Transportation Research Part D 96 (2021) 102861

Contents lists available at ScienceDirect

Transportation Research Part D

journal homepage: www.elsevier.com/locate/trd

Carsharing experience fostering sustainable car purchasing? Investigating car size and powertrain choice

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ARTICLE INFO

Keywords:
Battery electric vehicle
Car size
Stated preferences
Sustainable mobility
Carsharing
Attitudes and values

ABSTRACT

Scholars suggest that carsharing may lead to a reduction in car ownership and car travel. Research on how carsharing is connected to other sustainable effects such as an increased openness to micro to mid-sized battery electric vehicles is limited, however. We thus adopted a stated choice survey with 995 participants from Switzerland to test the car purchase preference of mobility users with and without carsharing experience. Results suggest that - for people living in the countryside - carsharing users have a 3 times higher likelihood of choosing a micro to mid-sized battery electric vehicle compared to participants without carsharing experience. We find a similar trend for people living in the agglomerations. We therefore recommend policy makers and mobility planners to take these benefits into account when planning carsharing services and its role in mobility systems.

1. Introduction

Private motorized transport is one of the main contributors of negative external effects through congestion, greenhouse gas emissions, health problems and noise – a situation which is likely to worsen considering the trend for increasing population. Many stakeholders thus actively support mobility concepts like carsharing in order to reduce vehicle miles travelled and the aforementioned negative externalities through a reduction in car ownership and car travel (Hoerler et al., 2019; Le Vine and Polak, 2019; Martin et al., 2010; Nijland and van Meerkerk, 2017). For example, Chen and Kockelman (2016) estimate reductions of greenhouse gases of over 50% when shifting from private car use to station-based carsharing. Moreover, today's private cars are over-dimensioned for most of their trip purposes, even for car owners living in urban environments where space is commonly scarce. Further, in order to reduce some of the negative externalities from conventional car use, scholars agree to switch to battery electric vehicles (BEVs) fueled with renewable energies as they have substantial less CO_2, noise and other pollutant emissions (Cox et al., 2020). Yet the uptake of BEVs remains small in different regions around the globe (Bratzel, 2019; McKinsey & Company, 2020). Even in Switzerland, where a considerable growth in sales has been observed, less than 5% of total new car registrations were BEVs in 2019 (Swiss Federal Office of Energy, 2020a). To achieve the targets of the Paris Agreement, a faster switch to BEVs is needed. Higher acquisition costs, range anxieties, insufficient charging infrastructure, long charging times and a general aversion to change are the main reasons for this resistance (Berkeley et al., 2017; Claudy et al., 2015). Overcoming anxieties and hindrances with this technology is thus important to accelerate the uptake. A number of scholars suggest that including BEVs in carsharing fleets could not only reduce vehicle miles

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https://doi.org/10.1016/j.trd.2021.102861

Available online 8 May 2021

travelled, but also increase the acceptance and diffusion of BEVs by their physical presence and low hurdles to trying out the new technology (Jensen et al., 2013; Schlüter and Weyer, 2019; Shaheen et al., 2020; Struben and Sterman, 2008; Wappelhorst et al., 2016). Overall, carsharing could therefore decrease CO_2 emissions and lead to more sustainable transports in four ways. First, through a reduction of vehicle ownership leading to less car use (e.g. Ko et al., 2019; Martin et al., 2010; Nijland & van Meerkerk, 2017). As an example, Rid et al. (2018)a,b summarized the private car replacement rate per carsharing car for European and American station-based and free-floating systems, finding a replacement rate between 4 and 15 cars for the station-based system and a replacement rate between 1 and 4 cars for the free-floating system. Second, by the provision of a fuel-efficient fleet (Martin et al., 2010; Namazu and Dowlatabadi, 2015). Third, by increasing the attractiveness of public transport through better accessibility (Namazu and Dowlatabadi, 2015), and forth, by enabling to get used and try out electric vehicles (EVs), and ultimately spurring their adoption, through a low hurdle and easily accessible presence in carsharing systems (Luna et al., 2020; Schlüter and Weyer, 2019; Schmalfuss et al., 2017; Shaheen et al., 2020; Wappelhorst et al., 2016).

However, despite this vast body of literature, little research elucidates the further benefits of carsharing experience on car purchasing decisions. Particularly, it has not been investigated, to the best of the authors' knowledge, whether experience with carsharing (and through that the awareness of having alternative cars at one's disposal) can have an influence on the size or the drivetrain technology in purchase decisions of mobility users. As an example, carsharing operators provide a set of different car models to choose from, reducing the need of owning a large car capable of transporting large luggage for the rare cases this is actually used. Especially since people overestimate their need for range in a car (Hao et al., 2020), small BEVs could be a reasonable alternative for many conventional car owners. Furthermore, carsharing could allow the use of a shared long-range car (i.e. combustion engine car, plug-in hybrid electric car and future long-range BEVs) for longer trips which exceed the range of common micro to mid-sized BEVs. This could allow to own a small electric vehicle, which only covers the every-day trips (and with its limited size would require less resources for its production and occupy less space) and use carsharing in those situations in which the range of a small electric vehicle is not enough (Needell et al., 2016). This rational has been investigated by Sprei and Ginnebaugh (2018) through semi-structured interviews of carsharing experts in Sweden and in California, USA. They refer to the car as a bundle, one needed for daily use and one for peak use (e.g. holidays, long trips). Sprei and Ginnebaugh (2018) conclude that a large variety of vehicles that cover the different needs should be present in carsharing and car-rental fleets, vehicles need to be close to the user and the availability of the needed vehicle should be high – characteristics that the carsharing operator Mobility is offering in Switzerland. Using carsharing in addition to BEVs could therefore overcome the common hurdles of owning a BEV and especially, smaller more environmentally friendly BEVs for everyday trips. Having experience with carsharing could therefore act as an enabler for the diffusion of small, electrified cars in standard daily mobility.

We therefore pose the following research question:

- Are carsharing users more likely to buy a micro to mid-sized BEV from a set of alternatives than non-carsharing users?

The corresponding null and alternative hypotheses are thus the following:

H_0: Carsharing users are not significantly more likely to choose a micro to mid-sized BEV than non-carsharing users

H_1: Carsharing users are significantly more likely to choose a micro to mid-sized BEV than non-carsharing users

In order to test H_1 we conducted a stated choice survey including a car size choice question and a powertrain choice question. The questionnaire was part of the Swiss Household Energy Demand Survey (SHEDS) conducted in April 2018.

We structure the remainder of the paper as follows: within the second section, we develop a general overview of user characteristics of carsharing adopters and give a brief overview of related work. In the third section, we explain the structure of the questionnaire together with the applied statistical methods, followed by the results in section four. Finally, we discuss the findings and draw a conclusion, as well as provide recommendations for future research in sections five and six, respectively.

2. Background

2.1. *Carsharing and carsharing adopters*

Today, consumers can choose between four different carsharing models; round-trip station-based, one-way station-based, free-floating and peer-to-peer carsharing. Round-trip station-based carsharing is the most traditional form of carsharing where one needs to return the car at the same designated parking lot. Another form of station-based carsharing includes one-way trips, where the vehicles can be dropped off at a different station form the pick-up point. Free-floating as well as company based peer-to-peer carsharing are newer forms of carsharing. The former does not rely on designated parking lots, instead, vehicles can be picked up and returned anywhere within a given service area. In peer-to-peer carsharing, private car owners make their vehicles temporarily available for shared use directly or via a platform provided by a third-party operator. A good overview of these different carsharing models is provided in Machado et al. (2018).

