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Federal Department of the Environment, Transport, Energy and

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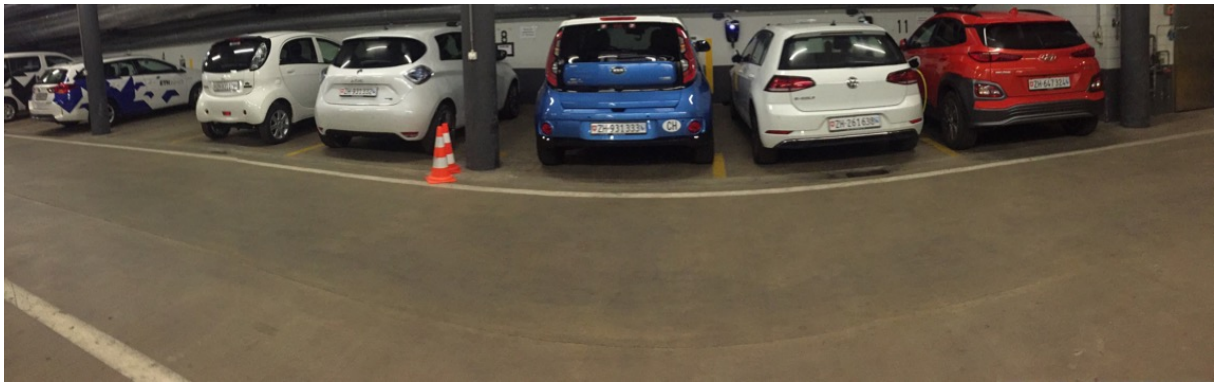
**Swiss Federal Office of Energy SFOE**
Energy Research and Cleantech

**Interim report dated** 15.09.2019

# Fostering the Transition Towards More Fuel-Efficient Cars



**Source:** Gracia Brückmann 2019

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Swiss Federal Institute of Technology Zurich

Institute of Science, Technology and Policy
Institut für Wissenschaft, Technogie und Politik

**Date:** 15 September 2019

**Location:** Bern

**Subsidiser:**

Swiss Federal Office of Energy SFOE
Energy Research and Cleantech Section
CH-3003 Bern
www.bfe.admin.ch

**Co-financing**

ETH Zurich

CH-8092 Zurich

www.ethz.ch

**Subsidy recipients:**

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**SFOE contract number:** SI/8100087-00-01-05

# Zusammenfassung

Dieses Forschungsprojekt untersucht die politischen Präferenzen und die Kaufentscheidungen der Verbraucher im Bereich des individuellen motorisierten Verkehrs. Diese Branche, die als eine der Hauptursachen für Treibhausgasemissionen anerkannt ist, verfügt bis heute über ein hohes Dekarbonisierungspotenzial. Die in der Schweiz zugelassenen Fahrzeuge verursachen Jahr für Jahr die höchsten Emissionen (pro km) im Vergleich zu den europäischen Nachbarländern. Um den Klimawandel einzudämmen, ist es daher von größter Bedeutung, die Emissionen des Verkehrs im Land zu reduzieren. Derzeit haben die verfügbaren Fahrzeugmodelle, insbesondere Elektrofahrzeuge (EV), das Potenzial, die verkehrsbedingten Emissionen der Schweiz zu reduzieren, die Nachfrage ist jedoch gering. Letzteres könnte auf vernachlässigbare politische Anreize und die psychologische Distanz der Verbraucher zu diesen neuen Fahrzeugen zurückzuführen sein. In diesem Projekt haben wir exklusive Umfragedaten zu einer Stichprobe von Schweizer Autobesitzern gesammelt, um ihre politischen Präferenzen und ihre Kaufabsichten für Elektrofahrzeuge zu untersuchen. Wir führen Umfrageexperimente zu politischen Präferenzen durch und verwendeten ein randomisiertes kontrolliertes Feldexperiment, um abzuschätzen, wie die Bereitstellung von Informationen und eine 48-stündige Probefahrt mit vollelektrischen Fahrzeugen die politischen Präferenzen und Kaufabsichten beeinflussen. Im gegenwärtigen Stadium haben wir eine erste Befragung, den Feldversuch mit Probefahrten und Informationen, und die erste Befragung nach der Intervention durchgeführt. Dieses Projekt versucht, die Lücke in der evidenzbasierten Forschung zu politischen Präferenzen nach der Erfahrung dieser neuen Technologien zu schließen, um die Entwicklung von Politiken in diesem Bereich zu unterstützen.



# Summary

This research project examines policy preferences and consumer choice within the area of individual motorized transportation. Recognized as a major source of greenhouse gas emissions, to this date, this industry still maintains a high decarbonisation potential. Year after year, the newly registered Swiss car fleet produces the highest emissions (per km) compared to neighbouring European countries. Therefore, in an effort to mitigate climate change, reducing the country's transportation's emissions is of utmost importance. Currently, available car models, notably electric vehicles (EV), have the potential to reduce transport-related emissions in Switzerland, however, demand is low. The latter might be attributed to neglectable political incentives and consumers' psychological distance to these new vehicles. In this project, we collected unique survey data on a random sample of Swiss car holders to study their policy preferences as well as their EV purchase intentions. We conduct survey experiments on policy preferences and used a randomized controlled trial field-experiment in order to estimate how the provision of information and a 48-hours test-drive with fully electric vehicles influence policy preferences and purchase intentions. At the current stage, we have conducted a baseline survey, the field-experiment with test-driving and information, and did the first post-treatment survey. This project attempts to close the gap in evidence-based research on policy preferences after the exposure to these new technologies in an attempt to facilitate policy development.

# Contents

# Abbreviations

| | |
|---|---|
| BEV | Battery Electric Vehicle |
| EV | Electric Vehicle |
| DK | Don’t know (as a survey response option) |
| GHG | Greenhouse Gas |
| ICEV | Internal Combustion Engine Vehicle |
| RNS | Rather not say (as a survey response option) |

# 1 Introduction

## 1.1 Background information and current situation

While many sectors of the Swiss economy have in recent years increased their energy efficiency and reduced their greenhouse gas (GHG) emissions and fossil fuel dependence, the transportation sector, which accounts for around 32% of Switzerland's GHG emissions (FOEN 2017) and the largest part of energy (SFOE 2019) is falling behind. One key part of the Swiss energy strategy thus aims to reduce vehicle emissions (and by implication fossil fuel consumption) to an average of 95 g/CO2 for new cars by the year 2021 (SFOE 2017). This would help not only in reducing GHG emissions, but also in reducing local air pollution and noise (Sierzchula et al. 2014). Based on currently available car models (e'mobile by electrosuisse 2019; EnergieSchweiz 2018), this target could be achieved today. However, weak consumer demand for fuel-efficient cars remains a major obstacle. In 2018, only nearly 1.4 % of new registrations (or 5411 cars) were solely powered by electricity.

Previous studies on the demand for fuel-efficient cars have mostly used conventional surveys, stated choice experiments, and computational simulations to characterize the efficiency gap in car purchasing behaviour. Building on that research, this project focuses on examining policy options to encourage the adoption of more fuel-efficient cars. In contrast to many previous studies, and in particular to those conducted in Switzerland, this project employs an experimental approach.

Using a random sample of Swiss car holders (from the Swiss cantons of Aargau, Schwyz, Zug, and Zurich) we administered a baseline survey (Brückmann and Bernauer 2019; Brückmann, Willibald, and Blanco 2019). In this first, baseline survey in 2018, we received answers from 4,148 owners of conventional cars who had no BEV registered yet. Survey participants were then randomly assigned to one of three experimental treatment groups: (1) providing detailed information on BEVs, relating to car attributes that buyers typically pay attention to; (2) provision of the same information on BEVs, plus test-driving of such a car; (3) a control group with neither (1) nor (2). This design is a two-by-two design (information yes/no, test drive yes/no, leaving out a group that would receive no information and a test drive, which would either confuse test drivers or them searching the information (at least partially) themselves).

## 1.2 Purpose of the project

Decarbonizing transportation poses enormous challenges (Rockström et al. 2017; Rogelj et al. 2015; Schellnhuber, Rahmstorf, and Winkelmann 2016): The conventional car is perceived as convenient, fast, ideal for long-distance driving, while it offers privacy and luggage space and is regarded as a status symbol (Gärling and Schuitema 2007). Cars with internal combustion engine need to be replaced with vehicles that do not rely on fossil fuel, such as battery electric vehicles (BEVs) in conjunction with energy from renewable sources (Ajanovic and Haas 2016). A suitable country for using many BEVs is Switzerland: It has enormous decarbonization potential as year-after-year the fleet of newly registered cars has the worst emission record (ACEA 2019; auto suisse 2019) in Europe. On the other hand a high share of the country's electricity is already from renewables (mostly hydropower) and the legislation ("energy strategy") is planning to replace all remaining non-renewable energy sources, including nuclear energy, with renewables by 2050 (SFOE 2018).

For this transition to decarbonized transportation, many states enact policies to promote electric vehicles (Hardman 2019; Hardman et al. 2017; Rietmann and Lieven 2019; Zhang et al. 2014). However, so far it is not yet clear which policies are supported in Switzerland. Furthermore it is not

clear how particular treatments, such as a 48 hours test drive with a fully-electric car (BEV) and a detailed, comprehensive information package on these cars alters support for policies and purchase intentions. Following established findings in the literature (Graham-Rowe et al. 2012; Schneider, Dütschke, and Peters 2014) experience matters for stated interest in EVs. In this experiment, we used a randomized-control trial among Swiss car holders to assess whether any of these measures will lead to more purchase interest in electric vehicles.

## 1.3 Objectives

We aim at assessing whether our treatment interventions had positive effects on attributes respondents associate with more fuel-efficient cars, on their intentions to switch to more fuel-efficient cars, and how these treatments affect preferences towards a wide range of governmental interventions intended to increase the vehicle fuel-economy (e.g. subsidies, charging infrastructure, and the financing of these policies).

In this project we aim at establishing causality through several measures. First, there was a random sample of participants, sourced from the official car registries. Second, there is random-assignment to one of three experimental treatment conditions.

# 2 Procedures and methodology

We first administered a baseline survey (see annual report 2018) and asked for consent to take part in two future surveys. In this first, baseline survey, we received answers from 4,148 owners of conventional cars, that had no BEV registered yet. Survey participants were then randomly assigned to one of three experimental treatment groups, as described before. This design is a two-by-two design (information yes/no, test drive yes/no, leaving out a group that would receive no information and a test drive, which would either confuse test drivers or them searching the information (at least partially) themselves).

