Are carsharing users more likely to buy a battery electric, plug-in hybrid electric or hybrid electric vehicle? Powertrain choice and shared mobility in Switzerland*

Raphael Hoerler, Uros Tomic, Jeremy Van Dijk, Anthony Patt and Andrea Del Duce

Abstract—**The mobility system is undergoing a paradigm shift from fossil fuel-based mobility towards carbon neutrality and greater energy efficiency. Yet this transformation is still in its infancy. In order to reach the CO_2 target defined by the Paris Agreement, an increased use of sharing and electric vehicles is suggested. While many scholars have already investigated the factors relevant for promoting the use of sharing or electric vehicles, less is known about the interplay between experience with carsharing and future car buying decisions. We thus adopted a stated choice survey with 995 participants randomly drawn from the German and French-speaking population of Switzerland to test the drivetrain purchase preferences of users with and without carsharing experience. Results suggest that carsharing users are two times more likely to buy an electric-drive vehicle, i.e. battery electric, plug-in hybrid or hybrid electric vehicle, compared to non-carsharing users, even after controlling for socio-demographics, mobility characteristics, values and pro-environmental attitudes.**

I. INTRODUCTION

With the current and anticipated negative external impacts of private motorized transport including increased congestion and higher costs related to CO_2 emissions, health problems and noise, carsharing is actively supported by many stakeholders as scholars find a potential for increased sustainability [1], [2]. Chen and Kockelman [3], for example, estimate a total greenhouse gas reduction of over 50 percent by shifting from private car use to station-based carsharing, taking into account the combined effects of reduced vehicle ownership, reduced vehicle-distance traveled, fleet-level fuel efficiency improvements, reduced parking infrastructure demand, and trips shifted to no-car modes. Especially the combination of carsharing and ride pooling is seen as a way to reduce vehicle miles travelled (VMT) and the aforementioned negative externalities, both through a reduction in car ownership and car travel [1], [4], [5]. Adding to that, today's private cars are over-dimensioned for most of their trip purposes, calling for a reduction in size and power, especially within cities where space is scarce. The common agreement among scholars is that cars should be electric-drive vehicles, especially battery electric (BEV) and plug-in hybrid electric vehicles (PHEV) with batteries charged with renewable electricity, to maximize the reduction of CO_2 emissions [6]. Yet the uptake of battery electric vehicles (BEV), plug-in hybrid vehicles (PHEV) or hybrid electric vehicles (HEV), which, for simplicity, we will refer to as electric vehicles (EV) in the this paper, remains small in Switzerland (less than 15% of total new car registrations) and other regions around the globe [7], [8]. A faster switch to low-carbon technologies is needed to achieve the targets of the Paris Agreement. Reasons for this resistance include range anxieties, lacking charging infrastructure or long charging times for BEV but also higher purchase costs and a general aversion to change to EVs in general [10], [11]. Even though EVs are able to fulfill the large majority of the daily mobility needs, internal combustion engine vehicles (ICEV) are typically preferred at the purchase level in order to have a vehicle, which will guarantee maximum flexibility in all situations, for example, in long trips, where a re-charging of BEVs would be necessary. Also compared to PHEVs and HEVs, which can reach longer distances than BEVs, ICEVs are preferred due to their known properties and less complex technology. Overcoming anxieties and hurdles with this technology is thus key to increasing the uptake. Some scholars suggest that electric carsharing (e-carsharing) may not only reduce VMT, but also increase the acceptance and diffusion of EVs by their physical presence [12] and low hurdles to trying out the new technology [13], [14]. However, the potential benefits of conventional carsharing, i.e. using combustion engine cars, for EV diffusion has not been discussed. Conventional carsharing could allow the use of long-range cars when private and smaller, city-oriented BEVs are insufficient, such as for weekend or holiday trips or trips with large luggage. On the other hand, experience with carsharing might also increase the openness to try-out new technologies like BEVs, PHEVS and HEVs. Having experience with carsharing might therefore overcome the common hurdles associated with owning an EV and lead to an increased preference for buying an electrified car.