Scholars find that especially round-trip station-based carsharing attracts people with a sustainable lifestyle (Lempert et al., 2019). Contrary, one-way members self-report that they carshare for convenience and use their own private car more frequently than round-trip station-based carshare members, even though they use the carsharing service more often than the round-trip station-based members (Lempert et al., 2019). Station-based carsharing platforms normally require a fixed membership fee and thus attract more financially committed people (with a higher income) in comparison to peer-to-peer carsharing members. Furthermore, having a public transport subscription and zero cars in the household increases the likelihood to subscribe to a station-based service instead of a peer-to-peer service (Münzel et al., 2019). As such, station-based carsharing is mostly used as a complement to public transport and replacing a private car, while freefloating and peer-to-peer carsharing are used to satisfy spontaneous needs and for convenience (Lempert et al., 2019; Knie et al., 2016). Generally, older people are less inclined to join a carsharing service, probably due to established habits and convenience. Also other socio-economic factors play a key role in carsharing adoption. A higher education, being a man (due to less safety concerns) and living in the city centres increase the likelihood of adoption (Prieto et al., 2017). However, while different carsharing business models attract different users, the preference for EVs within a carsharing service is in line with the affinity to carsharing in general (Burghard and Dütschke, 2019). A variety of these socio-economic factors found to be relevant in carsharing adoption will later serve as explanatory variables in our study and are summarized in section 3.2.

2.2. Related work and research gaps

To the best of the authors' knowledge, no research insights into car size preferences in combination of powertrain choice of future car purchases between carsharing users and non-users are available to date. Still, we want to refer to relevant studies that separately investigated car size choice and the interaction of carsharing with EVs. Baltas and Saridakis (2013) for example, applied a multinomial logit model to test the preference of participants of an online survey for different car types (ranging from micro cars to SUVs), finding that gender, income, education, marital status, place of residence as well as openness for buying an electrified version of the car significantly influences the car type choice. Nayum et al. (2016) analyzed the differences between five conventional car buyer groups and one electric car buyer group on a range of socio-psychological variables. They find that attitudes towards convenience of the car like comfort differed strongly among buyers of small to medium sized cars and buyers of big and powerful cars and especially to buyers of EVs. Higgins et al. (2017) applied a large online survey to measure the preferred next vehicle body type (from economy to SUV and pickup truck) in combination of preference for powertrain (ICEV, HEV, PHEV, BEV). They show that the SUV and pickup segments are more ICE oriented compared to the smaller car size segments. Yet, they did not investigate carsharing in their study.

So far, several studies investigated different aspects of the interaction of carsharing with EV ownership. Clewlow (2016), for example, investigated the differences in vehicle ownership characteristics between carsharing members and non-members in the San Francisco Bay Area utilizing a large household travel survey ($n = 63'082$). The findings suggest that carsharing members own significantly more EVs (including hybrid, plug-in hybrid and BEVs) than non-members. Whether this is an effect of subscribing to the carsharing service is unclear, however. Schlüter and Weyer (2019) adopted the technology acceptance model (TAM) to investigate the perceived usefulness and perceived ease of use of EVs, which together determine intention to adopt, among the users of a carsharing service in Germany. They find that carsharing experience leads to a higher perceived usefulness of EVs, because people using carsharing services have a mobility mindset that is in line with EV characteristics. Carsharing experience was not found to influence perceived ease of use of EVs. Schlüter and Weyer further asked the participants whether they would buy an EV as their next car finding that those who have experience with carsharing are more open to buy an EV as their next car compared to participants without carsharing experience. This effect was even higher for users of an EV carsharing service, which was confirmed by a study from Shaheen et al. (2020). Schmalfuss et al. (2017) also find that providing short-term BEV experience, i.e. through carsharing, could have the potential to enhance acceptance and satisfaction with BEVs. Similarily, Burghard and Dütchke (2019) report that those interested in carsharing are also more likely to own, have an intention to own and be interested in an EV. They further suggest that carsharing users exhibit characteristics that are conducive to the acceptance of EVs, such as less concern about dealing with limited range compared to conventional vehicles. While these studies already indicate a link of carsharing and EV adoption and provide useful information regarding our research question, they did not investigate the relevance of car size. Further, both Schlüter and Weyer (2019) and Burghard and Dütchke (2019) didn't focus on BEV but rather investigated the broader term of EVs including plug-in hybrid electric vehicles. Last, the conclusions from Clewlow (2016) and Shaheen et al. (2020) are based on descriptive analysis, without controlling for further factors such as attitudes and values.

Nonetheless, the studies summarized above are important in defining influential variables in car size and powertrain adoption, which are summarized in Section 3.2 of the Methodology.

To strengthen the literature and close the gap mentioned above, we implemented a binary logistic regression model to investigate the influence of experience with carsharing on choosing a micro to mid-sized BEV instead of a large/SUV BEV, plug-in hybrid electric vehicle (PHEV), hybrid electric vehicle (HEV) or internal combustion engine vehicle (ICEV) as their next car or car replacement.

3. Methodology

We designed a stated choice survey as part of the Swiss Household Energy Demand Survey (SHEDS) 2018 to answer our research question (for more details on SHEDS see Weber et al. (2017)). In total 995 respondents were randomly assigned to and completed the experiment. The respondent assignment ensured a representative sample over a range of categories – specifically age, gender language region (French-speaking and German-speaking) and tenancy status. More information including a comparison with the overall SHEDS 2018 sample and the Swiss population can be found in Table A1 in the Appendix. The survey first asked details about the respondents' experiences and decisions around mobility, followed with the hypothetical sequential stated choice section. In the latter, we elicited respondents' stated preferences for car purchasing, including car size and powertrain, followed by that for public transport passes, and finally their transport mode choices. For a detailed explanation of the survey design, as well as analysis of transport mode choices, see van Dijk et al. (2020).

3.1. Stated choice survey

The stated choice section was designed in such a way as to first remind respondents of their current, real-life transport decisions, and then followed up by a hypothetical car choice. This structure offered each respondent a realistic and relatable choice situation and allowed us to obtain accurate and reliable responses, overcoming potential hypothetical bias.

We started by asking about respondents' access to and use of public transport services, and their habitual transport modes for commuting, local leisure, and weekend trips. Following this, we set up the realistic, hypothetical vehicle choice situation. In line with the stated preference literature, we primed the respondents to encourage truthful responses (Vossler et al., 2012) and reminded them about their budget constraint (e.g., Johnston et al. (2017)). We then framed the imminent car purchase decision, limiting it to currently available technologies and prices. We asked respondents to imagine they decide to purchase a new primary household car within the next year. The first choice task is to then choose the car size, between 'micro', 'small', 'small-medium', 'mid-size', 'large' and 'SUV' - based on the standard categories of the Touring Club Switzerland (Touring Club Switzerland, 2018). We also gave the option of 'none' for respondents who preferred not to buy a car at all or for which the displayed range of car size did not cover their preferences. Based

For the next set of questions, please imagine that you decide to purchase a car or replace your car within the next year.