## 2.1 Car and information treatment

Randomization was done before the first, baseline survey. 1233 people were assigned to the car treatment and we asked them, if they were willing to participate in a test drive, if it would have been offered to them. From 1233 survey participants (1078 online and 155 in the print version) we asked that in the first survey, nearly 65% have agreed to do the test drive. Together with the share of people who were still undecided, there was an 87% likelihood, among participants in this treatment group, to agree to a test drive. We randomly asked those people, if they would like to take a test drive.

The procedure was as follows: We wrote people a letter asking for their participation in a 48 hour test-drive. We did not explicitly mention that it is with an electric car, to get people into the test-drive independent of their prior attitudes towards these cars. People who received these letters had to call us to schedule a 48h appointment. We would not offer test-drives longer than three days (Friday afternoon to Monday morning, except for public holidays) and never shorter than 24 h, mostly aiming at around 48 h. To make sure that invited participants take part we tried to call them or inquire via email, if they did not make an appointment after the letter we sent them. We tried to reach out for people who did not answer up to five times. In total we sent out 621 invitation letters for the test drives. We were not able to ask all respondents if they would like to take part in the test-drive, as our car pool was limited.

In total we were able to use 8 different cars: A BMW i3, a Renault Zoé (belonging to ETHZ), another Renault Zoé, an eGolf, a Mitsubishi iMiev, a Kia Soul EV, a Smart Electric Vehicle, as well as a Hyundai Kona. Besides one car from ETH transport services, all cars were borrowed free of charge from the respective car importers or car retailers. All of these cars were with us between 1.5 and 5 months, each. The test-drives happened between November 01, 2018 and May 29, 2019.

In total 216 test-drives were made by study participants. The allocation of cars was quasi-random. It was based on peoples' time preferences for the test-drives and only in cases that people had very specific needs (e.g. more need of luggage space for a stroller, isofix for child seats, 4-seat car due to passenger capacity needs, smaller size needs due to garage sizes, longer range needs due to living at the distant borders of the cantons in the study,…) we tried to fulfil those. All of them received the information treatment on paper at the same time as we gave them instructions on how to drive an electric car. We also handed over a card from swisscharge, which is a company offering access to (paid) recharging stations. Participants had to bear recharging costs themselves but were lump-sum reimbursed with 20 Francs for completing the test drive.

## 2.2 Information treatment

After developing the information package (see annual report 2018) we gave these treatments (without the test-drive) to participants that already had been assigned to this treatment group. Additionally, a random sample of those, who had been previously allocated to the other treatment group (test drive and information) but not received that treatment. Specifically, people who were not offered any test drives (due to unwillingness expressed in the baseline survey or capacity limits, see section 2.1.) or that did not take up the test drive after us offering it. Reasons for the latter are unwillingness, no interest, or no time or our capacity limits.

These respondents are in the information-only treatment, and the information provided is shown online in the follow-up survey. The information sheet is sent in a printed and folded version to respondents in this treatment group, who took the survey on paper. In contrast, in the control group, no information was displayed and no leaflet was sent with the printed questionnaire.

# 3 Activities and results

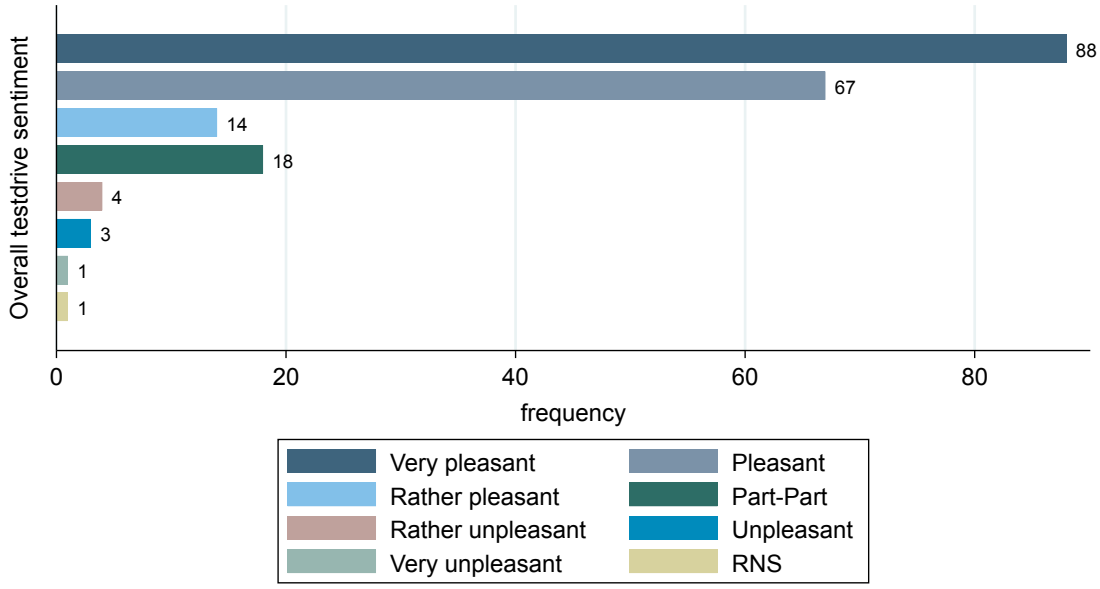
In what follows we describe in detail the (very preliminary) results of the second survey. This is the first survey after the treatments were implemented. The follow-up survey took place around three weeks after the test-drive (starting end of November 2018) and ended, after all test-drives were done. The control group surveys took place from End of February 2019 until June 2019 in continuing waves until beginning of August 2019.

## 3.1 Responses

We reached 2496 (partial and complete) answers, where 203 were test-drivers, 1097 received the information treatment and 1196 were in the control group. 2221 surveys were done online and 275 were done pen and paper. Again, two independent research assistants digitalized each of them. Then a third person compared both (digitalized) versions and corrected any mistakes. For each survey item (question), we also report item response, as we also use partial response here.

## 3.2 Test drives

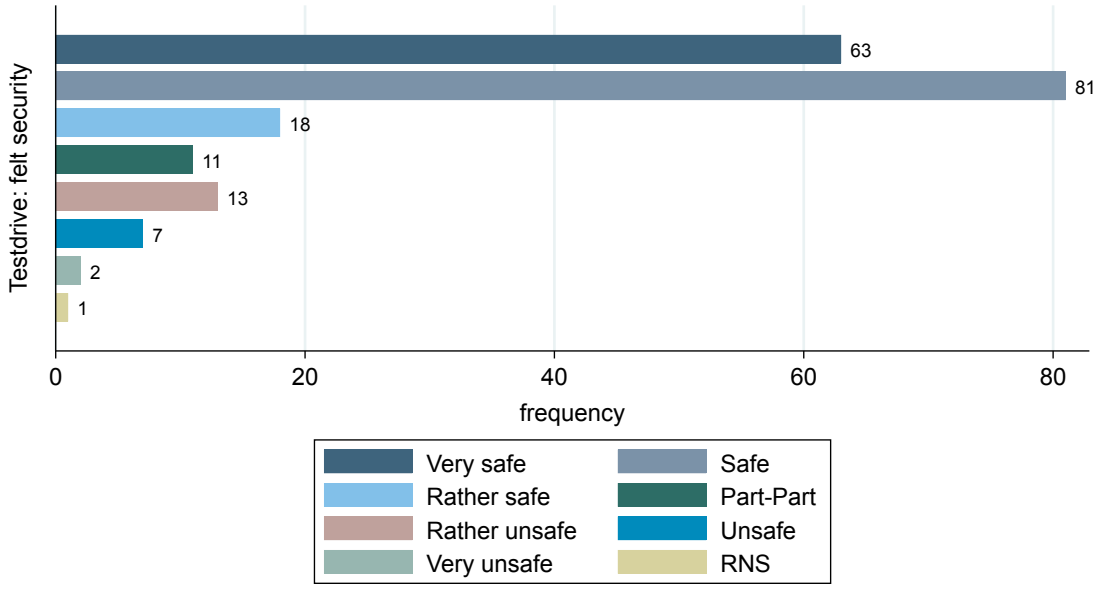
This survey started with a block of questions on the test-drives, for those people that did receive the treatment. Overall (see Figure 1), most of the test-drivers (45%) enjoyed the test drive and rated it “very pleasant”. 34 % found it pleasant, and only 4% did rate it (rather or very) unpleasant.




Testdrivers only,
N = 196

Figure 1: Response to "How did you feel about the test drive as a whole?"

Similarly, most test-drivers felt rather secure. 74 % felt “very safe” or “safe” during the test- drive (see Figure 2). In further research on this project, we shall look in more detail why some test-drivers did not feel safe and what this does to their car purchase preferences as well as policy preferences.




Testdrivers only,
N = 196

Figure 2: Response to "Did you feel more safe or unsafe during your test drive?"

In general, the test drive was (rather) exciting and not boring for most of the participants (see Figure 3).

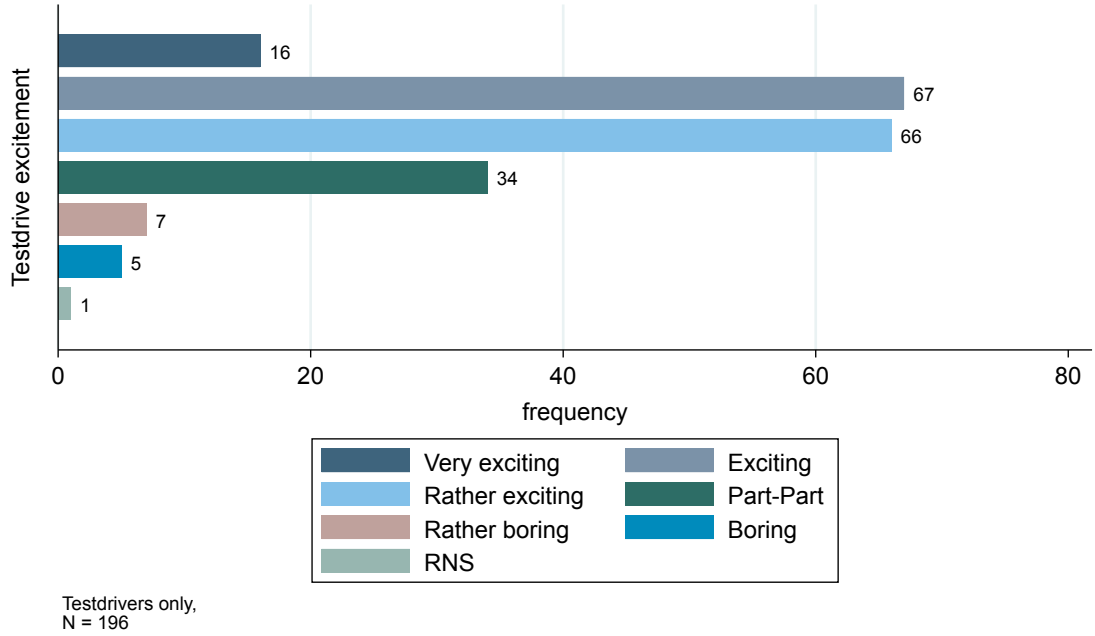



Figure 3: Response to "Was the test drive rather boring or exciting for you?"

