e., people who can imagine using a sharing scheme but are not yet a member) might not think of carsharing as an alternative to private car use, in the same way as early adopters do (Namazu et al., 2018). This might be, because followers are older and live in households with fewer wage earners (Namazu et al., 2018). Thus, due to their different

sociodemographic profiles early adopters and followers might have different needs and desires.

2.4. Research aims and theses

The literature on bike- and carsharing suggests that such schemes currently attract particular societal groups that can be differentiated according to age, gender, education, and income. Although some studies analyzed barriers to and motivators for joining sharing schemes, more research is needed to understand why some people use such schemes and others do not (Fishman et al., 2013; Giesel and Nobis, 2016; Ricci, 2015). Furthermore, researchers have suggested that it is important to differentiate between active and inactive members. Moreover, it has been argued that it is necessary to go beyond the recent focus on active users and also include associated factors of inactive membership (Becker et al., 2017; Namazu et al., 2018).

In this paper, we contribute to the literature on usage patterns. Specifically, we explore two non-member groups, namely potential members and uninterested non-members. More precisely, we aim to contribute to existing knowledge in two ways. First, we seek to advance insights about the relationships between other established practices and the new CBS practice. Second, we contribute to the research on barriers for members and non-members of CBS, by exploring missing links among materials, meanings, and competences. To this end, we distinguish four groups: active members, inactive members, potential members, and uninterested non-members. We expect to find demographic differences among the four groups, specifically in relation to age, gender, education and income, as found in the existing bike- and carsharing literature.

Three theses evolve from the above: There might be a relation between practices with similar elements (T1 and T2), and missing links between the elements of the CBS practice can explain non-performance (T3). In other words:

T1. Being a member of a carsharing initiative is associated with a higher probability of being a member of the CBS scheme.

T2. CBS members are more likely to be bike users. In contrast, we expect non-members to be less inclined to use bikes.

T3. Barriers to CBS usage relate to missing links among the elements of the CBS practice (materials, meanings, and competences) which can explain non-performance or restricted performance.

We purposely speak of theses rather than hypotheses, because presently there is very little research about inactive members, potential members, and uninterested non-members of sharing schemes on which we could base more differentiated assumptions. Investigating theses in this explorative research is legitimate, given the novel fine-grained distinction of groups, and because CBS itself is a new scheme (Becker and Rudolf, 2018).

3. Data and methods

We focused on the city of Basel in Switzerland, where carvelo2go started operating in April 2016. At the time of the data collection, in the summer of 2017, there were 24 rental locations (“hosts”), which are popular places, such as cafés, bike shops, and post offices. The rental locations are distributed throughout the city and surrounding municipalities. Generally, hosts have one CB for rent; a few locations have two. As Basel is very densely populated with 5,225 inhabitants per square kilometer spread over 37 km^2, routes are short, and hosts are accessible from all city districts (Federal Statistical Office, 2018a).

Hosts are responsible for charging the battery and providing a key in exchange for 25 hours of free CB use per month and free advertising on the bike. Users register online and reserve a CB at a host location, where the bike can be collected and returned. The reservation fee is CHF 5.00 (=EUR 4.40) for each reservation, and the hourly fee is CHF 2.00. Thus, renting a CB for eight hours costs CHF 21.00 (=EUR 18.00). There is no monthly membership fee, and renting a bike overnight is free as the hosts are closed. However, if hosts are closed during the day (e.g., on weekends or on Monday), users have to pay for that day. Discount options are available, such as a 50% off card for a fee of CHF 90.00 (=EUR 79.00) per year and discounts for members of the Swiss Touring Club.

3.1. Sample

Data were collected through an online survey conducted in German and English over a period of two months during the summer of 2017 among registered members and non-members of the CBS platform. In an e-mail all 1,160 registered members in the city of Basel and its suburbs were invited to participate in the survey. Data from non-members were collected by distributing the survey link via websites, newsletters, and Facebook groups of district organizations and popular cafés some of which also function as CBS hosts. The purpose of this sampling strategy was to get a comparison group of non-members who frequent the same host locations as CBS members (Fishman et al., 2014). Of the 275 members and 138 non-members who started the survey, 202 and 128 respectively completed it. All participants who completed the survey were included in a raffle to win a CBS voucher for CHF 90.00 (=EUR 79.00), sponsored by the CBS provider. However, to reduce selection bias, this information was communicated as a raffle to win a general transportation voucher. After we removed duplicates (n = 6) and respondents who did not live in Basel or the suburbs (n = 23), we retained a final sample of 301 individuals, 192 members and 109 non-members.

3.2. Measures

3.2.1. User groups

The structure of the survey allowed us to create four groups: active members, inactive members, potential members, and uninterested non-members. Active members and inactive members were differentiated using the average kilometers driven by a shared CB per month and the average amount paid per month. We categorized active members (n = 153) as those who indicated a value higher than 0 for kilometers driven and for spending per month, whereas inactive members (n = 26) were those who indicated a value of 0 for both. Potential members (n = 71) were not members of the CBS platform but could imagine trying out CBS. Uninterested non-members (n = 38) were not members of the CBS platform and could not imagine trying out CBS.

3.2.2. Independent variables

We selected the independent variables based on the literature on sharing and the theoretical framework. We included three variables related to transportation and sharing: possession of a driver's license, car ownership, and membership in carsharing schemes.

Having a driver's license is an important precondition for car use. Having a license reflects whether a person has the skills to drive a car. However, a driver's license is not needed to ride a CB. Thus, CBS might be an option for people without a driver's license, in particular, to expand their transportation options. Car ownership was included because it may compete with the use of CBS. We included a carsharing dummy because carsharing and CBS have similar characteristics.