Which of the following options best describes your most preferred choice of primary car?

None	Micro	Small	Small-medium	Mid-size	Large	SUV
○	○	○	○	○	○	○

Which of the following car options would you purchase?

Additional information is provided if you place the mouse over the column or row headers.

	1 Electric	2 Electric	3 Plug-in hybrid	4 Plug-in hybrid	5 Hybrid	6 ICE
Price (CHF)	68,000	85,000	65,000	85,000	70,000	61,000
Driving cost (CHF/100km)	4.10	3.50	5.00	7.70	8.00	11
Range of battery (km)	380	410	35	20	-	-
Max speed (km/h)	180	210	170	210	190	230
CO_2 emissions (g/km)	0	0	40	80	105	155

	1 Electric	2 Electric	3 Plug-in hybrid	4 Plug-in hybrid	5 Hybrid	6 ICE
Your choice:	○	○	○	○	○	○

Fig. 1. Car size choice question and an example of the powertrain choice question (attributes related to the car size "SUV"), as shown in the survey.

on the information given in the experiment, it is legitimate to assume that the majority of respondents who chose 'none' did not want to buy a car. This is backed by the fact that 70% of respondents choosing 'none' do not own a car.

Respondents who chose a car size proceeded to the second choice task, to choose a specific car. This was in the form of a choice table with six options and six attributes. Only one choice was made per respondent. The primary attribute was the car's powertrain, including two 'electric' (i.e. BEV) alternatives, two 'plug-in hybrid' (PHEV), one 'hybrid' (HEV), and one 'internal combustion engine' (ICEV). The attributes were 'price', 'driving cost per 100 km', 'battery range', 'max. speed', and 'CO_2 emissions (g/km)'. The attribute levels were determined by the previous choice of car size and within each car size, every respondent received the same attribute levels. These levels were calculated using data from the TCS on all cars available in Switzerland at the time (Touring Club Switzerland, 2018). Fig. 1 displays a sample of the car size choice questions and the powertrain choice question including the various attributes that were calculated according to the car size chosen before. For readability, only attributes for the "SUV" case are shown in the figure. For each of the two BEV and PHEV options we created a cheaper and more expensive option according to the cars on the market in Switzerland. The full experiment is described in more detail in van Dijk et al. (2020).

3.2. *Variable set included in our study*

As we focus on estimating the effect of carsharing experience on car size and powertrain choice, we want to reduce possible confounding effects to the minimum – that is latent variables associated with the outcome variable but also with carsharing experience potentially distorting the effect of carsharing experience on car size and powertrain choice. We thus conducted a comprehensive literature research to capture the most important variables in socio-demographics, mobility characteristics, attitudes and values explaining the adoption of carsharing, car size and powertrain. Prieto and Caemmerer (2013) as well as Orlov and Kallbekken (2019) provide a good summary of studies investigating car size and powertrain choice, respectively. Table 1 summarizes the variables included in our study and corresponding literature finding a significant effect on carsharing adoption, car size choice and powertrain choice. The categories and frequency of these variables as well as the car size and powertrain choice variable used in our study can be found in Table A2 in the appendix.

Table 1
Overview of variables in this study and corresponding literature.

Variables included in this study	Literature about the adoption of carsharing, car size and powertrain		
	Carsharing	Car size	Powertrain
Socio-demographics			
Age	(Dias et al., 2017; Lempert et al., 2019; Prieto et al., 2017)	(Herberz et al., 2020; Kim et al., 2020; Prieto and Caemmerer, 2013)	(Ferguson et al., 2018; Higgins et al., 2017; Ziegler, 2012)
Gender	(Acheampong and Siiba, 2020; Kawgan-Kagan and Popp, 2018; Prieto et al., 2017)	(Baltas and Saridakis, 2013; Kim et al., 2020; Prieto and Caemmerer, 2013)	(Ferguson et al., 2018; Herberz et al., 2020; Ziegler, 2012)
Education	(Becker et al., 2017; Dias et al., 2017; Münzel et al., 2019; Prieto et al., 2017)	(Prieto and Caemmerer, 2013)	(Ferguson et al., 2018; Herberz et al., 2020)
Type of living area	(Dias et al., 2017; Prieto et al., 2017)	(Baltas and Saridakis, 2013; Prieto and Caemmerer, 2013)	(Ferguson et al., 2018; Jones et al., 2020)
Household income	(Dias et al., 2017)	(Baltas and Saridakis, 2013)	–
HH structure	(Dias et al., 2017)	(Baltas and Saridakis, 2013)	(Orlov and Kallbekken, 2019)
HH size	(Efthymiou et al., 2013)	(Nayum and Klöckner, 2014; Prieto and Caemmerer, 2013)	(Higgins et al., 2017)
Mobility characteristics			
Public transport passes	(Becker et al., 2017; Münzel et al., 2019)	–	–
Number of cars in HH	(Dias et al., 2017; Münzel et al., 2019; Namazu et al., 2018)	(Nayum and Klöckner, 2014)	–
Mode choice	(Efthymiou et al., 2013; Münzel et al., 2019)	–	–
Travel time	(Efthymiou et al., 2013)	–	–
Attitudes and values			
Importance of safety	–	(Herberz et al., 2020; Mohammadi and Kermanshah, 2019)	(Daziano, 2012)
Importance of comfort	(Acheampong and Siiba, 2020)	(Nayum et al., 2016)	–
Importance of privacy	(Kim et al., 2017)	–	–
Importance of owning a car	(Kim et al., 2017; Paundra et al., 2017)	(Baltas and Saridakis, 2013; Herberz et al., 2020)	–
Biospheric values	(Kim et al., 2017; Münzel et al., 2019; Schaefers, 2013)	(Nayum and Klöckner, 2014)	(Herberz et al., 2020; Ziegler, 2012)
Egoistic values	(Buschmann et al., 2020)	–	–
Altruistic values	(Buschmann et al., 2020; Schaefers, 2013)	–	–
Hedonic values	(del Alonso-Almeida, 2019)	(Nayum and Klöckner, 2014)	–

3.2.1. Carsharing experience

Carsharing in Switzerland is dominated by the company Mobility Carsharing (or in short, Mobility), which has been established since 1997. Switzerland thus has a long history of carsharing and is already well-known throughout the country. They offer mostly round-trip station-based carsharing with freefloating being tested in two major cities. With 1530 stations offering a total of 3120 cars, Mobility covers whole Switzerland. Yet, so far, less than 5% of the fleet is electrified (Mobility, 2020). We measured the level of carsharing experience on a five point scale with the categories "Never", "Every few months", "Once a month", "Once a week" and "Several times a week". The experience could either be through sharing cars with families and friends or through a carsharing fleet operator like Mobility Carsharing. Fig. 2 shows the answer frequency per category.

As only very few respondents use carsharing more than once a month, and to increase the statistical power of the regression model, we combined the categories "Every few months", "Once a month", "Once a week" and "Several times a week" into "Some carsharing experience", leaving those with the category "Never" as "No carsharing experience", creating a binary variable.