In the following, we asked whether respondent charged, how they perceived charging. From our data from the swisscharge recharging cards we know, that only 77 recharging procedures on public recharging infrastructure were started. On average, they lasted less than 2 hours (106 minutes) and nearly 12 kWh were charged.

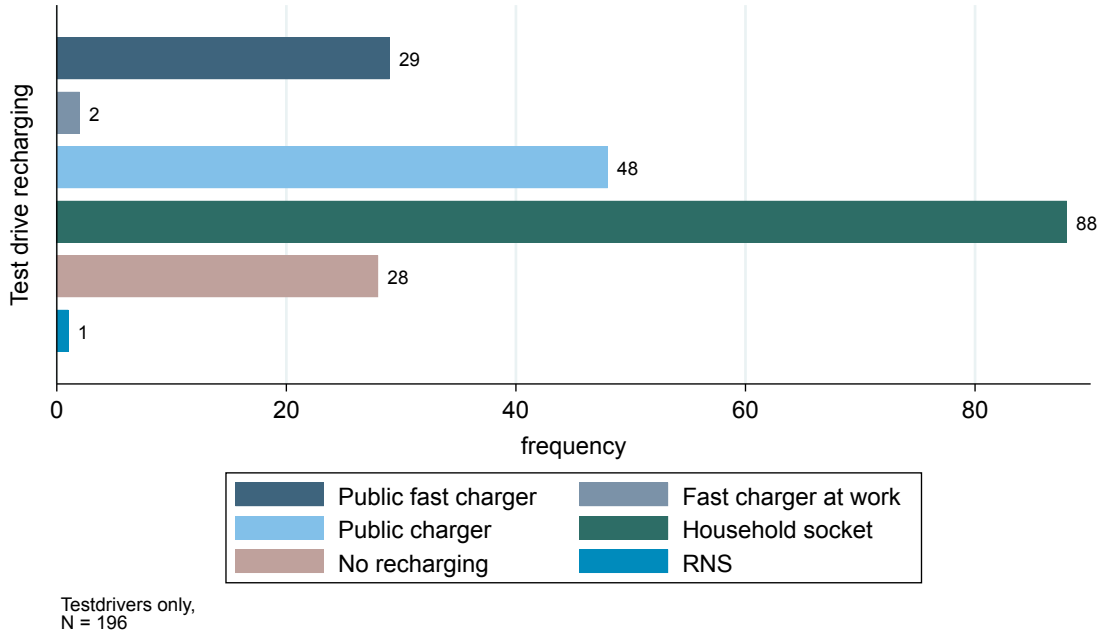



Figure 4: Response to "Did you charge the EV during the testdrive?"

Turning only to those people who actually recharged, we wanted to know, how easy or difficult it was for them, to find a charging point (see Figure 5). Only 61 % reported it was “very easy”, “easy” or “rather easy”. 13 % found it partly difficult and 24 % found it difficult. Later in the project, we shall assess whether these people did not read our instructions well enough, did or did not choose to use the swisscharge network and or how their home location is located in comparison to public charging infrastructure.

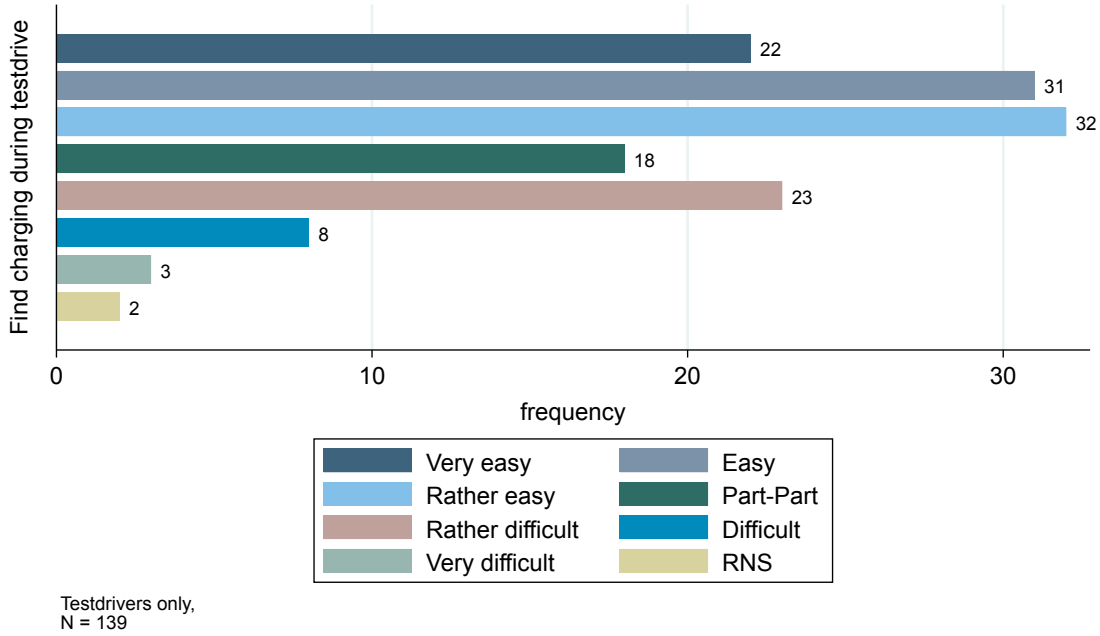



Figure 5: Response to “How easy or difficult did you find it to find a charging station (or another way to charge the battery) for the car during the test drive?”

Still asking only those people who actually recharged, we asked them how easy or difficult recharging itself was for them (see Figure 6). 83% reported on the positive side (“very easy”, “easy” or “rather easy”). As only so few people had difficulties with recharging, or abstained from answering, we are confident, our instructions we gave to participants were sufficient.

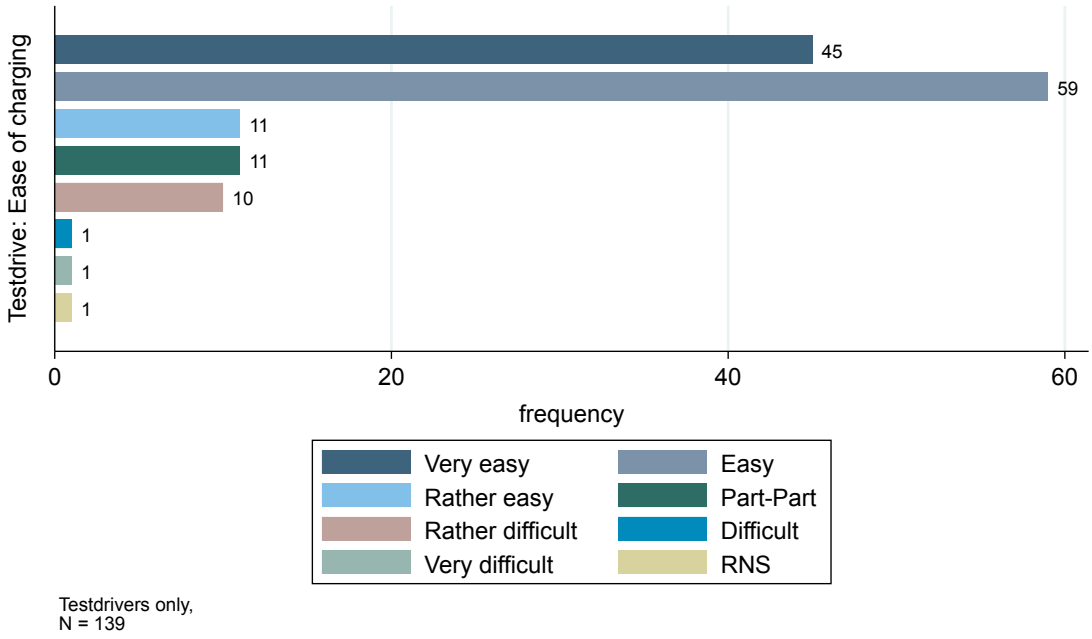



Figure 6: Response to “How easy or difficult did you find it to charge the car's battery?”

The last question only direct to those people in the test-driving experimental group was about their car usage (see Figure 7). Actual driving distances were recorded in most cases but not yet merged with the survey data. To see whether the car was used only a little or rather more, we inquired about their car use during the time they did the test-drive. The great majority of 54 % did as much driving (except for their way to ETH) with the test car, as they would have done otherwise with their private car. Only 12 % did less as without the test drive.

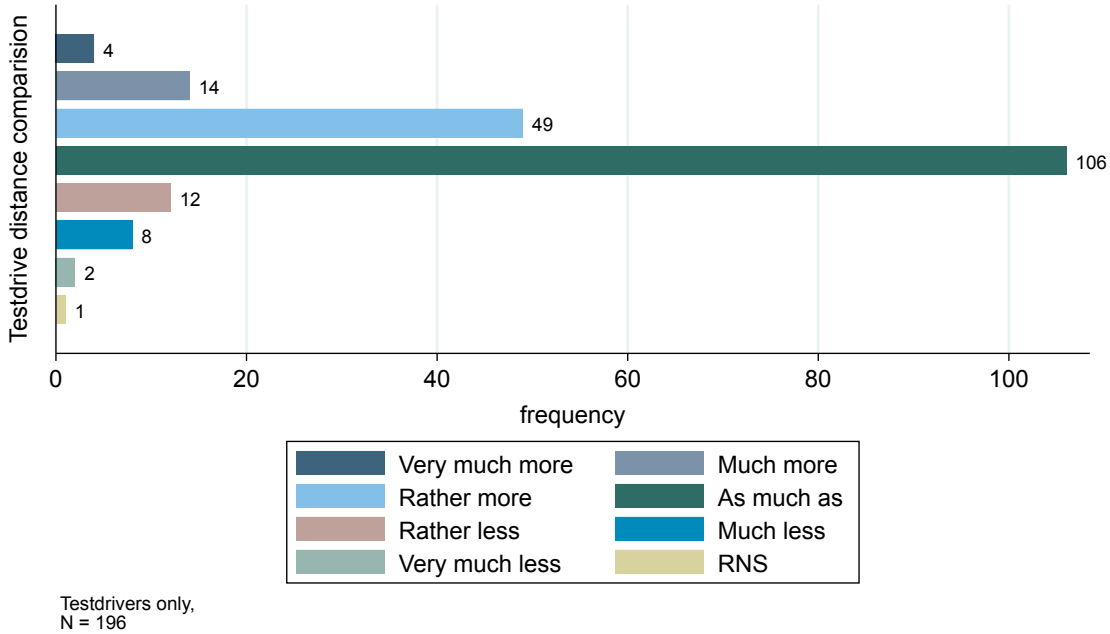



Figure 7: Response to “Did you drive more or less kilometres with the test vehicle than if you had used your own vehicle during the test drive time? (Please do not include the journeys to us at the ETH.)”