To investigate the relationship between CBS and current transportation habits, we measured transportation habits by asking respondents how they usually travel to the following places: grocery stores, building supply stores, work, leisure spots, post offices, daycare centers, kindergartens, and schools. The answer categories were car, electric car, public transportation, motorbike, bike/foot (i.e., soft mobility), e-bike, CB, electric CB, electric CB from carvelo2go, other, and I never go to such a place. Three variables were constructed by counting the purposes (i.e. places) for the three most frequently mentioned modes of transportation (car, public transportation, and bike/foot).

Additionally, a number of sociodemographic variables previously found to explain the use of bike- and carsharing (see sections 2.1 and 2.2) were collected: age, gender, income and education. Furthermore, we included household size because transporting children is an important reason for using CBS (Mobilitätsakademie AG, 2016). Table 1 displays the descriptive statistics of all variables for the user groups. Where possible, we compared the statistics to the official statistics for the city of Basel.

Table 1

Descriptive statistics for the four groups (column 1-4) and a comparison to official statistics (column 5).

	(1) Active	(2) Inactive	(3) Potential	(4) Not interested	(5) Basel
Driver's license (%)	83.5	96.0	89.4	80.0	73.6[1]
At least one car in the household (%)	26.9	16.0	33.3	40.0	48.0[2]
Carsharing members (% of total sample)	51.0	68.0	43.9	20.0	-
Carsharing members (% of those with a driver's license)[3]	58.9	70.8	49.2	25.0	8.6[1]
Tertiary education (%)	77.2	72.0	78.8	62.9	42.1[4]
Education in years (mean)[5]	15.12 (1.69)	14.84 (2.01)	15.26 (1.46)	14.60 (1.87)	–
Gross household income (median category, CHF)[6]	6000–8999	9000–12000	6000–8999	6000–8999	7938.55[7]
Household size (mean)[8]	2.86 (1.36)	3.72 (1.81)	2.62 (1.52)	2.20 (1.32)	1.95[9]

Age (mean)[10]	39.62 (10.44)	38.32 (8.70)	44.50 (14.83)	49.80 (15.25)	43.68[11]
Gender (% female)	40.0	44.0	51.5	60.0	51.73[12]
Number of car purposes (mean)[13]	0.41 (0.63)	0.52 (0.77)	0.55 (0.81)	1.00 (1.66)	–
Number of public transportation purposes (mean)[14]	0.65 (0.87)	0.48 (0.71)	0.94 (1.39)	1.03 (1.42)	–
Number of bike/foot purposes (mean)[15]	4.66 (1.78)	4.04 (1.70)	3.70 (1.83)	3.57 (2.20)	–
N[16]	145	25	66	35	

1 Authors` calculation based on Mikrozensus Mobilität und Verkehr (2015).
2 Städtevergleich Mobilität (2017)
3 Active members n = 121, inactive members n = 24, potential members n = 59, not interested n = 28
4 Federal Statistical Office (2018b)
5 Standard deviation in parentheses; min = 9, max = 16 (active and inactive members); min = 12, max = 16 (potential and uninterested non-members)
6 Respondents who did not wish to indicate their income were excluded here but were included in the regression model ("income not indicated"). CHF 1.00 = about EUR 0.90
7 Mean income, data for northwestern Switzerland (Federal Statistical Office, 2016)
8 Standard deviation in parentheses; min = 1, max = 8 (active and inactive members), min = 1, max = 9 (potential members), min = 1, max = 5 (uninterested non-members)
9 Federal Statistical Office (2017a)
10 Standard deviation in parentheses; min = 18, max = 69 (active members), min = 26, max = 70 (inactive members), min = 20, max = 78 (potential members), min = 23, max = 77 (uninterested non-members)
11 Federal Statistical Office (2017b)
12 Statistical Office Basel-Stadt (2018)
13 Standard deviation in parentheses; min = 0, max = 3 (active and inactive members), min = 0, max = 4 (potential members), min = 0, max = 8 (uninterested non-members)
14 Standard deviation in parentheses; min = 0, max = 4 (active members), min = 0, max = 2 (inactive members), min = 0, max = 8 (potential members), min = 0, max = 5 (uninterested non-members)
15 Standard deviation in parentheses; for all groups (except potential members) min = 0, max = 8, potential members: min = 0, max = 7
16 Number of observations included in the multinomial logistic regression model (see Table 3)

3.2.3. Usage barriers

Usage barriers were assessed via open-ended survey questions. To assess barriers for active and inactive members, participants were asked to briefly explain why they did not use CBS more often. Non-members were asked whether they could imagine using a shared CB at all. If the answer was "no" (i.e. the group of uninterested non-members), they were further asked why they could not imagine using CBS.[2]

[2] Unfortunately, we did not ask potential members about barriers. We discuss this point further in the limitations section 5.3.

3.3. Data analysis

We used two forms of data analysis. First, to gain insights into differences among the user groups, we estimated a multilevel model. Second, to investigate barriers, we coded and analyzed open-ended survey questions. All analyses were performed using Stata version 15.1 (StataCorp, 2017), the regression table was produced by employing the estout package (Jann, 2005, 2007), and the mrtab module (Jann and Schaeper, 2004) was used to analyze multiple responses.