While much literature exists on the potential reduction in VMT and car ownership through carsharing, little research elucidates the further benefits of carsharing experience on car

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R. Hoerler is with the Zurich University of Applied Sciences, 8400 Winterthur, Switzerland, Raphael.hoerler@zhaw.ch

U. Tomic is with the Zurich University of Applied Sciences, 8400 Winterthur, Switzerland, uros.tomic@zhaw.ch

J. Van Dijk is with the University of Neuchatel, 2000 Neuchatel, Switzerland, jeremy.vandijk@unine.ch

A. Patt is with the Swiss Federal Institute of Technology, 8092 Zurich, Switzerland, anthony.patt@usys.ethz.ch

A. Del Duce is with the Zurich University of Applied Sciences, 8400 Winterthur, Switzerland, andrea.delduce@zhaw.ch

purchasing decisions. We therefore pose the following research question:

- Are carsharing users more likely to buy an EV from a set of alternatives than non-carsharing users?

In order to answer this question, we conducted a sequential stated choice survey, including questions on car size and powertrain choice. We further applied a top-down segmentation, using carsharing experience and importance of having a private car, in order to better define the characteristics of car sharers and non-car sharers. 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 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.

II. State of the Art

Although, to the best of the authors' knowledge, no literature about a stated choice survey estimating the preference of carsharing users to buy EVs instead of ICEVs could be found, a few studies investigated the interaction of carsharing experience with EVs. Clewlow [15], 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 than non-members (18.3% in comparison to 10.2%, including hybrid, plug-in hybrid and battery electric vehicles). Whether this is an effect of subscribing to the carsharing service is unclear, however. Schlüter and Weyer [13] adopted the technology acceptance model (TAM) to investigate the perceived usefulness and perceived ease of use of EVs among the users of a carsharing service in Germany. They find that carsharing experience leads to a significantly higher perceived usefulness of EVs, because people using carsharing services have a mobility mindset that is in line with EV characteristics, yet the effect size is small. Carsharing experience was not found to influence perceived ease of use of EVs. Weyer and Schlüter 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 (although only significant on the p = 0.1 level). Similarly, Burghard and Dütchke [16] report that those interested in carsharing are also more likely to own, have an intention to own and be interested in a BEV. They further suggest that carsharing users exhibit characteristics that are conducive to the acceptance of BEVs, such as less concern about dealing with limited range compared to ICEVs.

While these studies already indicate a link of carsharing and EV adoption and provide useful information regarding our research question, the conclusions are based on a simple analysis of variance and regression model, without controlling for further factors such as mobility characteristics and attitudes. To strengthen the literature and close the gap mentioned above, we estimated the influence of experience with carsharing on choosing a BEV, PHEV or HEV instead of a ICEV as their next car or car replacement using a binary logistic regression model, controlling for socio-demographics, mobility characteristics, values and pro-environmental attitudes. The corresponding null-hypothesis is thus the following:

H0: Carsharing users do not differ in future powertrain choice decisions to non-carsharing users.

III. Methodology

In order to test this hypothesis, we designed a sequential stated choice survey and embedded this within the Swiss Household Energy Demand Survey (SHEDS) conducted in 2018 (for more details on SHEDS see [17]). In total 5514 household (HH) individuals took part in the 2018 survey wave, and 995 of the respondents were assigned to take our experiment after completing the primary SHEDS questionnaire. This assignment was semi-random, ensuring a sufficiently representative sample. The experimental setup comprised four treatments and a control group. The first and second treatment contained information about policy strategies either planned or decided, while treatment three and four contained information about a rating of mobility services. The latter two treatments were shown after the choice experiment while treatments one and two were shown at the start of the choice experiment. The treatments are not part of this study (for details refer to [18]).

A. *Questionnaire*

Respondents of the survey were asked how often they rely on carsharing either through companies (mostly station-based in Switzerland) or family and friends. The possible response categories were "Never", "Every few months", "Once a month", "Once a week" and "Several times a week". Fig. 1 shows the answer frequency per category.

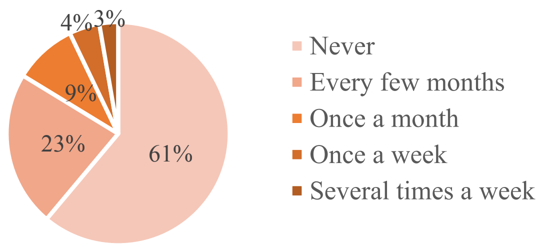

Figure 1. Frequency of carsharing use (n = 995).

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 "Carsharing users", leaving those with the category "Never" as "Non-carsharing users", and creating a binary variable.