## 3.3 Comprehension checks of treatment

In the next block of questions we aim at exploring the effects of the different treatments. The answer to all these questions were clearly stated in the information treatment. The order of the questions was randomized, so was the order of the answer options. Please note that in the figures, the word “Test Drive” always refers to the group that received both: a test-drive as well as a printed information treatment.

In the information treatment, we wrote that BEVs have higher energy-efficiency. We wanted to see how this is perceived (see Figure 8) by the general public (control group), those who received the information only, and those who received test drive and information. Overall, 71% of respondents were able to mark the right answer. Between the experimental groups, especially the share of wrong answers as well as the decrease in don’t knows (DK) is striking: Only 4 (6) % in the information (and test drive) treatment group did not know it.

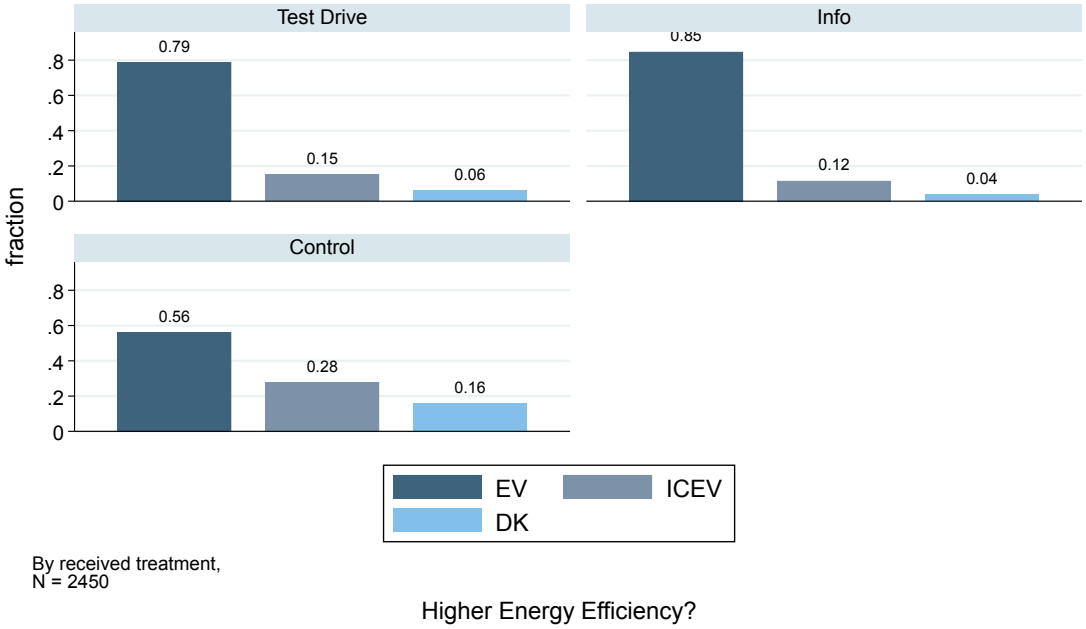



Figure 8: Response to “Which cars have a higher energy efficiency (energy consumed per kilometre or percent of the energy consumed that is actually used for travel)?”

The next piece of information we put in the information treatment and asked respondents about in the survey is about the purchase costs for EVs compared to ICEVs (see Figure 9). They are higher for EVs and 90% of all survey respondents knew the right answer. In contrast to the previous question, here the test drivers had the highest share of knowledge, both in terms of correct answers as well as the least “DK”s.

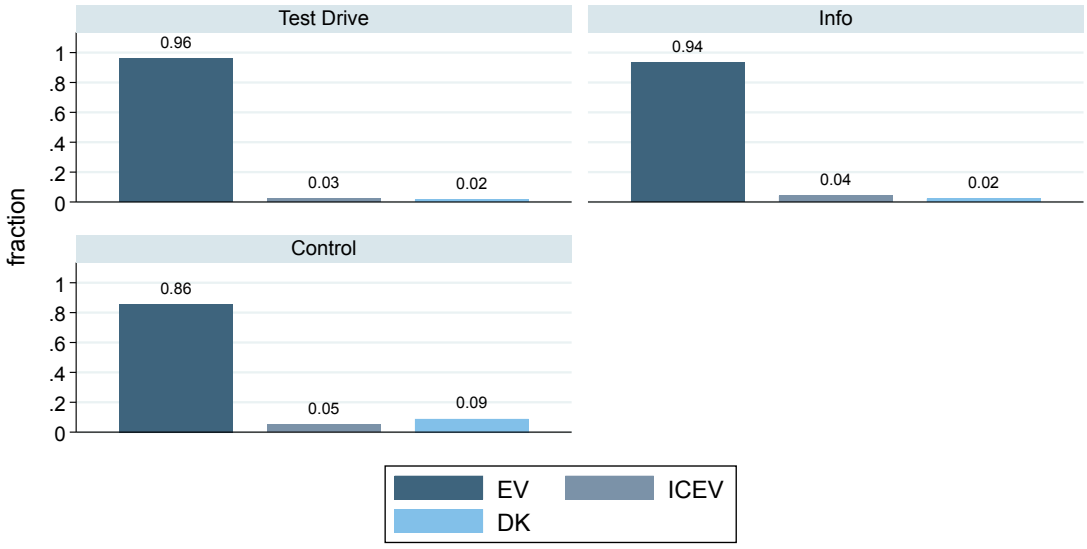



Figure 9: Response to “Which cars with the same external dimensions (length, height, width) and equipment have higher acquisition costs?”

In the information sheet we also showed that life cycle emissions are higher for ICEV than for EVs. This piece of information was inquired about in the survey, see Figure 10 for the results. Overall 77% knew the right answer. Again, but in contrast to the previous question, this piece of information was best memorized by the respondents in the information treatment group. In the general public, around 33 % did not know it (correctly).

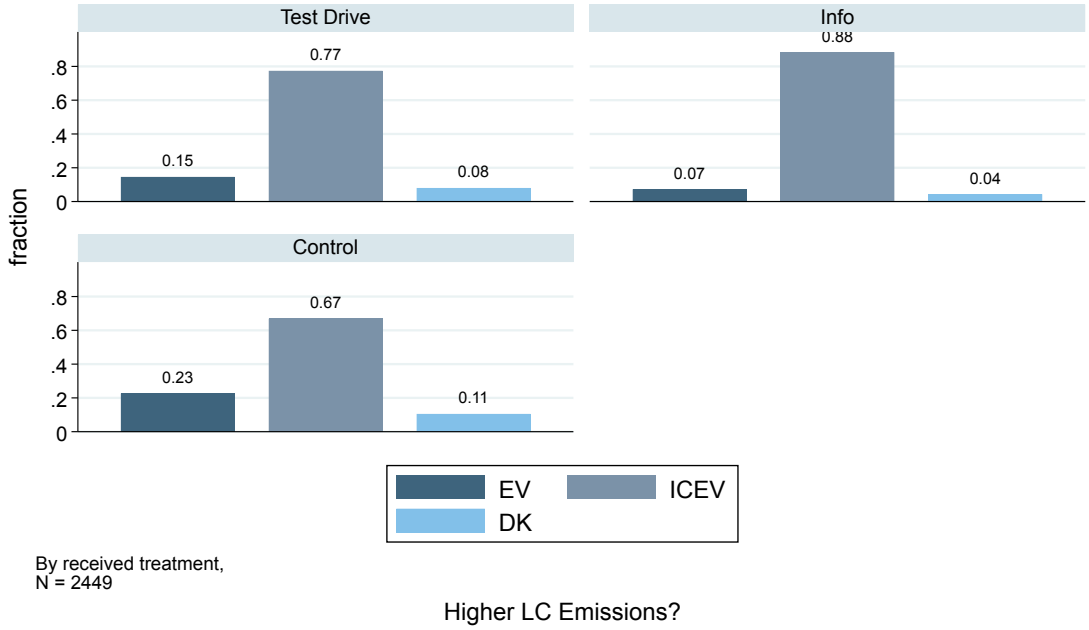



Figure 10: Response to “Calculated over the entire life cycle (production, operation, disposal) of a vehicle, which vehicles cause higher CO2 emissions?”

Taking the aforementioned questions on treatment comprehension together, there are 74% of those from the information treatment, who had all three right. In the information and test drive treatment group (who had a longer time between receiving the information and answering the survey) there are 61% who had all three right. In the control group however, only 33% have all three right. The mode (44 % of control group respondents) is being able to give two correct answers.

After four years of average operation an electric car amortises, as we told respondents in the information treatment. To recall this specific information might have been challenging, so the answers we received vary a lot, see the boxplot in Figure 11. The mean is 132 years, as some outliers heavily move the average. For describing and plotting, we leave out the 1% highest values (these are values between 30 and 150000 years). The average per group moves down to 8 years for the control group, 7 years for the car treatment and 5 years for the information treatment.

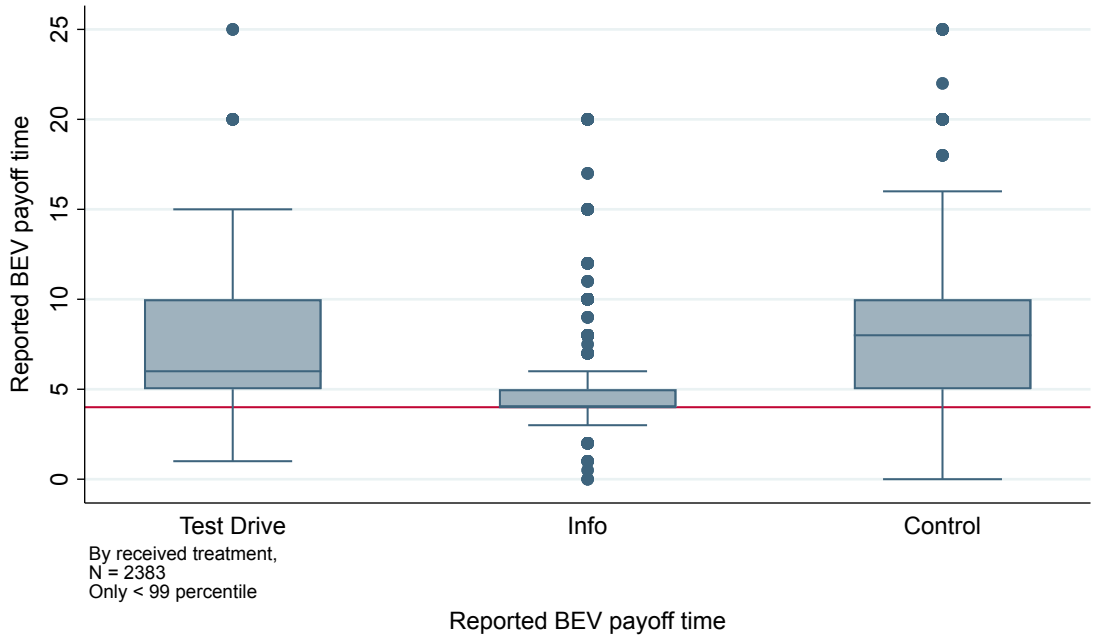



Figure 11: Response to “How many years do you have to own and operate an electric car, so that the total cost is about the same as the cost of a petrol or diesel car of the same size and mileage?” Red line indicates 4 years, as stated in the information sheet.