3.2.2. Socio-demographics

Many scholars like Baltas and Saridakis (2013), Prieto et al. (2017), Ferguson et al. (2018) or Acheampong and Siiba (2020) show the importance of socio-economic variables in explaining mobility choices like car size and powertrain or interact strongly with carsharing adoption. These include age, gender, education, type of living area, household (HH) income, HH structure and HH size.

3.2.3. Mobility characteristics

The most influential mobility characteristics were found to be the number of cars in the household (Dias et al., 2017; Namazu et al., 2018; Nayum and Klöckner, 2014), public transport passes (Becker et al., 2017) and mode choice (Efthymiou et al., 2013). Efthymiou et al. (2013) further show that travel time to go to work was a significant predictor for carsharing adoption.

3.2.4. Attitudes and values

Many scholars state the importance of including psychological and sociological attributes in explaining mobility behavior and purchase intentions (Bamberg, 2013; Herberz et al, 2020; Klöckner and Matthies, 2004; Steg, 2005; Ünal et al., 2018; Wall et al., 2007). Also the study from Nayum and Klöckner (2014) confirm that hedonic and biospheric values are crucial in explaining intention to buy fuel efficient cars. Nayum et al. (2016) further show that attitudes towards convenience of the car like comfort differed strongly among buyers of small to medium sized cars and buyers of big and powerful cars. Hence, we included the short version of the value scale originally developed by Schwartz (Schwartz, 1992) and adjusted by de Groot & Steg (de Groot and Steg, 2008), which is based on 16 questions and includes four values: biospheric, egoistic, altruistic and hedonic. We further included questions related to whether one would already consider an EV as the next car, the importance of safety, of comfort, of privacy and of owning a private car.

3.3. Statistical analysis

We followed a 4-step procedure to ensure the validity of our results. First, we checked the data for outliers and illogical answers as well as excluded participants who used less than 5 min to finish the choice survey (with a median of 10 min, we considered less than 5 min as too rushed for a meaningful completion of the questions). As such, we removed 21 cases from the survey. Second, the survey also includes two treatment groups not related to this paper, which received information prior to taking our stated choice questions. These were thus excluded from the study to mitigate potential response bias. A final sample of 826 respondents remained. Then, we created a binary variable with the categories 'micro to mid-sized BEV' and 'Not micro to mid-sized BEV' using the variables 'car size

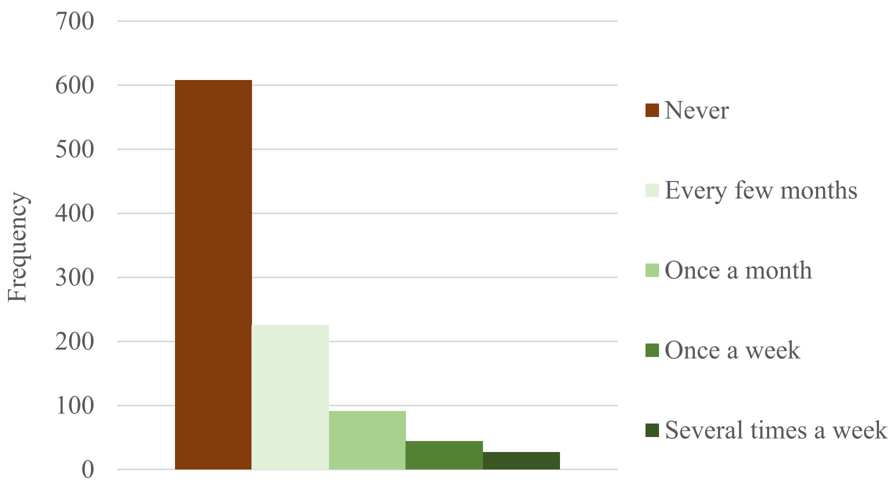

Fig. 2. Frequency of carsharing use (n = 995).

choice' and 'powertrain choice' (see Table A2), which then served as the independent variable in the binary logistic regression model. We applied an explorative stepwise backwards Ward approach to find relevant interactions of carsharing experience with the other independent variables. As such, all variables mentioned in Table A2 are included in the model together with all 2-way interactions of carsharing experience and the other independent variables. The interactions were then removed one-by-one if they exceed the p value of 0.1, remaining with the only significant interaction of carsharing experience with type of living area. Variables were further manually dropped if they did not significantly improve the model fit or explained variance. Third, all variables included in the regression analysis were checked for multicollinearity with Spearman's rho (see Table A3 in the appendix.). Last, the model fit statistic (Hosmer–Lemeshow test) was used to test for goodness of fit of the regression model.

3.4. Limitation

First, being a stated preference study, the answers of the participants might not mimic their real behavior as if they really were about to buy a new car. This is commonly referred to as the "hypothetical bias" (Beck et al., 2016) or the "attitude-action gap" (Lane and Potter, 2007). This is especially true for technologies that are new or still in a test-phase like BEVs if one considers their still relatively low diffusion rate. However, as each year new EVs are entering the market with models like Tesla, Nissan or Renault already widely known in Switzerland and Europe and the overall steadily growing interest in electric mobility (Swiss Federal Office of Energy, 2020a), we estimate this effect to remain small. Furthermore, the purpose of our study is to estimate beta coefficients instead of forecasting, where normally revealed preferences are used best (Axsen et al., 2009). Second, we did not sample according to carsharing experience in order to have a random sample. Yet this lead to only few participants which use carsharing on a weekly basis and forced us to combine the categories with carsharing experience into one "experience" category in order to have a high enough n for statistical analysis. In order to still be able to account for the various latent effects summarized in Table 1 without overfitting the regression models, we ensured to stay in the range of 5 to 9 cases per predictors as suggested by Vittinghoff and McCulloch (2007). We thus acknowledge the need to also specifically target carsharing users in future studies to complement this research. Generally with non-experimental data, unobserved latent variables that both affect the dependent variable and correlate with independent variables are a concern, as for example, reversed causality could exist. We accounted for that by implementing a random sample and including a wide selection of known and potential confounders into the model like socio-demographics, mobility characteristics, attitudes towards comfort, biospheric and hedonic values. Nevertheless, traces of such effects cannot be ruled out. Last, the six car models (two BEVs, two PHEVS, one HEV and one ICEV) from which respondents could choose is a simplification of the real-world, even though great attention was put into using up-to-date attributes for the respective car (i.e. price, driving cost, range, max. speed and CO_2 emissions).

4. Results

We first present descriptive results to the car size choice and powertrain choice question followed by the results of the regression model to estimate the likelihood to choose a micro to mid-sized BEV. The regression results are distinguished between socio-economic factors, mobility characteristics, attitudes and values.

4.1. Descriptive results

Table 2 serves as first overview of the relation between carsharing experience, car size choice and powertrain choice. Note that around the same percent of respondents with and without carsharing experience chose not to select one of the displayed car size categories (represented with the option "None"). These cases were subsequently excluded in the further analysis, which can be seen in the row of powertrain where the total n drops from previously 826 to 730. Fig. 3 shows the combination of car size and powertrain according to our research question. Clearly, respondents with carsharing experience seem more likely to prefer a micro-to mid-sized BEV in comparison to respondents without carsharing experience. Whether this difference is significant will be elaborated in the subsequent section.