3.3.1. Multilevel model

We were interested in gaining insights into factors that explain group membership in one of the four groups: active members, inactive members, potential members, uninterested non-members. The data showed a nested structure, as active and inactive members are *members*; in contrast, potential members and uninterested non-members are *non-members*. Multinomial logistic regression is an appropriate modeling technique in the case of nominal outcome variables when the outcomes are independent. However, because of the nested structure, the assumption of independence of irrelevant alternatives was not met (Long and Freese, 2014). To account for the nested structure, we estimated a multilevel model. First, we employed a logistic regression model using membership/non-membership as the binary outcome variable. Second, we assessed group affiliation by running a multinomial logistic regression model. We accounted for the correlation of error terms between the two models.

We chose the independent variables in accordance with the theoretical framework and empirical literature (see section 3.2.2). To estimate membership, we included carsharing, bike usage, and gender as predictors. Previous research has shown that these variables express CBS-member characteristics (Becker and Rudolf, 2018). In T1 and T2, we assume that carsharing and bike usage play a role in explaining the adoption of membership. However, we also include these variables in the multinomial logistic regression to explore whether they can also explain group affiliation. Table 3 displays the results. As the sample was small, and we applied a non-randomized sampling strategy for non-members, the results should be interpreted with care. The coefficients describe tendencies in addition to insights from the descriptive statistics.

3.3.2. Mixed-methods analysis of usage barriers

We analyzed open-ended survey questions qualitatively to gain further insights into the barriers for active and inactive members and uninterested non-members. We analyzed the barriers for the three groups by creating categories. Reliable coding categories were developed in a three-step procedure (Hruschka et al., 2004). First, we developed an initial broad coding scheme to categorize the answers to the open-ended questions. This coding scheme was based on a preliminary viewing of the answers and was related to the barrier categories found in the literature (Fishman et al., 2012, 2014; Gifford, 2011). Second, we independently coded all answers based on the broad coding scheme. Third, we discussed the differences and created additional categories to create the scheme shown in Table 2. We then coded the barriers as dummy variables, with 1 indicating that the barrier was mentioned by the individual. We ended up with a multi-response variable (see Table A.2 for additional details).

Table 2
Coding scheme for open-ended survey questions about barriers (i.e., reasons for non-usage)

Category	Specific barriers mentioned

Sharing procedure	Limited flexibility (host opening hours)
	Limited spontaneity (bikes are already reserved when the user wants to reserve spontaneously)
	Limited access (hosts too far away)
	Too much effort
	Inconvenient
	Too costly
Irregular purpose/irregularly needed	No need
	Only for a specific purpose
	Other modes of transportation sufficiently satisfy user's purpose
Features of CB	Too unwieldy
	Type of bike that is available/closest does not suit the user's purposes (no rain cover, child seat versus more space for cargo)
	Does not like CBs
Nature of e-support	Does not like e-bikes
	Wants to stay fit
Public infrastructure	Narrow streets
	No parking for CBs
Safety concerns/perceived risk	Afraid of cycling in the city (motor vehicle speed)
	CBs are difficult to ride
Access to functionally similar mode of transportation	Owns a CB or has access to a CB (e.g., can borrow it from neighbors)
	Owns an (e-)bike with a trailer or has access to a trailer
CB unknown	Does not know electric CB (sharing)
Inexperienced	Little or no use until now
Not integrated into daily life	Not used to electric CBS as a means of transportation
Inability	Illness, age
Other	Topography, does not like bikes in general

4. Results

4.1. Membership and group affiliation

Table 3 presents the regression results. The five columns show the average marginal effects.[3] Column 1 displays the results of the logistic regression whereas columns 2–5 show the results of the multinomial logistic regression. The coefficients can be interpreted as follows: A one-unit increase or a discrete change in an independent variable increases (+) / decreases (–) the probability of belonging to the respective group (or of being a member; see column 1) by $\hat{\beta} \times 100$ percentage points, holding all other independent variables constant.

[3] The odds ratio coefficients are displayed in Table A.3. The sizes of coefficients are in line with what was found in a study on carsharing (Namazu et al., 2018).

Table 3
Regression results.

	(1)	(2)	(3)	(4)	(5)
	Membership (1 = member)	Active	Inactive	Potential	Un-interested
Carsharing member (reference category: no carsharing member)	0.104 (0.055)	0.073 (0.063)	0.024 (0.031)	–0.012 (0.058)	–0.086 (0.044)
Number of purposes for soft mobility use	0.060*** (0.013)	0.043* (0.021)	–0.022* (0.009)	–0.037 (0.019)	0.015 (0.014)
Female (reference category: male)	–0.103 (0.055)	–0.134* (0.058)	0.019 (0.033)	0.042 (0.051)	0.073 (0.040)
Driver's license (reference category: no driver's license)		–0.069 (0.089)	0.075* (0.031)	0.042 (0.086)	–0.048 (0.059)
At least one car in the household (reference category: no car in the household)		0.067 (0.072)	–0.099*** (0.029)	0.051 (0.065)	–0.020 (0.055)
Number of purposes for car use		–0.057 (0.041)	0.015 (0.017)	–0.028 (0.035)	0.071** (0.024)
Number of purposes for public transportation use		–0.015 (0.031)	–0.039* (0.019)	0.012 (0.027)	0.041* (0.017)
Age		–0.006** (0.002)	–0.002 (0.001)	0.004 (0.002)	0.005*** (0.001)
Income (gross household income per month in CHF; Reference category: 6000–8999)					
9000–12000[1]		–0.135 (0.084)	0.133* (0.055)	–0.082 (0.073)	0.085 (0.061)
Education (in years)		0.013 (0.019)	–0.033** (0.011)	0.023 (0.017)	–0.003 (0.009)
Household size		–0.007 (0.025)	0.032** (0.011)	0.004 (0.023)	–0.029 (0.022)
N (cases per group)		145	25	66	35
N (total)	297				

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[1] Other income categories were not statistically significant at the 5% level (see Table A.1).