## 3.4 Treatment effects on charging network density and range perceptions

As in the first survey, we wanted to examine if people are aware whether there is a public charging point around them, and in which proximity (see Figure 12). For test drivers, the average reported is 3.8 km (and 86 % reported), for the information only treatment group it is 8.1 km (71 % reported), and 6.8 km was on average reported by the control group (reported by 64 %). As before, with open text fields, some extreme values are shifting the results. Again, looking only at the lowest 99% of the data (i.e. excluding values above 50 km distance to nearest recharging station which slightly reduces the number of observations for this particular question), the values from above change for the information only (control) group to 5.2 (4.8) km, while remaining stable for the remaining experimental group.

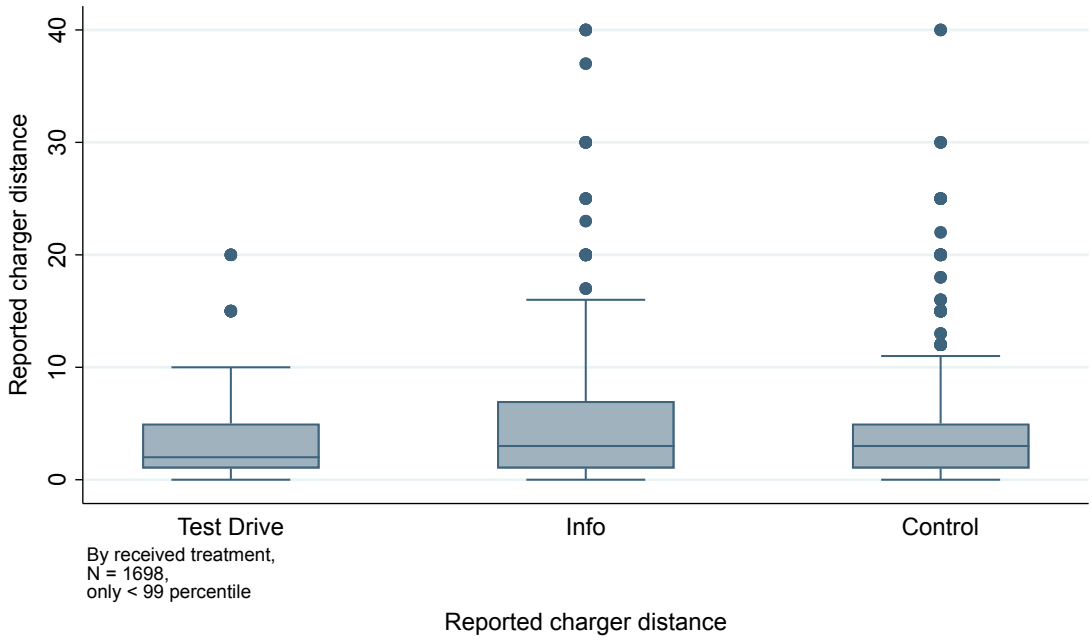



Figure 12: Open text field answer to “Suppose you had to charge an electric car: Do you know the distance from your home to the nearest charging station for electric cars?”

When asking people what they assume which distances can be covered by a medium-sized battery electric car, the values people offer differ heavily between treatment categories. So does the choice for indicating that one does not know this at all. In the car treatment group it is 1.5 %, in the information group it is 4.8 %. 6.1 % in control group do not know it.

Regarding the distance one could cover, see Figure 13, extreme outliers again move the results for the information only and control group. Keeping all values the test drive treatment group states a mean of 252 km, information treatment states 740 km on average, and the control states 597km. Removing again 1% of the highest data yields the following picture: 250 km, 289 km, and 275 km, respectively.

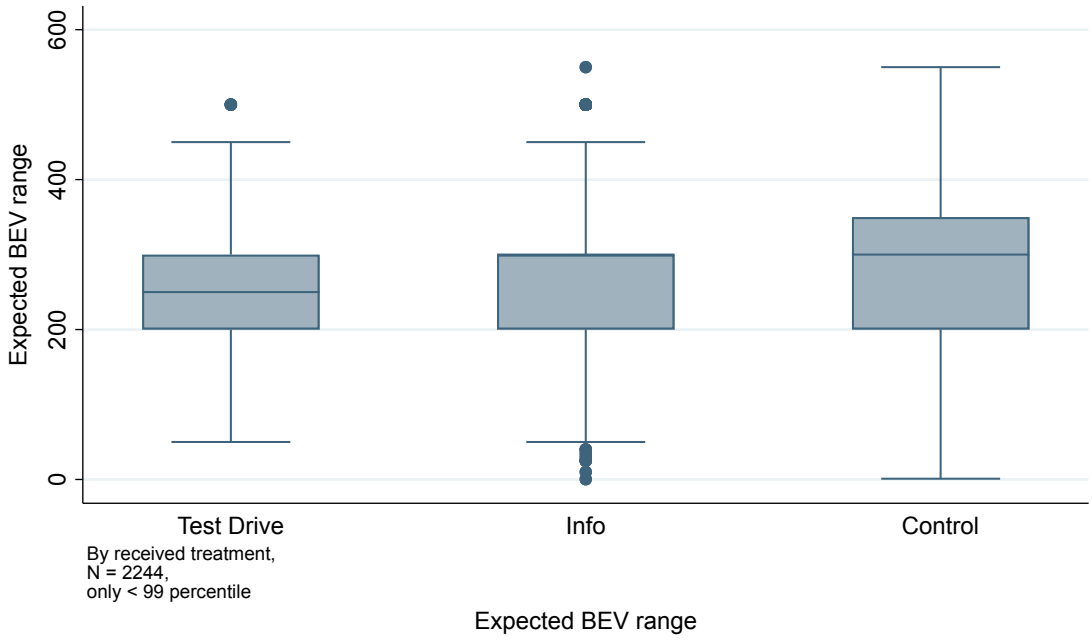



Figure 13: Open text field answer to “What do you estimate, how many kilometres can an electric car (exclusively battery-powered) of the compact class (e.g. BMW i3, Nissan Leaf, Renault Zoe, VW e-Golf) cover today with a fully charged battery?”

## 3.5 Treatment effects on comparisons between ICEVs and EVs

As outlined in the proposal of this research project, we aim at discovering differences between experimental groups, in terms of respondents’ perceptions of different, relevant vehicle attributes. As before, these questions were in random order displayed to respondents from all three groups and we directly asked respondents about their opinion “We would now like to ask you to give us your personal assessment of different car types.”

First, we turn to the individuals’ perception of technology maturity for different car types (EV and ICEV). Figure 14 displays the results for the three treatment groups. From the figure and regression analysis it becomes obvious, that mostly the information (only) treatment changed perceptions here.

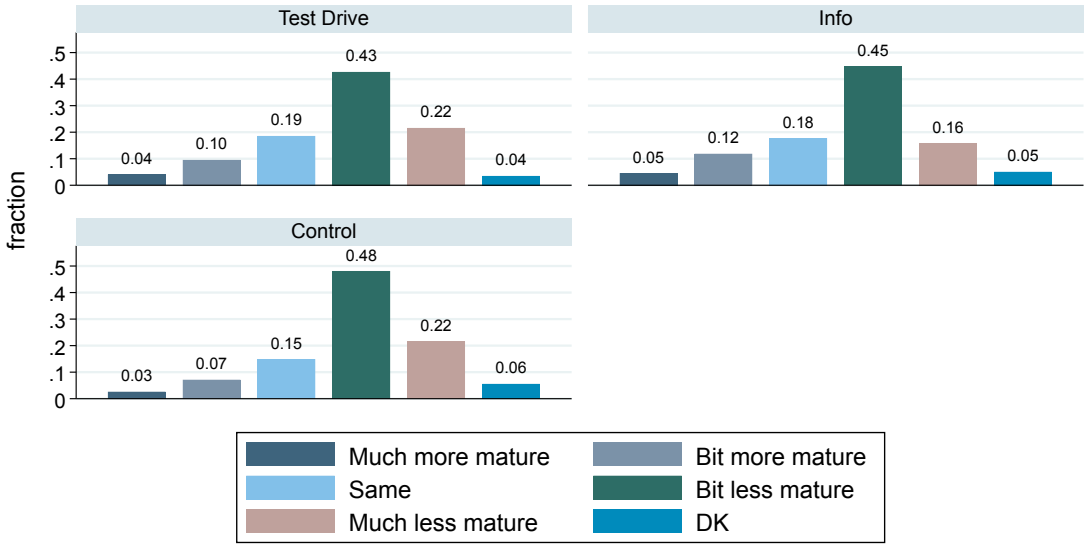



Figure 14: Response to “If you think of the technology of electric cars (exclusively battery-powered cars), how mature or not do you think this technology is compared to cars with diesel or gasoline engines? Electric cars are compared ... (much more mature ... much less mature).”

Second, we look at perceived running costs (see Figure 15). Here, both treatment groups differ statistically significant from the control group. 50 % of test-drivers realized that BEV are much cheaper to maintain, while it where only 44 % in the information (only) treatment group and only 29 % in the control group. In both experimental groups 84 % of respondents evaluated the maintenance costs as (much) cheaper, while in the control group only 64 % did so.