Table 2
Percentage and frequencies for each category of the car size choice and powertrain choice.

Category	No carsharing experience	Some carsharing experience
Car size choice (n = 826)		
None	12% (58)	12% (38)
Micro	2% (11)	1% (4)
Small	25% (127)	34% (112)
Small-medium	24% (120)	22% (71)
Mid-sized	15% (73)	17% (54)
Large	4% (21)	3% (9)
SUV	18% (90)	12% (38)
Powertrain choice (n = 730)		
BEV	29% (130)	41% (117)
PHEV	14% (64)	20% (58)
HEV	16% (70)	14% (41)
ICEV	40% (178)	25% (72)

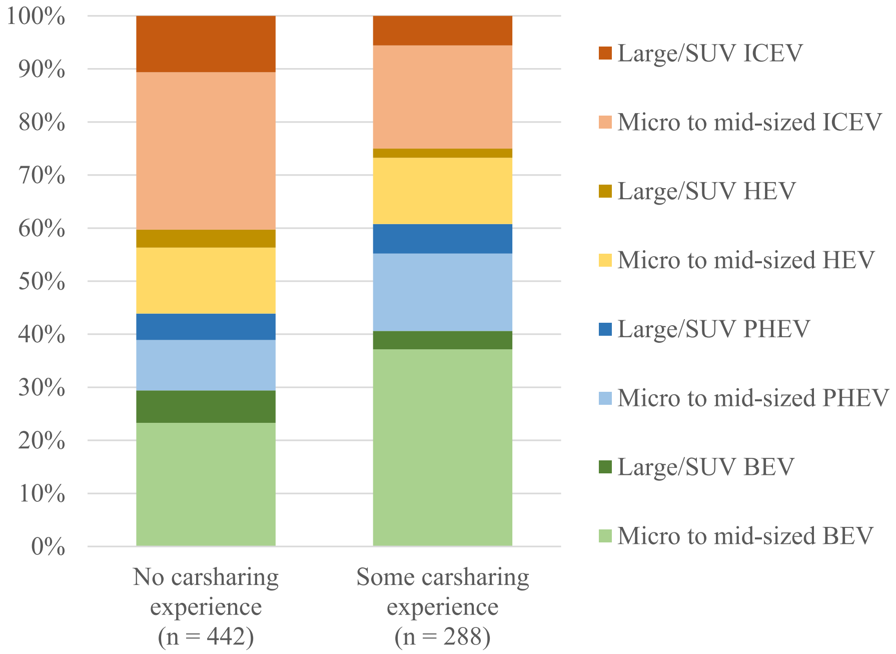

Fig. 3. Share of powertrain choice separated by car size and carsharing experience.

4.2. Powertrain choice

We compare the results of the regression to test the likelihood to choose a micro to mid-sized BEV with and without the interaction term of carsharing experience and type of living area in Table 3. The Omnibus chi-square test, log likelihood, Nagelkerke R^2 and percent of correct classification are all superior in model 2 including the interaction. The likelihood ratio test between these two model shows that, indeed, model 2 is a better fit ($\chi2$ (df = 2) = 10.23, p = 0.006).

Table 4 displays the results of the final model to test the influence of experience with carsharing (coded as 0, no carsharing experience and 1, some carsharing experience) on the likelihood to choose a micro to mid-sized BEV. Only variables significant on the $p < 0.1$ level are included in Table 4 to retain readability. Note that the reference categories specified in parentheses change for some variables in order to be able to show all significant results. The omnibus-test of model coefficients is highly significant ($\chi^2(23, N = 826) = 275.34, p < 0.0001$). Furthermore, the Hosmer-Lemeshow-test is non-significant ($\chi^2(8, N = 826) = 6.16, p = 0.63$), indicating a good model fit. The Nagelkerke R^2 of 0.49 is very high, explaining 49% of the variance in the powertrain choice question.

A positive beta coefficient (*B*) indicates a higher likelihood to choose a micro to mid-sized BEV compared to the reference category, which is indicated in parentheses. Contrary, a negative *B* indicates a lower likelihood to choose a micro to mid-sized BEV. For a better interpretation of the effect size, the odds ratio (exp(*B*)) can be used. It states how much more likely a specific level of a variable is to choose a micro to mid-sized BEV in comparison to the reference category. In case of a continuous variable, the odds ratio represents a one point increase of the variable. Odds ratios below 1 indicate a lower likelihood to choose the dependent variable. For an easier interpretation one can take the inverse of this value.

Since the dependent variable is a combination of car size and powertrain choice, similar variables found to have a significant impact on car size choice by previous literature (Table 1) show significant effects on the likelihood to choose a micro to mid-sized BEV. These include HH structure, number of cars in the HH, biospheric and hedonic values. Regarding relevant literature about the choice of powertrain, we confirm that age and type of living area seem to have a significant effect on the choice. We further find significant

Table 3
Comparison of the regression model with and without the interaction term.

	Model 1 (Without interaction)	Model 2 (Including interaction)
Omnibus test (χ^2)	265.11, $p < 0.0001$	275.34, $p < 0.0001$
−2 Log likelihood	524.72	514.49
Nagelkerke R^2	47%	49%
Percent correct classification	80.9%	82.2%
Hosmer-Lemeshow test	1.292, $p = 0.996$	6.162, $p = 0.629$
N	826	826
Degrees of freedom	21	23

Table 4
Binary logistic regression results of the powertrain choice model.

Variable	Level (reference)	B	Exp (B)	95% CI for Exp (B)	
				Lower	Upper
Socio-demographics					
Age group in years	35–54 (18–34)	−0.59**	0.55	0.31	0.97
	55+ (18–34)	−0.68**	0.51	0.27	0.96
HH structure	Couple without children (Single person HH)	0.50*	1.65	0.93	2.94
	HH with children (Couple without children)	−0.54*	0.58	0.33	1.02
Mobility characteristics					
Number of cars in HH	1 (0)	−0.63*	0.53	0.28	1.02
	2 or more (0)	−1.24***	0.29	0.12	0.68
	2 or more (1)	−0.62**	0.54	0.29	0.996
Attitudes and values					
Consider electric vehicle?	Yes (No)	2.77***	15.91	8.98	28.20
Importance of safety	Very important (Important or less)	−0.82***	0.44	0.27	0.73
Importance of privacy	Very important (Important or less)	−0.50**	0.61	0.37	0.98
Biospheric value	–	0.66***	1.93	1.31	2.84
Altruistic value	–	0.40**	1.49	1.00	2.22
Hedonic value	–	−0.38**	0.68	0.49	0.94
Interaction					
Carsharing experience * Type of living area	No carsharing exp. + City (No carsharing exp. + Countryside)	1.03**	2.81	1.22	6.45
	No carsharing exp. + City (No carsharing exp. + Agglomeration)	0.89**	2.42	1.21	4.88
	Some carsharing exp. + Agglomeration (No carsharing exp. + Agglomeration)	0.79*	2.21	0.87	5.61
	Some carsharing exp. + Countryside (No carsharing exp. + Countryside)	1.19**	3.28	1.24	8.67

B = parameter estimate, *, ** and *** significant at $p < 0.1$, $p < 0.05$ and $p < 0.01$, respectively, Exp(B) = odds ratio, CI = confidence interval

effects for whether the respondents would already consider an EV as the next car replacement, importance of safety, importance of privacy and altruistic values. We have a significant interaction in the model. The likelihood to choose a micro to mid-sized BEV not only depends on carsharing experience but also on type of living area. Fig. 4 illustrates this interaction with a line plot.