As expected, there are sociodemographic differences among the four groups. Regression results reveal the following tendencies:

Membership: A higher number of biking or walking purposes increases the probability of being a CBS member.
Active members: A higher number of biking or walking purposes increases the probability of being an active CBS member. Increasing age and being female, in turn, decrease the probability of being an active member.
Inactive members: Having a driver's license, having a higher income, and living in larger households increase the probability of being an inactive member. A higher number of biking/walking purposes and public transportation use, the availability of a car in the household, and higher education levels, in turn, decrease the probability of being an inactive member.
Potential members: The analysis revealed no statistically significant predictors that explain affiliation with the potential members group.
Uninterested non-members: Having more purposes for car and public transportation use and being older increase the probability of being an uninterested non-member.

4.2. Usage barriers

Fig. 2 shows the barriers to CBS use. Only barriers that were mentioned by at least 10% of respondents in one of the three groups are displayed (see details in Table A.2). Potential members were asked about their purposes for CBS use instead of barriers; accordingly this group was not included in this analysis.

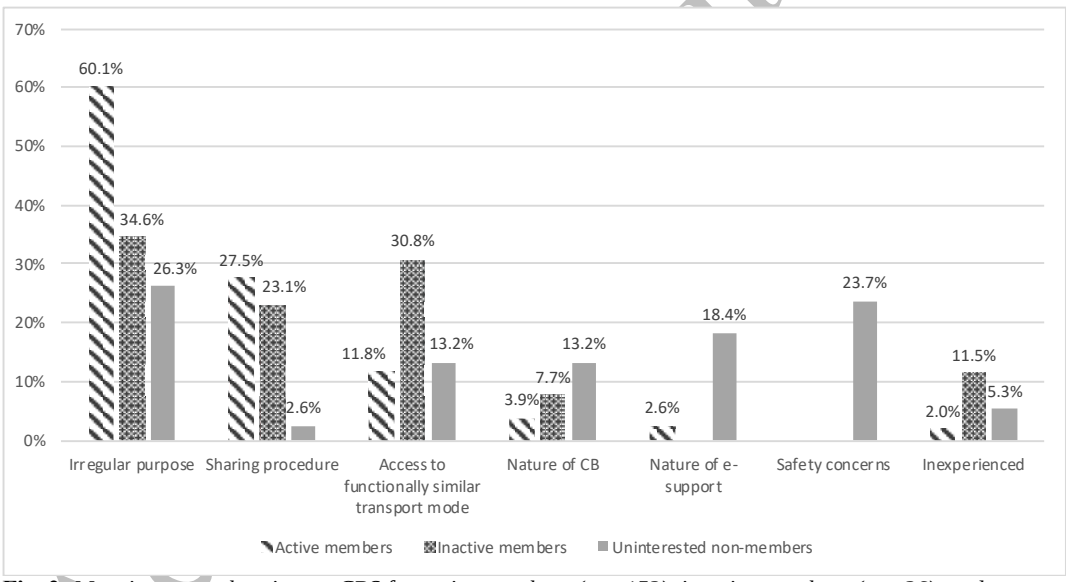

Fig. 2. *Most important barriers to CBS for active members (n = 153), inactive members (n = 26), and uninterested non-members (n = 38). For a description of the barriers, see Table 2.*

The most common reasons why all three groups either did not use CBS more frequently or did not try the sharing scheme were that they had no need at all or only an irregular need to use a shared CB. Respondents reported that other modes of transportation satisfied their needs (60.1% of active members, 34.6% of inactive members, and 26.3% of uninterested non-members). As the following quotes illustrate, members used CBS only for specific purposes when alternative modes were not appropriate:

Carvelo2go is good for transporting bulk purchases…, or to transport something big.
(52-year-old woman, active member, two-person household)

My grandchildren rarely come to visit me.
(70-year-old man, inactive member, two-person household)

In contrast, uninterested non-members briefly stated that they did not need CBS, and most did not elaborate on their reasons. Those who did mention a reason pointed to alternative modes for transporting cargo, such as bike trailers, cars, and carsharing. One person categorically excluded the option of transporting loads with a bike:

The speed of an e-bike frightens me, and I would not transport cargo with a bike.
(33-year-old woman, uninterested non-member, one-person household)

The second most mentioned barrier for active members (27.5%) and the third most mentioned barrier for inactive members (23.1%) concerned features of the sharing procedure. Members mentioned limited flexibility and spontaneity as well as cost as reasons why they did not use the service more often:

Too few rental locations and opening hours are too short.
(37-year-old man, active member, four-person household)

I find the service bad, because the rental is linked to the shops' opening hours, and renting during the weekend is very expensive (e.g., the host is closed on Mondays). That is why I bought my own electric CB.
(36-year-old man, inactive member, four-person household)

Having access to functionally similar modes of transportation was the second most mentioned barrier for inactive members (30.8%) and the third most mentioned barrier for active members (11.8%):

I can do all my errands by bike and bike trailer.
(29-year-old woman, active member, five-person household)

I have only used carvelo2go once to transport children who were visiting. There are several CBs in my neighborhood which I can borrow for free.
(35-year-old man, inactive member, four-person household)

Compared to active members, a larger proportion of inactive members owns an electric CB (15.4% of inactive members compared to 4% of active members). Inactive members mentioned their own CBs as a reason for not using the sharing platform more often. They often directly related their decision to purchase a CB to sharing scheme limitations, such as opening hours or accessibility:

The nearest rental location is too far away. That is why I bought my own CB.
(33-year-old woman, inactive member, four-person household)