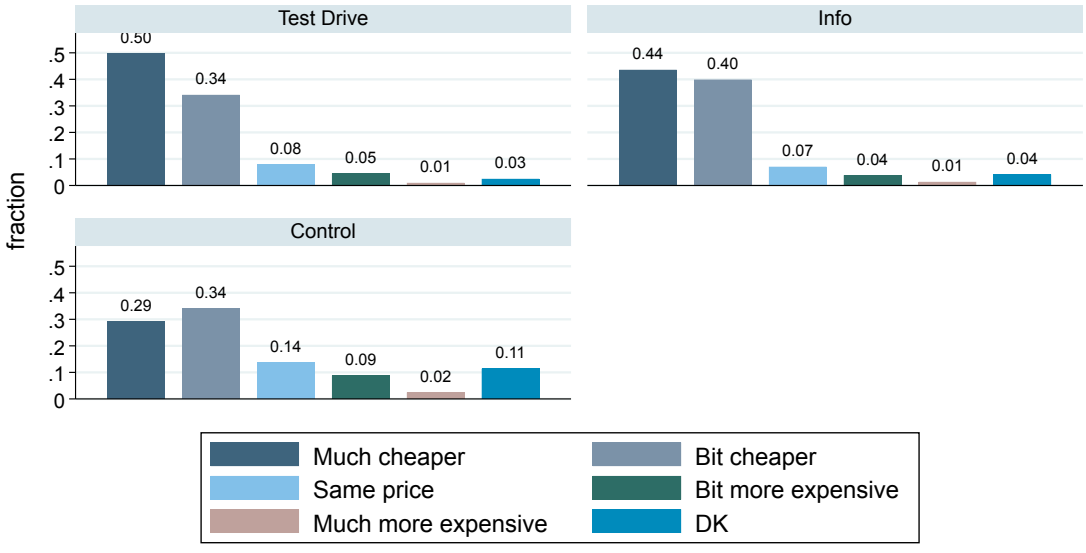



Figure 15: Response to “How would you evaluate the pure maintenance costs (i.e. not the acquisition costs / costs for the car purchase, but only for operation and service) for electric cars (exclusively battery-powered cars) compared to cars with petrol or diesel engines? Electric cars are... (much cheaper ... much more expensive) to maintain.”

For perceived resale value as well as environmental impacts, the only group that differs statistically significant from the control group, is the treatment group that solely received information. This is depicted in Figure 16 and 17. The general picture is that the uncertainty about the resale value is high, as we always see 15-16 % of people who do not have any knowledge and values are nearly evenly spread over response categories. Strikingly, the information (only) treatment group has a slightly more optimistic view on the resale value, however we did not give any information on this topic.

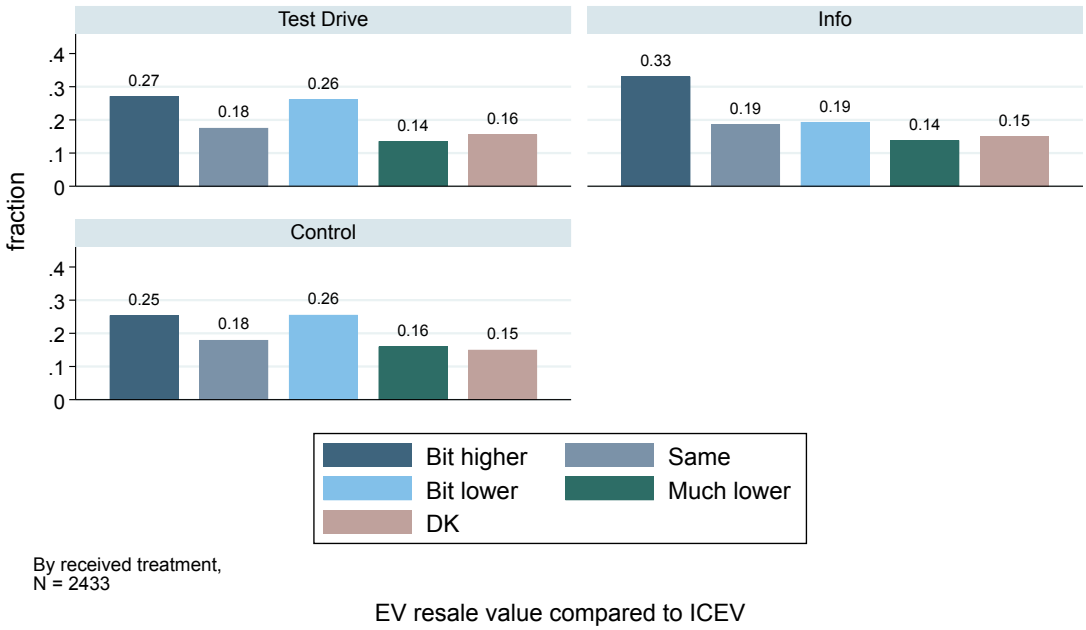
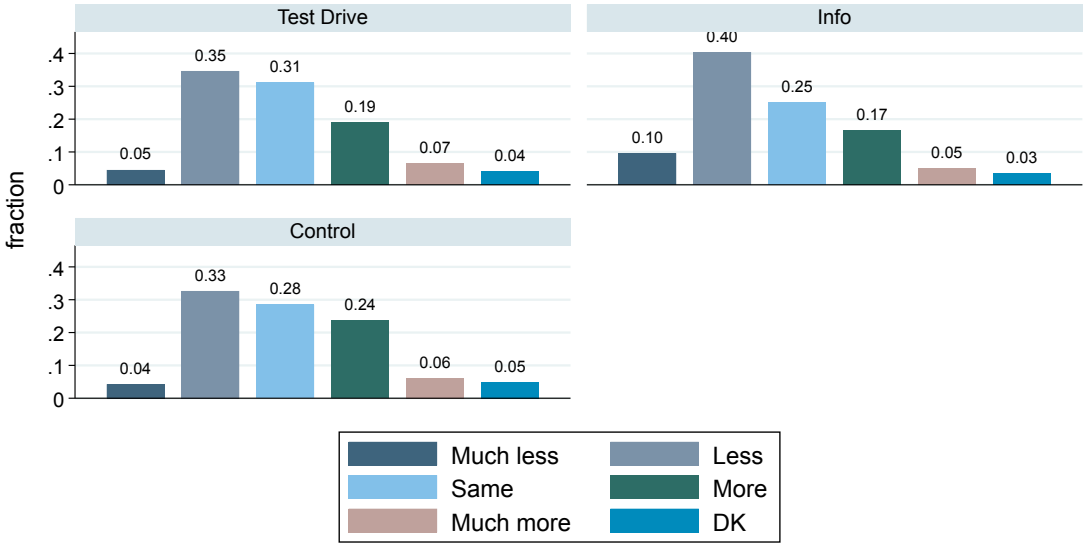



Figure 16: Response to “How would you estimate the resale value (second-hand value) after five years for electric cars (exclusively battery-powered cars) compared to cars with petrol or diesel engines of the same age and mileage? The resale value of electric cars after five years with the same mileage is … (much higher… much less)?”

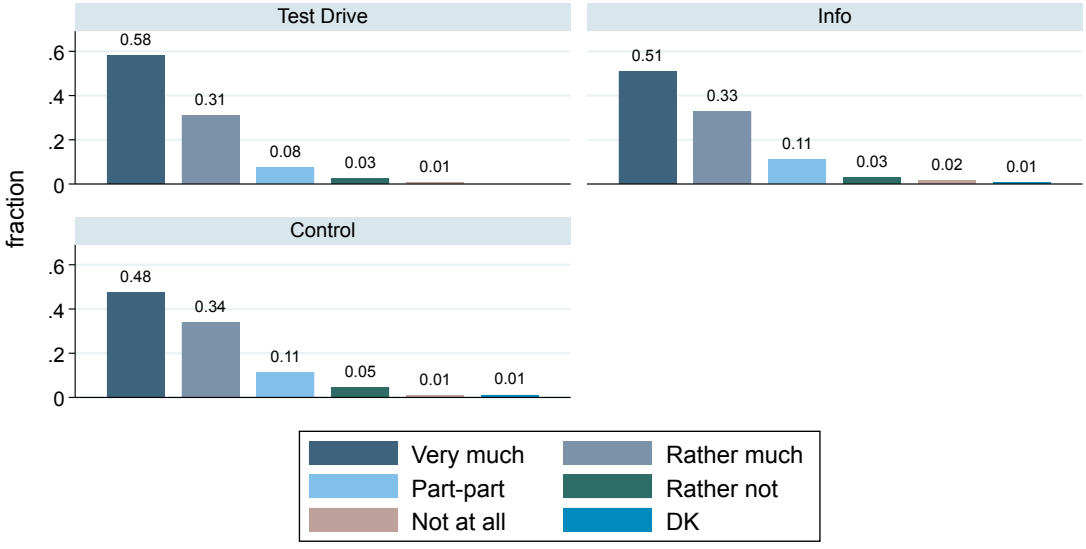
As stated above, the perception of environmental impacts, is similar for car treatment and control group. It is slightly (but statistically significant) better for the information treatment group, see Figure 17. 40 % of the information treatment group perceive the environmental impacts of electric cars less than that of conventional cars.




By received treatment,
N = 2431

Figure 17: Response to “If you are thinking about manufacturing, using, disposing of and recycling an electric car (battery-powered car only), how much more environmentally friendly or harmful do you think electric cars are compared to cars with petrol and diesel engines?”

The perception of the electric car as a mean to reduce traffic noise was also assessed. Here, the group mostly perceiving this benefit positively was the group that received test drives and information. It seems that experience (statistically significantly) matters when it comes to realizing the noise reduction potential of BEVs. Figure 18 displays the results for all three groups. We acknowledge the fact that generally, BEVs are already viewed widely as rather helpful.




By received treatment,
N = 2431

Figure 18: Response to “If you think of the sounds of electric cars (battery powered cars only) compared to the sounds of cars with gasoline or diesel engines, how helpful or unhelpful are electric cars from your point of view to reduce noise in cities and on busy roads?”

We also measured the perceived differences in attractiveness, lifestyle fit, and practicability. For these variables, no statistical significant differences could be found. We therefore provide the descriptive graphs in the appendix.

## 3.6 Treatment effects on car choice

We now turn to respondents' stated car purchase plans. Over all three experimental groups, around 60 % plan to buy a car in 2021 or later. Also, whether the next car will be an additional or replacement car hardly varies. Only between 3 and 5 % intent to purchase an additional car as their next car. Similarly, we only see neglectable differences between the three groups, when it comes to their preferred type of new car: a fabric new car, a demonstrator or one-year-old car or a used car. Figure 22 depicts exemplarily the results.