To be able to characterize the carsharing users and non-users, we included the common socio-economic variables such as age, gender, education, income, place of residence, HH size and HH structure (single, family without children, and family with children). We further included mobility-related questions about the number of cars in the HH, public transport passes, frequency of train usage, dominant mode choice for commuting, weekday leisure and weekend trips and average time used for these trips. It is crucial to include these mobility-related questions as car sharers display strong differences in mobility characteristics compared to non-users. As such, mobility-related variables are potential confounding variables. Many scholars state the importance of including psychological and sociological attributes in explaining mobility behavior [19]–[21]. Hence, we included the short version of the value scale originally developed by Schwartz [22] and adjusted by de Groot & Steg [23], which is based on 16 questions and includes four values: biospheric, egoistic, altruistic and hedonic. We further included questions related to the importance of owning a private car, of safety, and of comfort, plans on reducing car carbon footprint, plans on reducing car usage, and pro-environmental attitudes derived from a set of 12 questions.

Comparing our study sample with the Swiss population reveals a slightly higher average age (48,7 years / 42.5 years), a larger number of males (51.5% / 49.6%) and a higher share of well-educated persons (53.8% / 49.5%). Place of residence and HH income do not differ significantly from the Swiss population.

B. Segmentation and stated choice survey

The openness to adopt carsharing is correlated with ownership or importance of one's own car, where those having a high sense of ownership are less inclined to use carsharing [24]–[27]. Still some carsharing adopters may use carsharing also for status purposes [28]. For a deeper understanding of the differences between carsharing users/non-users who show high/low importance of owning car, we used a top-down segmentation to create four groups. These are: 1) carsharing users with low importance of own car (CS-L), 2) carsharing users with high importance of own car (CS-H), 3) non-carsharing users with low importance of own car (NO-CS-L) and 4) non-carsharing users with high importance of own car (NO-CS-H). We analyzed the various socio-economic, mobility-related and attitudinal questions according to this segmentation. For the actual stated choice survey questions, we separated the effect for carsharing users and own car importance to see the real effect of both.

The stated choice survey was designed in a sequential structure to mimic the natural decision-making process. The choice tasks were given a relative design, with attribute levels of the final task depending on the respondent's previous choices. This also leads to an unbalanced design, as the number of times an attribute level was offered was not pre-determined. The choice tasks were tailored in this way in order to offer each respondent a realistic and relatable choice situation. This allowed us to obtain accurate and reliable responses.

The stated choice survey proceeded as follows. We first clarified the respondent's actual situation, asking about their 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. We primed the respondents and framed the imminent car purchase decision, limiting it to currently available technologies and prices. The respondents were asked to imagine that they would have 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'. These categories are based on the standards given by the Touring Club Switzerland (TCS) [29]. We also gave the option of 'none' for respondents who preferred to not buy a car at all. Those who chose none stopped here and proceeded no further in our choice survey.

Those who chose a car size above proceeded on to the second choice task, which asked the respondents to choose a specific car from six options defined by five attributes. Two options were 'electric' (i.e. BEV), two plug-in hybrid vehicle (PHEV), one hybrid (HEV), and one internal combustion engine vehicle (ICEV). The attributes were 'price', 'driving cost per 100km', 'battery range', 'max. speed', and 'CO_2 emissions (g/km)'. Upon hovering the mouse over each option or attribute title, a brief explanation popped up. The attribute levels related to the choice of car size and within each car size, every respondent received the same attribute levels. Levels were calculated using data from the TCS on all cars currently available in Switzerland [29]. For each of the two BEV and PHEV choices, respondents had the possibility of choosing between a cheaper and more expensive option. We used an approximate 33 and 66 percentile value of each attribute, relating the other attributes positively or negatively to the price. For the hybrid and ICEV options, we gave approximate mean values.

C. 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 minutes to finish the choice survey (with a median of 10 minutes, we considered less than 5 minutes as too rushed for a meaningful completion of the questions). As such, we removed 21 cases from the survey. Second, the treatment groups one and two (refer to [18]), who received different information prior to the choice experiment were excluded from the study to mitigate potential response bias. A final sample of 826 respondents remained. Third, all variables included in the regression analysis were checked for multicollinearity. Last, the model fit statistic (Hosmer–Lemeshow test) was used to test for goodness of fit of the regression model.

IV. RESULTS

We first describe the four segments according to socio-demographics, mobility characteristics, attitudes and values using crosstabs and comparisons of means. TABLE 1 yields an overview of distributions and means.