Uninterested non-members declared safety concerns as the second most frequently mentioned barrier (23.7%), but no other group stated them as barriers:

I don't know these vehicles and I don't feel like moving around with a CB in city traffic; instead, I would rather have something delivered or even transport some bulky object by public transport. I still find Basel too car-focused, and the traffic is not bike friendly enough to use the bike more than I need to.
(41-year-old woman, uninterested non-member, one-person household)

This and related quotations show that people in this group found the city too car-centered and not bike-friendly enough and were afraid of the way people drive. Furthermore, people perceived riding electric CBs as too risky, especially if they do so infrequently without regular practice. Some were daunted by the electric motor, which makes the bikes

faster. This fear relates to the nature of the electric motor, which was the third most frequently mentioned barrier for uninterested non-members (18.4%):

I am not interested in battery-powered vehicles (energy consumption!). Generally, I think the streets are too small.
(69-year-old man, uninterested non-member, two-person household)

Respondents in this group did not seem to like e-bikes. The quotation above suggests that this person attributed his lack of interest in e-bikes to energy consumption. In contrast, the four active members who mentioned the nature of e-support as a barrier (2.6%, see Table A.2) framed it in a much more positive way. They said they would prefer to use their own muscles to stay fit.

A larger fraction of uninterested non-members mentioned features of CBs as a barrier (13.2%) compared to active (3.9%) and inactive (7.7%) members. This group mentioned CB features, such as size, weight, and load safety. As the following quotation shows, these features were often related to other barriers, such as road safety issues and infrastructure:

I never cycle. I find CBs too big, they do not fit into conventional bike parking spaces and therefore they use an incredible amount of space. Also, I find them dangerous.
(71-year-old man, uninterested non-member, two-person household)

Some members mentioned that the features of the shared CB sometimes do not fit their purposes, such as when it has a child seat, but users need more space to transport goods, or when they require a rain cover and this is not provided.

5. Discussion

The two aims of this paper were: firstly, to gain insights into how established transportation practices relate to the new CBS practice and, secondly to explore barriers to CBS usage. In the following sections, we discuss the findings in regard to these aims.

5.1. The relationship between established transportation practices and the new CBS practice

Drawing on a social practice theory framework, we proposed that individuals more easily perform a new practice if the new practice contains relevant elements that resemble an established practice. The theses addressed the relation between carsharing and CBS (T1), as well as the relation between riding a bike and riding a shared CB (T2).

We were unable to find support for T1; i.e. membership in a carsharing scheme did not explain membership in CBS or group affiliation. This differs from the descriptive findings by Becker and Rudolf (2018) who show that a quarter of CBS users perceive carsharing as a direct substitute for CBS. That the present study found no association between carsharing membership and CBS membership is likely due to the high share of carsharing members in the non-member sample, compared to official figures (see Table 1 for descriptive figures and section 5.3 for the sampling limitations).

The results do, however, support T2. Regular bike usage is associated with CBS membership. This finding confirms Becker and Rudolf's (2018) findings that 71% of CBS users rely on a bicycle in their daily lives. Furthermore, we found that *active* CBS members are *more* likely to use soft mobility (bike/foot) for their daily travel, whereas *inactive* members are *less* likely to do so. This result highlights the value of adding fine-grained subdivisions within member and non-member groups. Furthermore, it allows us to

refine T2 and to formulate a testable hypothesis for future research: *Active* CBS members are likely to be regular bike users.

Relating this finding to social practice theory, we can confirm that there are similarities in the practices of cycling and CBS use regarding materials, meanings, and competences. Regular bike users are familiar with the materials, which are the bike and the bicycle infrastructure in the city. Meanings related to cycling as daily transportation mode and the transporting of goods by bike are likely to be similar in CBS. Finally, regular cyclists have acquired the relevant cycling competences to maneuver safely in the city.

Uninterested non-members, in turn, are likely to use cars or public transportation as daily mode of transportation. Analogously, Namazu et al. (2018) found that uninterested non-members of a carsharing scheme were more attached to private car use compared to members and potential members of carsharing. Thus, uninterested non-members' established practices differ substantially from the CBS practice. Cars and public transportation differ functionally from CBS and are associated with different materials, meanings, and competences. The bikeshare literature has shown that switching from a car to bike sharing is less likely than switching from other sustainable options to bike sharing (see section 2.2). Furthermore, Becker and Rudolf (2018) found that only 6% of CBS users mentioned cars as their main daily modes of transportation. We expected non-members to be less inclined to use bikes (T2). Taking into consideration the findings of this paper, together with results of previous research, we can refine our assumption about non-members. We now formulate a testable hypothesis: Uninterested non-members of sharing schemes are likely to use private cars for daily transportation.

Thus, CBS as a low-carbon transportation innovation likely addresses users who are already performing similar practices. In turn, people with dissimilar practices are unlikely to try out such schemes, at least not until wider structural factors that facilitate deeper changes in travel routines are introduced.

5.2. Barriers to CBS usage: Missing links among materials, meanings, and competences

The results for uninterested non-members suggest that there are missing links among the material, meaning, and competence element of the CBS practice. These results confirm the third thesis (T3). Barriers related to the size, weight, and load safety of a CB indicate a missing link regarding the material element of the practice. Additionally, uninterested non-members might not share the meanings associated with transporting loads by bicycle. Finally, they probably also lack competences related to cycling and navigating the city safely. Security concerns are prevalent among the group of uninterested non-members, which is in line with the literature on barriers to bike sharing (Fishman et al., 2012). Security concerns are not inherent in the sharing feature but in cycling in the city or using a CB in general. When the practice is imagined to be daunting or unsafe, it is likely to not be performed.