The graph shows that carsharing experience does not uniformly increase the openness to choose a micro to mid-sized BEV in contrast to the respondents without any carsharing experience. We see, however, that the openness to choose a micro to mid-sized BEV declines strongly once respondents are living in the agglomeration or countryside if they have no carsharing experience (dashed line). In Table 4 we see that persons living in the city are 2.8 times more likely to choose a BEV compared to persons living in the countryside (significant on the $p < 0.05$ level). Interestingly and supporting our alternative hypothesis that carsharing experience could lead to higher openness to choose a micro to mid-sized BEV, persons who have carsharing experience and live in the countryside are 3.3 times more likely to choose a micro to mid-sized BEV compared to persons without any carsharing experience also living in the countryside (significant on the $p < 0.05$ level). Table 4 further shows that a similar effect could be found for persons living in agglomerations although slightly weaker (odds ratio of 2.2 and significant on the $p < 0.1$ level).

For a clear overview of the effect size of each variable significantly ($p < 0.1$) influencing the likelihood to choose a micro to mid-sized BEV, we visualized the odds ratios including the 95% confidence interval in Fig. 5. The dashed line corresponds to an odds ratio of 1. Confidence intervals who surpass this line are therefore not significant on the $p < 0.05$ level but still on the $p < 0.1$ level. Similar to Table 4, variables who have a p value above 0.1 are not included. Note that the × axis is in a logarithmic scale.

5. Discussion

The results confirm our alternative hypothesis that people with carsharing experience are more likely to choose a micro to mid-sized BEV, which, however, depends on the type of living area. We put special emphasis on including and controlling for the effect of biospheric and altruistic values in the model as especially people who rank high on these variables show greater interest in environmentally friendly mobility solutions potentially distorting the association between carsharing and preference for BEVs or smaller cars (e.g. Herberz et al., 2020; Nayum and Klöckner, 2014). We thus argue that people with carsharing experience might exhibit characteristic that go beyond the variables included in our study and influence their car size and powertrain choice.

Similar to Schlüter and Weyer (2019) who report that carsharing users have a mindset that is in line with the characteristics of BEV, such as accepting smaller range compared to ICEV, our study seems to confirm that people living in rural regions or in the agglomeration might develop such mindsets with carsharing experience. Persons living within the city are already more open towards buying a micro to mid-sized BEV, yet carsharing experience does not significantly increase this openness in contrast to people living in the countryside or agglomeration. The reasons for this interaction effect can be manifold. One possible explanation could be that for people living within the city, everyday trips are well covered by today's available BEV, reducing the need to rent a car from a carsharing operator or family and friends for a specific trip exceeding the range limit of current BEVs. Melliger et al. (2018) and Zhou et al. (2020) already show that the majority of everyday trips can be covered by low-range BEVs in Switzerland, Finland and Bejing. On the contrary, everyday trips in the countryside are usually longer increasing potential range anxiety (Jones et al., 2020), which could be

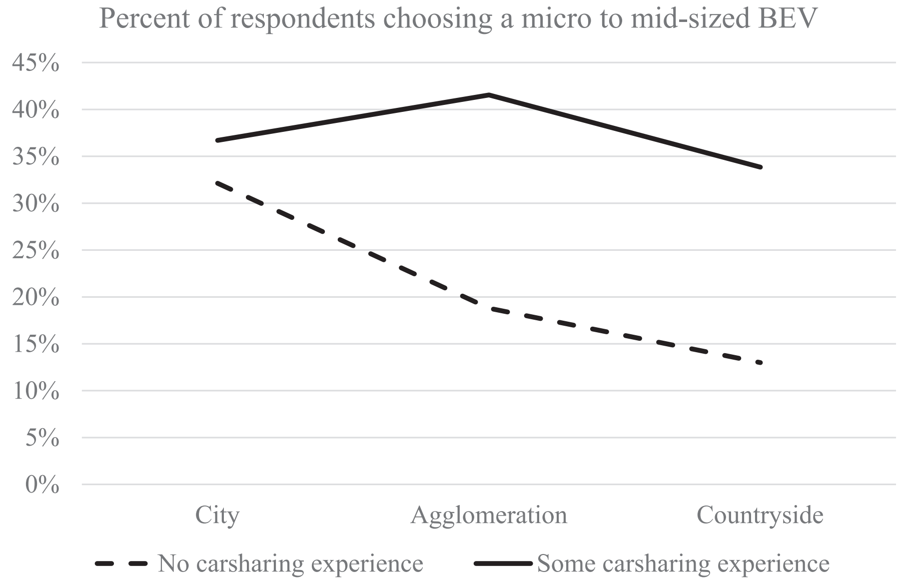

Fig. 4. Interaction between carsharing experience and type of living area, line plot.

reduced through the possibility of carsharing at hand.

One of the core drivers to take the decision to buy a car is a change in the family structure like the birth of first child (Gu et al., 2019). Motivating these people to forego buying a car is challenging. However, our study indicates that experience with carsharing might reduce the likelihood to buy a large/SUV car. Establishing a station-based carsharing service including a variety of different models to choose from targeting these groups could provide them the security that their needs, which go beyond the capability of their small every-day car, are covered by this service. Further, as carsharing services generally attract younger people who might not yet have kids, the positive experience of sharing cars, the flexibility of different car models to choose from and the possible first contact with a BEV might spill over to the next life stage of having kids. This is in line with the findings from Burghard and Dütschke (2019) who state that changing circumstances, such as moving or starting a family, can turn carsharing users into electric vehicle buyers. We therefore argue to specifically target the younger generation and families with kids to decrease shifts from no car ownership or ownership of a small to mid-sized car to a large/SUV car. Especially in cities where space is a limiting factor, the adoption of smaller cars could relieve space needed for parking and provide additional opportunities for recreational areas or room for bicycles and pedestrians.

Within our study, the percentage of HHs owning at least once car is significantly higher in agglomerations (86%) or the countryside (91%) compared to HHs living in the city (62%) and thus represent a higher potential for electrification. Especially considering that cities generally provide good alternatives to the private car, policies in cities should focus on the shift from car use to public transport instead of private car electrification. Our findings are promising in this regard, as people from the countryside and agglomeration might be significantly more open to buy a micro to mid-sized BEV if they experienced the benefits of carsharing. The typically better access to a parking lot close to the residence and more space for the installment of a BEV charging station, facilitates the adoption of BEV in the countryside. However, Jones et al. (2020) point to the difficulties of adopting EVs in rural areas since public charging infrastructure is generally lacking compared to urban areas. Further, enabling people living in rural areas to experience carsharing is challenging. Rotaris and Danielis (2018) note that especially in rural areas carsharing demand is lower compared to densely populated areas like cities, demanding different business models that are more socially oriented and with greater involvement of local municipalities. Still, they find a non-negligible demand for carsharing among persons holding a driving license living in rural areas. In this regard, Münzel et al. (2018) suggest that especially the traditional round-trip carsharing and peer-to-peer carsharing business models could be successful in the long-term.