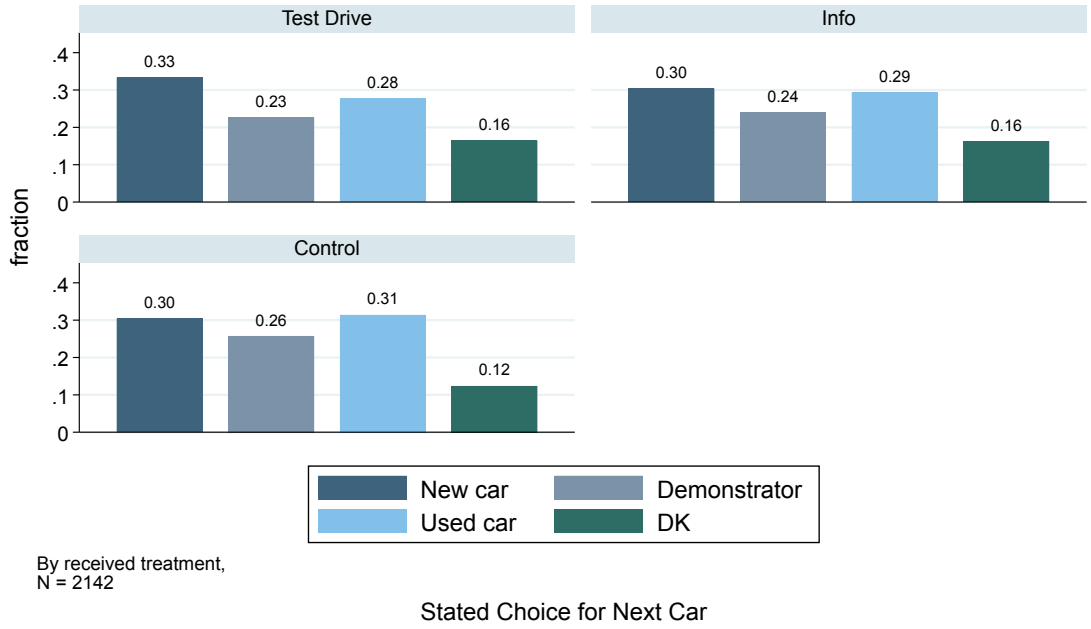



Figure 19: Response to "Will the car that you buy or lease next would rather be a new vehicle, a second-hand vehicle or a yearly/demonstration vehicle?"

Pooling all respondents' stated car purchase plans in terms of drivetrain choice, the modus (29 %) wants a gasoline car next. Additionally, 20 % state they want to buy a plug-in hybrid electric vehicle and 18% intent to buy a battery electric vehicle. However, by treatment group, these figures vary. In the group, that did a test-drive, 27 % plan to buy a BEV next, while it is only 17 % in the other two groups (see Figure 20). Also, test-drivers seem to be already (on average) much surer yet about their drivetrain preferences for their next car. In further steps, we shall examine the interplay between intended timing of purchase, new or used vehicle purchase intention and intention-to-treatment effects.

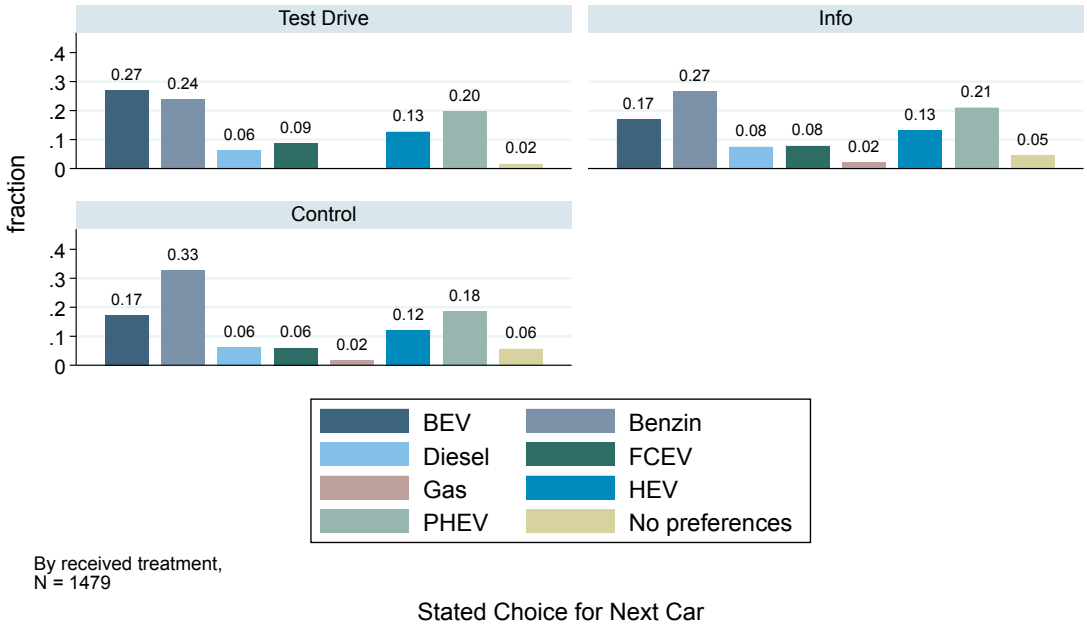



Figure 20: Response to “What will probably be the fuel and propulsion type of the car you want to buy or lease next?”

## 3.7 Treatment effects on EV policy preferences

We design several questions to understand the effect of the treatments on EV policy preferences. We mainly focus on overall policy support as well as reasons why people (dis-)approve EV policies, attitudes towards charging infrastructure development and who shall pay for these costly policies.

We directly question survey participants about their general (dis-)approval of governmental policies to foster a transition towards more electric cars on Swiss roads. This direct question reads as follows: “Are you in favour of or against the state taking measures to encourage the Swiss population to switch from petrol and diesel cars to electric cars (exclusively battery-powered cars)?” The question had to be answered on a scale from “Very convinced for it”, over “For it”, “Rather for it”, “Part-part”, “Rather against it”, “Against it”, to “Very convinced against it” and allowed for a “Do not know” option.

Overall, 55 % of respondents answer positively on this question, they are either “very convinced for it”, “for it”, or “rather for it”. While we see slightly more support in the information treatment group, and the test driving treatment group, we do not find statistically significant more support in comparison to the control group. Figure 21 graphically represents the results split by treatment group. As the figure shows, in the car treatment group there are 58 % generally in favour of EV policies, in the information group it is 56 %, while it is 52 % in the control group.

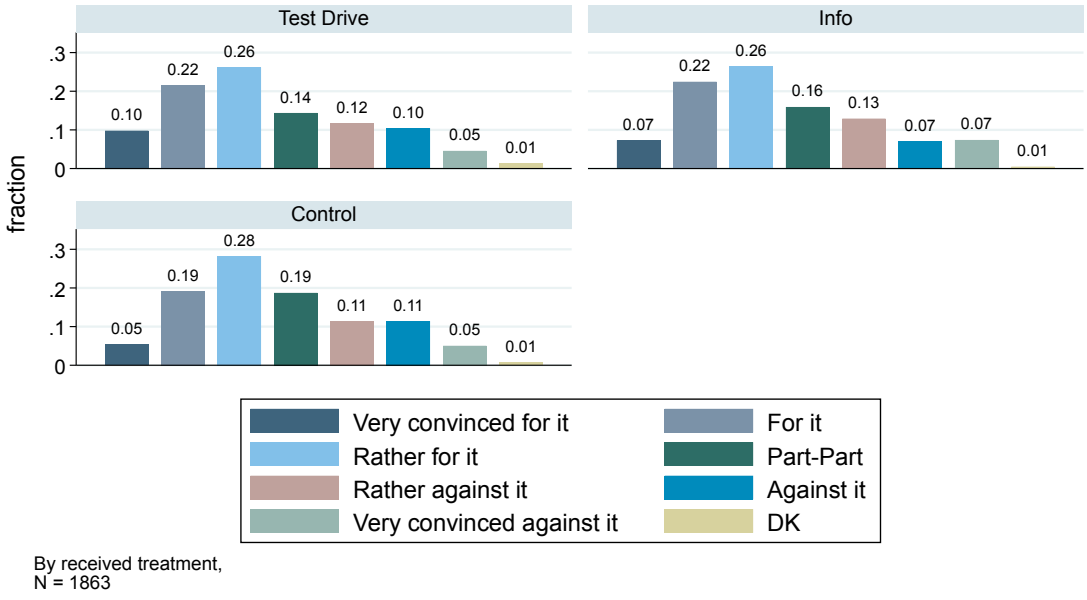



Figure 21: Response to "Overall, are you in favour or against the government taking measures to encourage the Swiss population to switch from petrol and diesel cars to electric cars (battery-powered cars only)?"

To get a deeper understanding of these policy preferences, we try to grasp what closely aligns with respondents' opinions on EV subsidies. We know from results, discussed in last year's annual report as well as in our working paper (Brückmann and Bernauer 2019), purchase subsidies receive relatively low support. Therefore, we offered several statements about the approval or disapproval of EV purchase subsidies, and asked respondents which of the following statements most closely represented their opinion offering the following options:

o Government contributions to the purchase of an electric car are to be endorsed, as they are in line with environmental protection.

o Government contributions to the purchase of an electric car are to be rejected, since they distort the market.

o Government contributions to the purchase of an electric car are to be endorsed, as they have higher acquisition costs of electric cars in comparison with gasoline and diesel cars level.

o Government contributions to the purchase of an electric car are acceptable only if they benefit households that own exclusively electric cars.

o Government contributions to the purchase of an electric car should be rejected, as richer households would tend to benefit from this.

o None of these statements

o Do not know

All respondents taken together mostly answered (27 %) that these subsidies should opposed as they have the potential to distort the market. 24 % of all respondents were in favour of them due to environmental reasons. While additionally 18 % approve them, in order to reduce the price gap between conventional cars and EVs, an additional 7 % approve those subsidies only when exclusively directed to households that only have EVs. In general, the results do not vary statistically significant by treatment group. Figure 22 depicts the results.

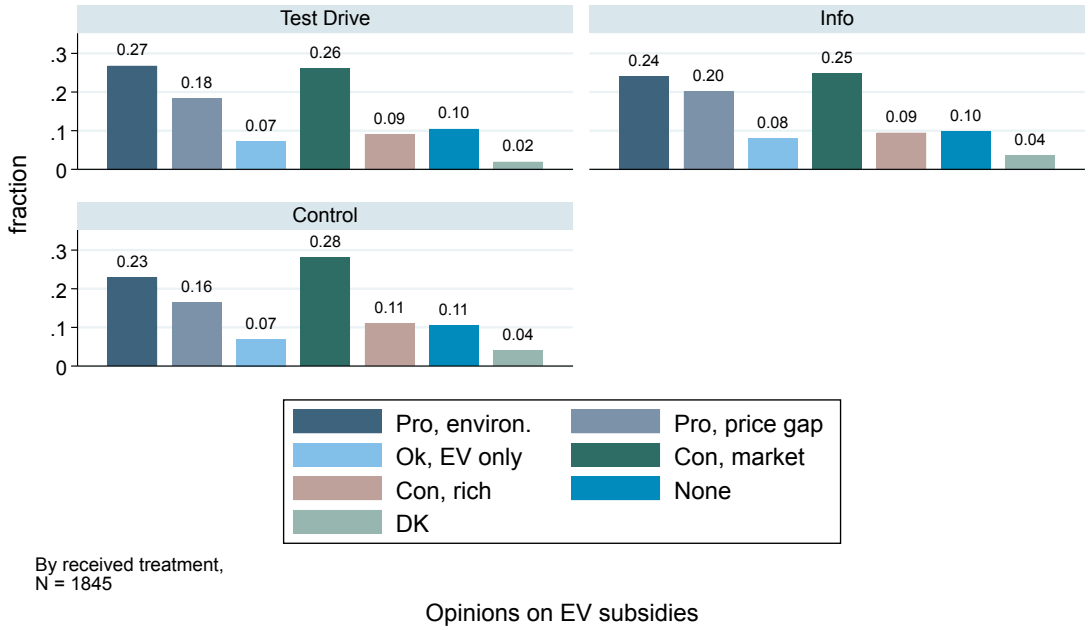



Figure 22: Response to “Which of the following statements do you most agree with?”