If materials, meanings, and competences are not aligned, CBS will likely not be adopted. Thus, the results suggest that there are major barriers for uninterested non-members to consider CBS. These barriers are related to all aspects of successful adoption of a practice. The missing links among materials, meanings, and competences could explain why these respondents are not members and are not likely to sign up for the scheme any time soon.

Among active and inactive members, the most frequently mentioned barrier was that they had only an irregular need for CBS. This might be why this group engages in sharing at all. Transportation sharing schemes like these are convenient when people do not regularly rely on the respective mode of transportation. At some point the likelihood increases that they would buy their own CB. Active and inactive members mentioned

several substitutes for CBS, for example, carsharing, conventional bikes (with trailers), and having goods delivered. Thus, in the absence of CBS this group still finds (low-carbon) alternatives to transport goods.

Another commonly mentioned barrier for CBS members related to the sharing procedure. This result corresponds to findings from the bike sharing literature that convenience, such as host proximity, is crucial to promote the system (Fishman et al., 2012, 2014). Thus, a lack of suitable sharing infrastructure explains the missing link between the material element and the two other elements of practice, meaning and competence. This missing link makes it difficult to integrate CBS into one's daily life.

Because CBS is new, people lack experience with the procedure and also forget about CBS. It is possible that complex and time-consuming sharing procedures that require considerable conscious effort impede automatization and habitual use (Verplanken and Wood, 2006). Furthermore, and as mentioned above, most users have other modes of transportation that sufficiently satisfy their needs in the absence of CBS. Because people might be routinized in using these other modes of transportation, CBS is sometimes not the first option they consider.

Social practice theory suggests that practices that serve similar purposes compete directly with each other (Spurling and McMeekin, 2015; Spurling et al., 2013). If the purpose is to transport bulky goods, CBS competes with the use of car(sharing), bike trailers, public transportation, or even having the goods delivered by someone else. Thus, CBS competes with other modes of transportation and other sharing schemes for finite resources, such as users' time. However, some people also mentioned very specific purposes for CBS (such as leisure activities with grandchildren) where no such competition with alternative modes of transportation impinges on decisions. This might indicate that new routines are developing, routines that are enabled by the CBS innovation. Such novel association of a particular purpose with the new practice thus also distinguishes the new practice from other practices.

Regarding the relation between sharing and owning, the literature on carsharing provides some evidence that individuals who join carsharing schemes shed the cars they own (Cervero et al., 2007; Le Vine and Polak, 2017). However, there is also evidence that trying out carsharing can result in the purchase of a private car (Giesel and Nobis, 2016). The latter finding is in line with that of a CBS study in which 35% of users reported planning to purchase a CB (Becker and Rudolf, 2018). The results of the present study also revealed a mixed pattern. One respondent stated that they used CBS to try out different CBs before purchasing one. In contrast, other respondents said they appreciated the existence of CBS because it allows them to use a CB without having to purchase one. The relationship between sharing and owning likely also depends on the convenience of the sharing infrastructure. Evidence for this can be found in quotations from inactive members who related their decision to purchase a CB directly to limitations of the sharing scheme. Thus, as already suggested by research on carsharing, simplifying the CBS procedure may result in users not purchasing their own CBs (Namazu et al., 2018).

The diffusion of CBS depends on its ability to recruit more practitioners. The most likely candidates are interested non-members. The findings in this study show that an equal proportion of men and women could imagine using CBS in the future (see Table 1). This differs from existing patterns, in which both active CBS users and early adopters of bike- and carsharing schemes are more likely to be male (Kawgan-Kagan, 2015). The indicated equal interest from men and women in the present study could indicate that CBS is on track to move out of the presently prevalent gender niche. Alternatively, the finding that an equal proportion of men and women could imagine using CBS in the future, but men are overrepresented among active CBS users could indicate that women do in fact join

such schemes less often than men. CBs might present a viable alternative to cars, particularly for women with children, as found in a US study (Riggs and Schwartz, 2016). A supportive bicycle infrastructure, cycling skills, and enough time to use a slower mode of transportation are factors that must be addressed for successful recruitment of female non-members (Riggs and Schwartz, 2016). Larger proportions of the population could be supported in acquiring related competences, but this requires a careful investigation of the links among materials, meanings, and competences.

5.3. Limitations

Limitations concern the sample, the location and the questionnaire for potential members. The sampling strategy for non-members was based on suggestions by Fishman et al. (2014), who proposed that studies should capture non-members living or working in the same geographic area as members. However, this strategy is likely to have introduced a bias by sampling people who frequent similar places and websites, and does not allow the calculation of participation rates. In particular, members of carsharing schemes were overrepresented in the sample when compared to official statistics (Table 1). Although we used neutral wording in announcing the raffle for a transportation voucher (incentive), it is possible that the raffle attracted people interested in mobility topics, thus biasing the sample. In addition to the non-random sampling strategy and selection bias, the numbers of participants in the inactive member and non-member groups were low. Accordingly, the results for the regression model must be interpreted with care.

Regarding the location of the present study, Basel is compact and densely populated, and the city structure has an impact on travel behavior (Schwanen et al., 2004). Compared to other Swiss cities, inhabitants of Basel cover large share of distances (17%) by bike (Städtevergleich Mobilität, 2017). Thus, future research should expand to other cities and regions with CBS schemes to further extend the external validity of the findings.

We did not ask potential members about their barriers to CBS. However, knowledge about such barriers could be helpful to identify hindrances for committed individuals. In a study on carsharing, barriers for potential members related to accessibility, flexibility, and fees (Namazu et al., 2018). In the present study, accessibility, flexibility, and fees were mentioned as barriers by active and inactive member groups. Future research could focus on the barriers for potential users of CBS to establish whether the barriers are similar to or different from the barriers for active and inactive users.