Another opportunity presents the integration of carsharing into a Mobility as a Service (MaaS) subscription plan facilitating the access to and possible first contact with carsharing. Further, Nayum and Klöckner (2014) find that car purchasers with a lower brand loyality are more likely to choose an EV, which could be fostered by the experience of using carsharing, as typically carsharing companies use different car brands, and the experience of a multimodal lifestyle supported by MaaS (Silvestri et al., 2020). Hoerler et al. (2020) further find that carsharing experience could increase the openness to use MaaS amplifying the range of possible contributions from carsharing to sustainable mobility.

In sum, we see two main opportunities by which a carsharing service could increase the openness of the general public to engage in sustainable mobility decisions. First by being present in urban areas with a divers set of car models to choose from in order to complement the needs of car-free HHs. A divers set of car types to choose from could be marketed especially to the younger generation, single person HHs and couples in the early stage of family planning in order to leverage the potential to forego buying a large car as the primary car, and instead, opt for a smaller car. Second by providing a fleet of long-range cars to complement current range shortages of

Fig. 5. Odds ratios and 95% confidence interval of the powertrain choice model.

BEV increasing the likelihood of people living in rural areas and agglomerations to buy a micro to mid-sized BEV.

In addition, another opportunity presents the provision of e-carsharing fleets enabling access to the BEV's new technology and reducing common misconceptions about range limitation (Schlüter and Weyer, 2019; Shaheen et al., 2020). According to our findings, e-carsharing should be provided in the perimeter of cities underlining the recommendations form Luna et al. (2020), while carsharing including long-range cars should be established in the countryside to use both potentials for increasing the uptake of BEVs. Further, especially as long as BEVs in carsharing fleet are less profitable than conventional cars (Rid et al., 2018b), providing a mixed fleet in the agglomeration could help cross-subsidizing the non-profitable electric cars in the e-carsharing fleet.

6. Conclusion and recommendations

Through a stated preferences survey with 995 participants from the German- and French-speaking regions of Switzerland we investigated whether carsharing experience could lead to an increased preference for micro to mid-sized BEVs. We find support for our hypothesis in the data and propose policy makers and mobility planners to not only see carsharing as a mean to reduce car ownership and car travel, but also consider the potential to increase the uptake of micro to mid-sized BEVs in agglomerations and rural regions. In light of these results, we advise mobility planners and policy makers to consider on the following 4 recommendations: 1) reduce the likelihood to purchase a large/SUV car for people experiencing life-changing events such as starting a family and people living in single person HHs, by advertising the benefits of smaller cars in combination of carsharing at hand, including a wide spectrum of car models to choose from; 2) focus on the advertisement of private micro to mid-sized BEV in the countryside and agglomerations in combination of conventional long-range cars in carsharing to complement the current range disadvantages of micro to mid-sized BEVs and profit from the higher openness to buy a micro to mid-sized BEV with carsharing experience; 3) establish e-carsharing in the perimeter of the inner city to exploit the visual effect of BEVs in the fleet and facilitate first experiences with the technology together with reduced local pollution and 4) focus on a mixed fleet of BEVs and long-range cars (i.e. conventional cars and PHEVs) in the perimeter of agglomerations to leverage the possibility of cross subsidizing the non-profitable BEVs and the higher openness to buy a BEV.

These policy suggestions should be evaluated together with the expected growth rate of BEVs. Since financial resources are limited, policies solely targeted to increase the uptake of BEVs might have a greater impact compared to splitting the resources to also foster carsharing in order to increase the uptake of BEVs through this mechanism. With the current growth rate of BEVs, the potential contribution to a fastened uptake of BEVs through experience with carsharing might be less relevant in the medium-term. Between 2018 and 2019 the market share of BEVs on new car sales in Switzerland has risen from 1.7% to 4.2%, indicating a growth rate of roughly 150% (Swiss Federal Office of Energy, 2020a). While this high growth rate was attributed to a strong increase of different BEV models available in 2019, the most up-to-date scenario analysis of EV diffusion in Switzerland still expects a combined market share of BEVs and PHEVs on new car sales of roughly 50% by 2030, considering an optimistic scenario (EBP, 2020). With this growth rate and scenario analysis in mind, we propose to consider the potential effect of increased openness to buy a micro to mid-sized BEV by fostering carsharing with conventional cars in the short-term and the general effect of carsharing experience in reducing the likelihood to choose a large/SUV car in the long-term since no trend for an increased adoption of small cars is currently visible in Switzerland and other countries, even inclining to the opposite (Statista, 2020; US EPA, 2020). In the future, the higher openness to buy a micro to mid-sized BEV due to carsharing experience could be supported by fully electrified carsharing fleets, with similar driving range, size and utilities as combustion engine cars today. Last, policy measures fostering the sharing of cars as one element of a multi-modal, public transport-centered transport system and a sharing economy in general are indispensable for a sustainable mobility system addressing the limited space and growing congestion induced by the growing population within the status quo of owning private vehicles.

The results and recommendations need to be viewed in relation to the characteristics of Switzerland with its dense public transport network, widespread possibilities of station-based carsharing and mountainous topography. The potential of carsharing as a complement to a small BEV might be different in other countries with a more dispersed road network and typically longer trips like in the United States and Germany. Still, as Needell et al. (2016) show, most car trips could already be covered by a low-range BEV even in the United States.

Future research might test our findings with a longitudinal study including car size and powertrain characteristics before and after subscribing to a carsharing service and thus add revealed preferences to the literature. Further importance should be given to new mobility lifestyles consisting of a combination of carsharing and/or public transport and small private BEVs, to analyze whether people would adopt such lifestyles and how these could be fostered.

CRediT authorship contribution statement

Raphael Hoerler: Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing. **Jeremy Dijk:** Methodology, Writing - review & editing. **Anthony Patt:** Writing - review & editing. **Andrea Del Duce:** Supervision, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

We would like to acknowledge the access to the SHEDS database provided by the University of Neuchatel. Special thanks go to Sylvain Weber for his help in crafting the survey and constructive feedback. This research was supported by the Swiss Competence Center for Energy Research (SCCER) Efficient Technologies and Systems for Mobility, funded by Innosuisse.

Appendix A

Table A1 compares the study sample with the overall SHEDS 2018 sample and the Swiss population. SHEDS is representative of the Swiss population for age, gender, region (French-speaking and German-speaking) and tenancy status (tenants and owners).

Table A1
Comparison of the study sample, SHEDS 2018 and the Swiss population.