As expected, the segments differ most strongly for mobility characteristics yet also socio-demographic differences are apparent. The CS-L group is dominantly young, female, highly educated and lives within the city. Almost 60% of the HHs within this group do not own a car. Contrary, the NO-CS-H group is mostly aged between 35-54 years, better balanced in gender, has a lower level of education and lives in agglomerations. Only 1% of the NO-CS-H group does not own a car. Generally, the mobility characteristics are mirrored by the importance of having an own car. As such, the CS-H and NO-CS-H segments dominantly use the private car for travelling, own less public transport passes and would replace their current car with an SUV in more than 20% of the cases.

TABLE I. CHARACTERISTICS OF SEGMENTS (N = 826)

Variable	Level	Segment			
		CS-L (26%)	**CS-H (14%)**	**NO-CS-L (27%)**	**NO-CS-H (34%)**
Socio-demographics					
Age	18-34	35%	27%	18%	20%
	35-54	42%	36%	35%	41%
	55+	22%	37%	47%	38%
Gender	Male	45%	54%	51%	52%
	Female	55%	46%	49%	48%
Education	Apprenticeship	21%	37%	45%	42%
	High school	18%	18%	15%	12%
	Higher education	61%	45%	40%	46%
Place of residence	City	66%	42%	56%	38%
	Agglomeration	19%	25%	27%	37%
	Countryside	15%	33%	17%	25%
Gross HH income	Less than 3,000 CHF	8%	2%	5%	1%
	3,000–4,500 CHF	13%	9%	11%	9%
	4,501–6,000 CHF	17%	13%	24%	18%
	6,001–9,000 CHF	33%	32%	28%	31%
	9,001–12,000 CHF	18%	29%	19%	24%
	More than 12,000 CHF	11%	15%	13%	17%
HH structure	Single person	32%	27%	26%	31%
	Couple without children	29%	33%	39%	34%
	Couple with children	32%	36%	30%	32%
	Non-family shared HH	7%	4%	5%	3%
HH size	Mean	2.18	2.32	2.14	2.27
Mobility characteristics					
Public transport passes	GA 1st class	4%	6%	5%	3%
	GA 2nd class	28%	8%	29%	9%
	Regional pass	31%	12%	26%	11%
	None	37%	74%	39%	77%
Train usage	Non user	0%	4%	1%	8%
	Low user	22%	55%	27%	54%
	Heavy user	34%	19%	43%	25%
	Heavy user commuter	8%	4%	6%	5%
	Top user	34%	18%	23%	8%
Number of cars in HH	0	59%	3%	33%	1%
	1	33%	51%	57%	56%
	2	8%	39%	9%	37%
	3 or more	0%	7%	1%	6%
Dominant mode choice: commuting	Own car	10%	66%	20%	68%
	Public transport	69%	29%	64%	23%
	Bike or foot	21%	5%	17%	9%
Dominant mode choice: weekday leisure	Own car	16%	72%	24%	69%
	Public transport	42%	13%	44%	8%
	Bike or foot	42%	15%	31%	24%
Dominant mode choice: weekend trip	Own car	29%	84%	36%	85%
	Public transport	64%	8%	48%	9%
	Bike or foot	7%	8%	17%	6%
Consider electric vehicle?	No	31%	58%	50%	56%
	Yes	69%	42%	50%	44%
Choice car size	None	17%	2%	21%	4%
	Micro	1%	1%	3%	1%
	Small	40%	24%	27%	24%
	Small-medium	22%	22%	24%	24%
	Mid-sized	13%	23%	11%	18%
	Large	2%	4%	3%	5%
	SUV	4%	25%	11%	23%
Time home-(work, weekday leisure, weekend trip)	Commuting	30.81	26.8	22.84	19.18
	Weekday leisure	17.97	15.66	18.65	15.94
	Weekend trip	62.48	39.95	49.2	44.73
Average number of persons in car	Commuting	1.17	1.23	1.16	1.16
	Weekday leisure	1.68	1.90	1.70	1.80
	Weekend trip	1.92	2.11	1.91	2.08
Values and attitudes					
Plans on reducing car usage (only if HH owns at least one car)	Likert scale 1, lowest to 5, highest	2.85	2.66	2.85	2.38
Plans on reducing carbon footprint	Likert scale 1, lowest to 5, highest	2.95	2.98	2.86	2.59
Importance of safety	Likert scale 1, lowest to 5, highest	4.11	4.22	4.19	4.44
Importance of being comfortable	Likert scale 1, lowest to 5, highest	3.75	4.03	3.53	3.91
Values (Likert scale 1, lowest to 5, highest)	Biospheric	4.11	3.99	4.21	3.93
	Egoistic	2.55	2.79	2.53	2.76
	Altruistic	4.07	4.05	4.02	3.86
	Hedonic	3.69	3.93	3.64	3.84
Pro-environmental attitudes	Likert scale 1, lowest to 5, highest	3.83	3.60	3.79	3.56