5.4. Prospects for future research

Social practice theory seems promising for future research to explain innovation in practices and non-performance of practices. The performance of practices differs across population segments. Thus, the question becomes relevant whether certain practices, such as CBS, remain within a sub-segment of the population (e.g. regular bike-users) or can spread. As CBS is new, it is not clear how much the characteristics of active users merely reflect the typical characteristics of early adopters. Further research could investigate whether user profiles change as CBS becomes more widespread.

This question of user profiles is also linked to the identification of diffusion paths beyond the group of early adopters. Future research could focus on the systems viewpoint. It could, for example, take the multilevel perspective and investigate interactions among niches, regimes, and landscapes to explain diffusion or resistance (Geels et al., 2017). Likewise, it would be interesting to focus on the individual and societal levels. The diffusion of social norms could be considered to identify tipping points for low-carbon transportation innovations (Nyborg et al., 2016). Future research can also consider the role of CBS to encourage cycling among the wider population (Hosford et al., 2018).

Another related task for future research concerns the diffusion of transportation sharing schemes beyond a predominantly male group of early adopters. Differences between men and women in the use of sharing schemes are often explained with different roles, and thus with distinct transportation purposes for women and men, depending on the cultural and infrastructure contexts (Riggs and Schwartz, 2016). To address gender-specific barriers, future research could investigate whether women experience particular barriers to CB use and sharing and what these barriers are.

The analysis revealed that CBS as a unit of analysis is not straightforward. This is because it involves at least three practices at the same time: sharing a mode of transportation, using an electrically supported vehicle, and transporting goods or children. Therefore, future research needs to carefully consider different aspects and possible links among sharing concepts, electric mobility, and the need to transport cargo. These aspects are closely linked to urban planning (Riggs and Schwartz, 2016). Since different modes of transportation require different infrastructure, it would be a considerable advantage if national travel statistics distinguished, firstly, among different types of bikes (conventional bike, e-bike, and CB) and, secondly, among membership in sharing schemes for different modes of transportation.

Regarding financial and socioeconomic aspects, future research could investigate the influence of trip costs on mode choice. This particularly concerns the relation between sharing and owning vehicles. Payment on a usage basis might be more visible than one-time purchase costs. Additionally, the costs of sharing (in terms of money and convenience) might be too high compared to using private vehicles, which could explain why sharing schemes are presently a niche development. However, future research is needed to investigate this assumption and to identify the relationship between sharing and owning vehicles.

6. Conclusion and policy implications

In this paper, we examined CBS as a low-carbon transportation innovation. The results showed that the CBS practice is more likely to be performed when it shares elements with established practices. However, missing links among the elements of the new CBS practice explain non-performance.

In tying the findings back to social practice theory, we are able to derive some policy implications. To make full use of the potential of CBS, policy makers should consider practices as a whole. Any low-carbon transportation innovation whose diffusion depends exclusively on consumers' willingness to substitute current practices (Shove, 2015) is unlikely to disseminate beyond the group of early adopters. Non-adoption is partly related to different sociodemographic characteristics between members and non-members and is probably related to distinct roles and conventions of normality. For example, larger households may perceive using sharing schemes as more complicated than smaller households and an additional burden to coordinating the daily routines of every household member. Thus, policy makers could take into account the particularities of practices of different population groups and support materials (including infrastructure and technology), address associated meanings, and build competences.

Substituting resource intense transportation practices with low-carbon practices might be more effective if policy intervenes in both practices at the same time (Spurling and McMeekin, 2015). The comparative advantage of CBS to cars can be supported by a bike-friendly infrastructure, which gives priority to bikes and takes away advantages of private car use, e.g. limiting parking facilities for cars and at the same time designing infrastructure to prioritize cycling and walking (Spurling and McMeekin, 2015).

Informing policy interventions with ideas from social practice theory may help encourage substantial changes in the ways people live (Shove, 2015). The status quo, in turn, is supported by established infrastructures which make it easier to perform current practices (Shove et al., 2012). Thus, current infrastructure likely supports vehicle ownership-centered systems that make private car use more convenient than sharing schemes.

To make CBS more competitive with established practices, additional rental locations and different pricing schemes (e.g. providing free rentals when the hosts are not open) could help to make CBS more convenient and competitive. Safety training for electric CBs might help increase perceived competencies. However, this has to be linked to infrastructure developments that make cycling in the city safer. In addition, the features of a *shared* CB have to be taken into account, because CBS users ride an electric CB irregularly and might therefore lack routine. Bike trailers were often mentioned as direct substitutes for CBs. Thus, CBS providers could consider offering bike trailers in addition to CBs as is already the case with some CBS providers in Austria and Germany (Becker and Rudolf, 2018).

Adapting the infrastructure for CBS (such as adequately wide parking spaces and wider cycling lanes) is, however, a challenge. Different modes of transportation compete for finite space on roads, and the corresponding practices compete directly with one another. Policy makers, and in particular transportation planners, always confront the question, to whom do we give and from whom do we take away? Considering the links among materials, meanings, and competences can help address the broader picture in which practices are performed.

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Appendix

Table A.1

Regression results for all variables.