Variable	Level	Study (n = 995)	SHEDS 2018 (n = 5′514)	Difference Study/SHEDS	Swiss population
Age[1]	Average	48.65	44.25	$t(994) = 9.20$, $p = < 0.001$	*42.4*
Gender[2]	Male	51.5%	47.3%	χ^2 (1, N = 995) = 6.90, $p = 0.009$	49.6%
	Female	48.5%	52.7%		50.4%
Education[3]	Apprenticeship	32.7%	33.3%	χ^2 (2, N = 890) = 0.19, $p = 0.91$	41.1%
	High school	13.5%	13.6%		9.4%
	Higher education	53.8%	53.1%		49.5%
Gross Household income[4]	Less than 3′000 CHF	4.1%	6.0%	χ^2 (5, N = 845) = 7.60, $p = 0.18$	10′033 CHF (average)
	3′000–4′500 CHF	10.3%	10.0%		
	4′501–6′000 CHF	18.9%	17.9%		
	6′001–9′000 CHF	30.1%	28.9%		
	9′001–12′000 CHF	21.9%	20.9%		
	More than 12′000 CHF	14.7%	16.3%		

1 Swiss Federal Statistical Office (2020b).
2 Swiss Federal Statistical Office (2018b).
3 Swiss Federal Statistical Office (2019).
4 Swiss Federal Statistical Office (2018a).

Table A2
Sample characteristics (n = 826).

Variable	Level	Frequency	Percentage	Mean (Standard Deviation)
Socio-demographics				
Age	18–34	202	24.5	–
	35–54	324	39.2	–
	55+	300	36.3	–
Gender	Male	414	50.1	–
	Female	412	49.9	–
Education	Less than university degree	420	50.9	–
	University degree	389	48.1	–
Type of living area	City	415	50.2	–
	Agglomeration	232	28.1	–
	Countryside	179	21.7	–
Gross HH income	Until 5′999 CHF	219	27.0	–
	6′000–8′999 CHF	216	26.6	–
	9′000–12′000 CHF	146	18.0	–
	More than 12′000 CHF	114	14.1	–
	Prefers not to say	116	14.3	–
HH structure	Single person HH	243	29.4	–
	Couple without children	280	33.9	–
	HH with children	266	32.2	–
	Non-family shared HH	37	4.5	–
HH size	Mean	826	–	2.22 (1.16)
Mobility characteristics				
Carsharing experience	No carsharing experience	500	60.5	–
	Some carsharing experience	326	39.5	–
Public transport passes	GA 1st class	35	4.2	–
	GA 2nd class	159	19.2	–
	Regional pass	167	20.2	–
	None	465	56.3	–
Number of cars in HH	0	205	24.8	–
	1	409	49.5	–
	2 or more	212	25.7	–
Dominant mode choice: commuting	Own car	310	39.7	–
	Public transport	365	46.7	–
	Bike or foot	106	13.6	–
Dominant mode choice: weekday leisure	Own car	351	43.9	–
	Public transport	216	27.0	–
	Bike or foot	233	29.1	–
Dominant mode choice: weekend trip	Own car	428	57.8	–

(*continued on next page*)

Table A2 (*continued*)

Variable	Level	Frequency	Percentage	Mean (Standard Deviation)
	Public transport	243	32.8	–
	Bike or foot	69	9.3	–
Car size choice	None	96	11.6	–
	Micro	15	1.8	–
	Small	239	28.9	–
	Small-medium	191	23.1	–
	Mid-sized	127	15.4	–
	Large	30	3.6	–
	SUV	128	15.5	–
Powertrain choice	BEV	247	33.8	–
	PHEV	122	16.7	–
	HEV	111	15.2	–
	ICEV	250	34.2	–
Time home-(commuting, weekday leisure, weekend trip)	Commuting	826	–	24.20 (25.34)
	Weekday leisure	826	–	17.15 (18.83)
	Weekend trip	826	–	49.82 (56.79)
Attitudes and values				
Consider electric vehicle?	No	399	48.3	–
	Yes	427	51.7	–
Importance of safety	Not at all important (1)	0	0	4.26 (0.73)
	Not important (2)	18	2.2	
	Indifferent (3)	88	10.7	
	Important (4)	382	46.3	
	Very Important (5)	337	40.8	
Importance of safety binary	Important or less	488	59.2	–
	Very important	337	40.8	–
Importance of being comfortable	Not at all important (1)	6	0.7	3.78 (0.82)
	Not important (2)	41	5.0	
	Indifferent (3)	228	27.6	
	Important (4)	402	48.7	
	Very Important (5)	149	18.0	
Importance of being comfortable binary	Indifferent or less	275	33.3	–
	Important and very important	551	66.7	–
Importance of privacy	Not at all important (1)	0	0	4.36 (0.70)
	Not important (2)	10	1.2	
	Indifferent (3)	75	9.1	
	Important (4)	351	42.5	
	Very Important (5)	390	47.2	
Importance of privacy binary	Important or less	436	52.8	–
	Very important	390	47.2	–
Importance of owning a car	Not at all important (1)	224	27.1	3.06 (1.52)
	Not important (2)	74	9.0	
	Indifferent (3)	135	16.3	
	Important (4)	212	25.7	
	Very Important (5)	181	21.9	
Importance of owning a car binary	Indifferent or less	433	52.4	–
	Important and very important	393	47.6	–
Values (Likert scale from 1 (lowest) to 5 (highest))	Biospheric	826	–	4.06 (0.74)
	Egoistic	826	–	2.65 (0.72)
	Altruistic	826	–	3.98 (0.69)
	Hedonic	826	–	3.76 (0.76)

GA = General Abonnement, a public transport pass with unlimited travel in Switzerland of most railways and other public transport.

Table A3
Spearman correlation matrix for all variables included in the final binary logistic regression model.

Spearman's rho	Age	Education	Type of living area	HH structure	Carsharing experience	Number of cars in HH	Mode choice: commuting	Mode choice: weekday leisure	Consider electric vehicle?	Importance of safety	Importance of privacy	Values: Biospheric	Values: Altruistic	Values: Hedonic	Carsharing experience * Type of living area
Age	–														
Education	-,186**	–													
Type of living area	0.014	-,117**	–												
HH structure	-,093**	0.029	,078*	–											
Carsharing experience	-,178**	,115**	-,087*	0.019	–										
Number of cars in HH	0.065	-,075*	,329**	,218**	-,211**	–									
Mode choice: commuting	-,096**	,151**	-,285**	0.012	,156**	-,509**	–								
Mode choice: weekday leisure	−0.031	0.056	-,206**	0.000	,114**	-,393**	,473**	–							
Consider electric vehicle?	-,085*	,241**	-,091**	0.036	,126**	-,091**	,152**	,126**	–						
Importance of safety	0.040	-,101**	0.002	−0.062	-,095**	0.062	-,153**	-,156**	-,086*	–					
Importance of privacy	−0.033	0.022	−0.017	-,086*	−0.014	−0.032	−0.064	-,082*	0.036	,364**	–				
Values: Biospheric	,166**	−0.038	−0.040	−0.052	−0.008	-,155**	,158**	,095**	,137**	,126**	,142**	–			
Values: Altruistic	,124**	−0.019	−0.053	−0.047	,089*	-,097**	0.061	0.002	,107**	,177**	,150**	,519**	–		
Values: Hedonic	-,215**	0.015	−0.012	−0.034	0.020	,096**	-,105**	-,090*	−0.023	,219**	,248**	,110**	,120**	–	
Carsharing experience * Type of living area	-,162**	,088*	,077*	,034	,968**	-,151**	,104**	,075*	,111**	-,107**	-,019	-,002	,085*	,017	–

* And ** significant at $p < 0.05$ and $p < 0.01$ (2-tailed), respectively.

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