The segments with low importance of having a private car mostly use public transport for travelling, even though the NO-CS-L group has significantly more HHs owning at least one car compared to the CS-L group (67% vs. 42%). Also, the CS-L group does seem to be much more open towards EVs than the NO-CS-L group (69% yes answers compared to 50%). Regarding socio-psychological factors, the CS-L and NO-CS-L groups have higher plans on reducing car usage (each with a mean of 2.85), while the CS-H group is less inclined to reduce car usage (mean of 2.66) and the NO-CS-H shows the lowest mean (2.38). The NO-CS-H group also values the importance of safety much more than the other groups, is less altruistic and shows the lowest pro-environmental attitudes.

The results of the binary logistic regression to test the influence of carsharing on powertrain choice is shown in TABLE II. Only variables with a p value below 0.1 are displayed to reduce complexity of the table. Variables with a p value higher than 0.1 are: education, mode choice for commuting/weekday leisure and weekend trips, HH size, gender, public transport passes, egoistic values, number of cars in HH, train usage, time home-work, time home-weekend trip, Nr. of accompanying persons (work), Nr. of accompanying persons (weekday leisure), pro-environmental attitudes and choice car size. Despite their non-significant influence on powertrain choice, they were included in the regression to account for potential confounding effects.

The omnibus-test of model coefficients is highly significant ($\chi^2(51, N = 826) = 292.60, p < 0.0001$). Furthermore, the Hosmer-Lemeshow-test is non-significant ($\chi^2(8, N = 826) = 10.12, p = 0.26$), indicating a good model fit.

TABLE II. BINARY LOGISTIC REGRESSION RESULTS

Regression to test the influence on choosing an EV as the next car

Variable (reference)	*Level*	*B*	*Odds ratio*
Carsharing (Non-user)	Carsharing user	0.68**	1.97
HH structure (Single person HH)	Couple without children	0.08	1.08
	HH with children	-1.16**	0.31
	Non-family shared HH	0.79	0.45
Type of living area (City)	Agglomeration	-0.80**	0.45
	Countryside	-0.45	0.64
HH gross income per month CHF (More than 12,000)	Less than 3,000	-1.15	0.32
	3,000-4,500	0.24	1.27
	4,501-6,000	-1.33**	0.26
	6,001-9,000	0.08	1.08
	9,001-12,000	-0.64	0.53
Age group in years (18-34)	35-54	-0.09	0.91
	55+	-0.92**	0.40
Biospheric value		0.49**	1.63
Altruistic value		0.45*	1.57
Hedonic value		-0.32*	0.73
Time home-leisure activities (min)		-0.02**	0.98
Number of accompanying persons (Weekend trip)		0.45*	1.57
Importance of own car (Important)	Not important	0.77**	2.16
Consider EV? (No)	Yes	3.14***	23.10

*, ** and *** sign. on $p < 0.1$, 0.05 and 0.01 level, B = parameter estimate, odds ratio = odds that EV is chosen compared to the reference category

The parameter estimate (B) and odds ratio are displayed for each variable and level. The odds ratio is an intuitive measure for effect size. It states the likelihood of an event happening (in this case choosing an EV as the next car instead of an ICEV) compared to the reference category shown in parentheses. Odds ratios above one indicate an “x” times higher likelihood to choose an EV compared to the reference category, whereas odds ratios below one indicate an “x” times lower likelihood to choose an EV compared to the reference category. Taking the inverse of the odds rations below one creates the likelihood to choose an ICEV. As an example, the inverse of the odds ratio from HH with children is 1/0.31 = 3.2, stating that HH with children are 3.2 times more likely to choose an ICEV as the next car compared to single person HHs.