	(1)	(2)	(3)	(4)	(5)
	Membership (1 = member)	Active	Inactive	Potential	Un-interested
Carsharing member (reference category: no carsharing member)	0.104 (0.055)	0.073 (0.063)	0.024 (0.031)	–0.012 (0.058)	–0.086 (0.044)
Number of purposes for soft mobility use	0.060*** (0.013)	0.043* (0.021)	–0.022* (0.009)	–0.037 (0.019)	0.015 (0.014)
Female (reference category: male)	–0.103 (0.055)	–0.134* (0.058)	0.019 (0.033)	0.042 (0.051)	0.073 (0.040)
Driver's license (reference category: no driver's license)		–0.069 (0.089)	0.075* (0.031)	0.042 (0.086)	–0.048 (0.059)
At least one car in the household (reference category: no car in the household)		0.067 (0.072)	–0.099*** (0.029)	0.051 (0.065)	–0.020 (0.055)
Number of purposes for car use		–0.057 (0.041)	0.015 (0.017)	–0.028 (0.035)	0.071** (0.024)
Number of purposes for public transportation use		–0.015 (0.031)	–0.039* (0.019)	0.012 (0.027)	0.041* (0.017)
Age		–0.006** (0.002)	–0.002 (0.001)	0.004 (0.002)	0.005*** (0.001)
Income (gross household income per month in CHF; Reference category: 6000–8999)					
3000 or less		0.111 (0.141)	–0.055 (0.031)	–0.042 (0.142)	–0.015 (0.080)
3000–4459		0.009 (0.140)	0.051 (0.079)	–0.187 (0.097)	0.127 (0.100)
4500–5999		–0.020 (0.105)	–0.055 (0.031)	0.088 (0.104)	–0.013 (0.050)
9000–12000		–0.135 (0.084)	0.133* (0.055)	–0.082 (0.073)	0.085 (0.061)
12000 or more		–0.014 (0.098)	0.069 (0.062)	–0.064 (0.079)	0.009 (0.060)
Not indicated		–0.028 (0.093)	0.005 (0.046)	0.018 (0.089)	0.006 (0.050)
Education (in years)		0.013 (0.019)	–0.033** (0.011)	0.023 (0.017)	–0.003 (0.009)
Household size		–0.007 (0.025)	0.032** (0.011)	0.004 (0.023)	–0.029 (0.022)
N (cases per group)		145	25	66	35
N (total)	297				

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.2

Two-way table of the multiple responses about barriers.

	(1) Active	(2) Inactive	(3) Uninterested	(4) Total	(5) Chi^2/p*
Irregular purpose	92 60.1	9 34.6	10 26.3	111 51.2	17.16 0.00
Sharing procedure	42 27.5	6 23.1	1 2.6	49 22.6	10.73 0.06
Access to functionally similar mode of transportation	18 11.8	8 30.8	5 13.2	31 14.3	6.60 0.44
Features of CB	6 3.9	2 7.7	5 13.2	13 6.0	4.76 1.00
Nature of e-support	4 2.6	0 0.0	7 18.4	11 5.1	17.38 0.00
Safety concerns	0 0.0	0 0.0	9 23.7	9 4.2	44.23 0.00
Inexperienced	3 2.0	3 11.5	2 5.3	8 3.7	6.06 0.58
Public infrastructure	1 0.7	0 0.0	3 7.9	4 1.8	9.38 0.11
Not integrated in daily life	4 2.6	0 0.0	0 0.0	4 1.8	1.71 1.00
CB unknown	0 0.0	0 0.0	3 7.9	3 1.4	14.33 0.01
Inability	0 0.0	0 0.0	2 5.3	2 0.9	9.51 0.10
Other	0 0.0	1 3.9	1 2.6	2 0.9	5.08 0.95
Total responses	170	29	48	247	
Cases (N)	153	26	38	217	

* Pearson chi^2 and bonferroni-adjusted p values below
Columns 1-4 contain the frequency of responses and column percent of cases below

Table A.3

Regression results: exponentiated coefficients (= odds ratio).

	Membership	Inactive	Potential	Uninterested
	Baseline: non-member	Baseline outcome category: active member		
Carsharing member (reference category: no carsharing member)	1.630 (0.423)	1.198 (0.591)	0.784 (0.275)	0.338 (0.191)
Number of purposes for soft mobility use	1.333*** (0.094)	0.680* (0.109)	0.782* (0.098)	1.051 (0.183)
Female (reference category: male)	0.616 (0.159)	1.706 (0.871)	1.644 (0.529)	2.864* (1.422)
Driver's license (reference category: no driver's license)		6.038 (7.469)	1.341 (0.760)	0.741 (0.439)
At least one car in the household (reference category: no car in the household)		0.144** (0.102)	1.088 (0.425)	0.682 (0.490)
Number of purposes for car use		1.401 (0.401)	1.022 (0.235)	2.319** (0.744)
Number of purposes for public transportation use		0.599 (0.180)	1.116 (0.198)	1.592* (0.349)
Age		0.979 (0.021)	1.035* (0.015)	1.069*** (0.018)
Income (gross household income per month in CHF; Reference category: 6000–8999)				
3000 or less		0.000*** (0.000)	0.684 (0.589)	0.669 (0.801)
3000–4459		2.163 (2.611)	0.298 (0.357)	2.621 (2.416)
4500–5999		0.000*** (0.000)	1.426 (0.768)	0.934 (0.689)
9000–12000		6.109* (5.089)	0.935 (0.447)	2.791 (1.834)
12000 or more		2.779 (2.648)	0.764 (0.391)	1.087 (0.886)
Not indicated		1.164 (1.206)	1.136 (0.562)	1.141 (0.764)

Education (in years)		0.612** (0.108)	1.086 (0.118)	0.955 (0.110)
Household size		1.578* (0.281)	1.015 (0.145)	0.754 (0.202)
N (cases per group)		25	66	35
N (total)	297			

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