Most importantly, and confirming our hypothesis, those participants who use carsharing are 2 times more likely to buy an EV (odds ratio of 1.97). In addition, participants with high pro-environmental attitudes and altruistic values and who see low importance in owning a car are more likely to buy an EV. Contrary, HHs who have the following attributes are less likely to by an EV: having children as opposed to single HHs, living in agglomerations instead of cities, medium income compared to income above 12’000 CHF, older individuals, high hedonic values and high time use for leisure activities. This result suggests that carsharing user exhibit characteristics that go beyond pro-environmental, socio-demographic and mobility characteristics influencing powertrain choice, as we have controlled for these effects in the model. Fig 2. illustrates the odds ratio of the significant categorical parameters from TABLE II (the variable “consider electric vehicle” is neglected for better visualization). The reference category is shown within brackets. Note that we changed the reference category for HH structure, type of living area, HH income and age for better visual comparisons. As an example, carsharing users are two times more likely to buy an EV instead of an ICEV.

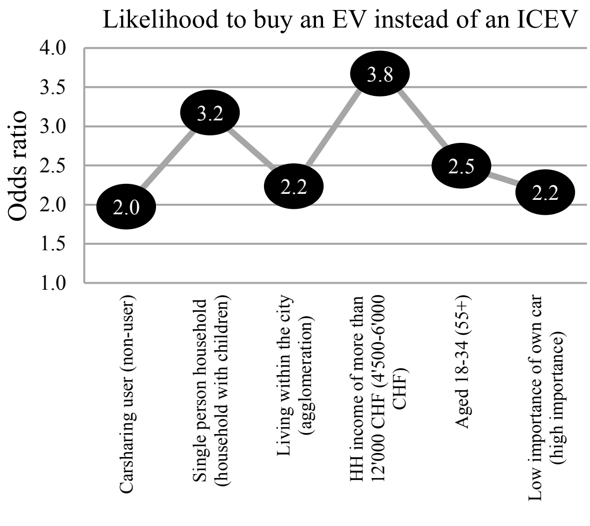

Figure 2. Odds ratio of the likelihood to buy an EV instead of an ICEV.

The overall explanatory power of the model is very high, with a Nagelkerke R squared of almost 0.6, explaining 60% of the variance defining the choice to buy an EV.

V. DISCUSSION

The findings suggest that when a situation arises where one considers buying or replacing a private car, carsharing users are in favor of EVs. If this behavior is linked to the exposure to carsharing, the uptake of EVs might be expanded by the provision of carsharing services. However, if instead people attracted to carsharing are open to buying an EV in the first place, then this would distort our findings. We tried to account for these latent effects by including a variety of sociological and psychological variables. With 60% of variance explained in the regression model, we are confident that carsharing experience could indeed lead to an increased openness to EV. This result could provide important levers to decision-makers and transport planners as carsharing experience could foster a more sustainable mobility lifestyle. By supporting access to carsharing, the attitude of the population towards EVs might be changed positively. With further strategies, like information campaigns discussing the mutual relationship between carsharing and EVs, this lifestyle change could be accelerated. In terms of assessing the potential environmental benefits, which may be obtained through carsharing, the results raise another question: could experience with carsharing motivate to buy a car for HHs currently not owning a car and, as such, increase private car ownership? While we do not see such an effect in our study, other researcher argue that especially for car-savy people, carsharing could act as a "gateway drug" [24]. Within our study (refer to TABLE I) we see that the CS-H group, i.e. those who use carsharing and see a high importance of owning a car, are mostly already owning at least one car. Only 3% do currently not own a car within this group, indicating that a shift from these 3% to car ownership would be negligible. The potential increase in alternative vehicles may even be fostered by encouraging the NO-CS-L group, i.e. those not using carsharing and exhibiting a low importance of an own car, to adopt carsharing. More than 60% of this group are car owners, who may in the future avoid buying a car thanks to carsharing [5] or replace the current car by an EV due to the increased openness shown in our study. This group is further characterized by the highest value in planning to reduce car use and strong biospheric values, signaling a large potential for the adoption of sustainable alternatives such as carsharing or small EVs, respectively.

VI. Conclusion

Within this paper we elaborated the interplay between carsharing experience and powertrain choice through an online questionnaire. We demonstrate that carsharing users show a two times higher likelihood to purchase an EV instead of an ICEV compared to non-carsharing users. By controlling for a variety of sociological and psychological variables, we argue that carsharing experience might be a lever for increasing the diffusion of EVs. Still, for a better accountability of latent effects, further research including questions about motivations joining a carsharing system is required. Especially by focusing on a representative sample of heavy carsharing users, future studies could provide important additional insights to our results. Even though we did not see an increase in the decision to buy a car for carsharing users who currently own no car, such rebound effects need to be carefully considered when planning carsharing services. Moreover, further research into car size choice among carsharing users and non-users to provide better insight about the sustainability potential of conventional carsharing is also needed.

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