When it comes to investments in recharging infrastructure, respondents are more supportive. Our results from the question in this regard show that our respondents, especially the test drivers, very much would approve governmental support for recharging infrastructure. Figure 23 shows the answer to a question, how the recharging network should be developed. Differences between treatment groups are not statistically significant. Again, we asked respondents which statement they agree most with. The following statements were offered:

o The construction of publicly accessible charging stations for electric cars should be left completely to free competition (market or private sector).

o The state should support the construction of charging stations for electric cars.

o The state should fully take over the construction of charging stations.

o Don't know

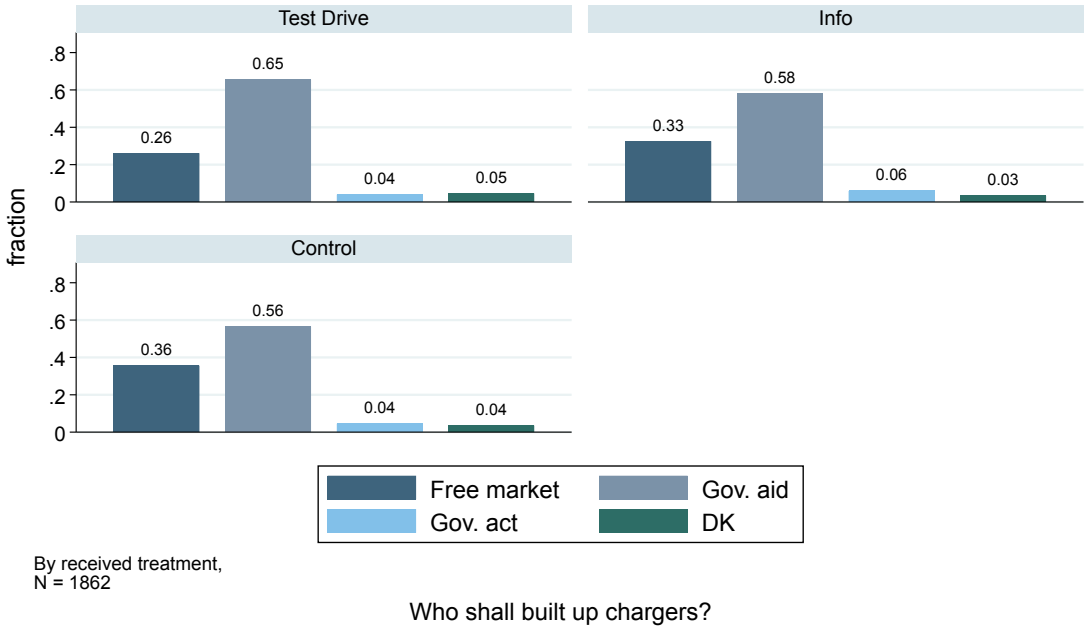



Figure 23: Response to “Which of the following statements do you most agree with?”

Lastly, we directly asked respondents who should pay for the costly electric vehicle policies. Tax payers, car owners, or ICEV owners. Again, we allowed for “don’t know”. Overall, 50 % of respondents are in favour that car owners pay for these polices. 31 % are in favour of making all taxpayers pay for it, while only 11 % want ICEV owners to pay for these policies. Figure 24 displays the results. Again, differences between groups are not statistically significantly different from zero.

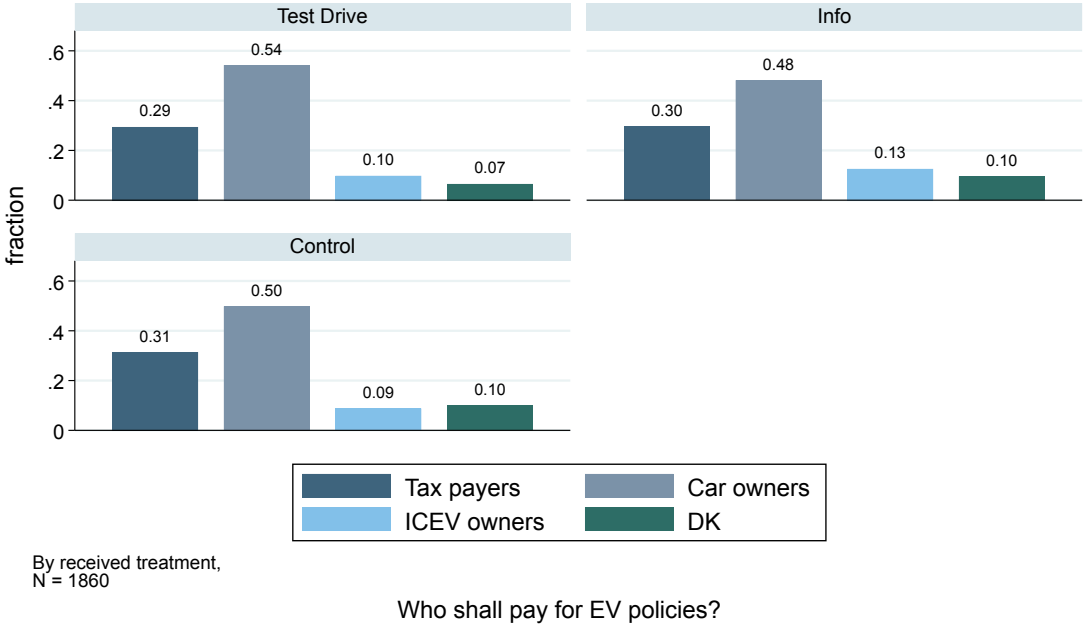



Figure 24: Response to “Who should bear the costs of the political measures that encourage the Swiss population to switch from petrol and diesel cars to electric cars?”

In addition to the direct questions, we designed a list experiment in order to find out, if individuals disapprove engagement in EV policies in general. A list experiment (or: item count technique) is a survey experiment designed for sensitive question. Those are survey questions about topics, that respondents might not want to answer (honestly). It is widely used in the social sciences, and originates from a technique to study deviant behaviour (Miller 1984). The general idea is to first randomly part the whole sample in two. Half of the sample will get allocated in the treatment group, the other half in the control group. Participants in the control group receive a certain number of non-sensitive statements, while the treatment group is receiving the same non-sensitive statements plus one sensitive statement. Instead of evaluating each statement, all respondents only state how many of all statements they agree to. If not all or none statements are agreed on by the respondent, the researchers are unable to know the individuals' sympathy with the statements. This gives an added element of privacy to the respondents. However, in aggregate, researchers know about the prevalence of the sensitive item support: The difference-in-means between control and treatment group shows the agreement to the sensitive question (Aronow et al. 2015).

| **Control Group** | **Treatment Group** |
|---|---|
| At least three to four women should sit on the Federal Council. | At least three to four women should sit on the Federal Council. |
| The Swiss military need new fighter planes. | The Swiss military need new fighter planes. |
| Foreigners should be given the right to vote and be elected at community level. | Foreigners should be given the right to vote and be elected at community level. |
| All Swiss nuclear power plants should be decommissioned within 10 years. | All Swiss nuclear power plants should be decommissioned within 10 years. |
| Companies should pay less tax in Switzerland. | Companies should pay less tax in Switzerland. |
| | It is wrong for politics to promote electric cars. |
| **Average: 1.82** | **Average: 2.08** |

Table 1: List Experiment Items

In the control group, see Table 1, we observe on average 1.82 supported items, while it is 2.08 in the treatment group. That is, the sensitive item "It is wrong for politics to promote electric cars." is only agreed on by 26 % of respondents. However, this difference is not statistically significant. We argue this is due to several factors: It might just not be regarded as inherently wrong for politics to promote electric cars. Or the item is not sensitive. Lastly, it could be that respondents did still report wrongly.

# 4 Evaluation of results to date

In this report we provide very preliminary results from a randomized controlled trial experiment. We provide first results, that should be handled with great care. We mainly show descriptive results, and mention inferential statistics, only were necessary and carried out by the time of writing this report.

Interestingly, the three first comprehension check questions (see Section 3.3), do not form a single factor. Apparently, people remembered some of the information, but all three are rather unique. We will try to understand what drove this finding in future research.

The test drive treatment altered different attributes more than did the information (only) treatment. This can be observed in Section 3.5. Apparently, noise reduction potential was realized during the test drive, though people from this experimental group rated it highly positive. The environmental benefits were valued rather positively by the respondents from the group that only received information. This hints towards a good understanding of environmental benefits of electric cars. How this differences in altered perceptions translates to choice for the next cars' drivetrains (Section 3.6) remains open for further research.

From the direct policy questions, we fail to establish a statistically significant change depending on the treatments (see Section 3.7). This hints toward the fact, that maybe policy preferences are rather independent from our treatments. They might be formed beforehand and not altered so easily. In the next steps, we aim at analysing this using covariates, such as political and attitudinal covariates we gathered in the baseline survey.

# 5 Next steps

In the near future, we aim at finalising current working papers out of this project (Brückmann and Bernauer 2019; Brückmann, Willibald, and Blanco 2019) and sending them to journals for peer-review. We also will work on drafting working papers, with data presented in this report. We are especially interested in the effect of the two treatments on car purchase and policy preferences. In later stages of the research project, our results will include also moderation effects, intention-to-treatment effects as analyses of treatment heterogeneity .Especially on the paper we plan to write about EV policy preferences the data from the conjoint stated-choice experiment needs to be analysed and taken into account.

Besides that, we plan the last survey wave in this panel, which will be fielded will be in early 2020. We aim at examining whether the current treatment effects are stable over time. We intent to see whether this differs by treatment received and also will measure revealed preferences on EV adoption (i.e. we look whether our survey respondents made EV purchases).

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# 7 Appendix

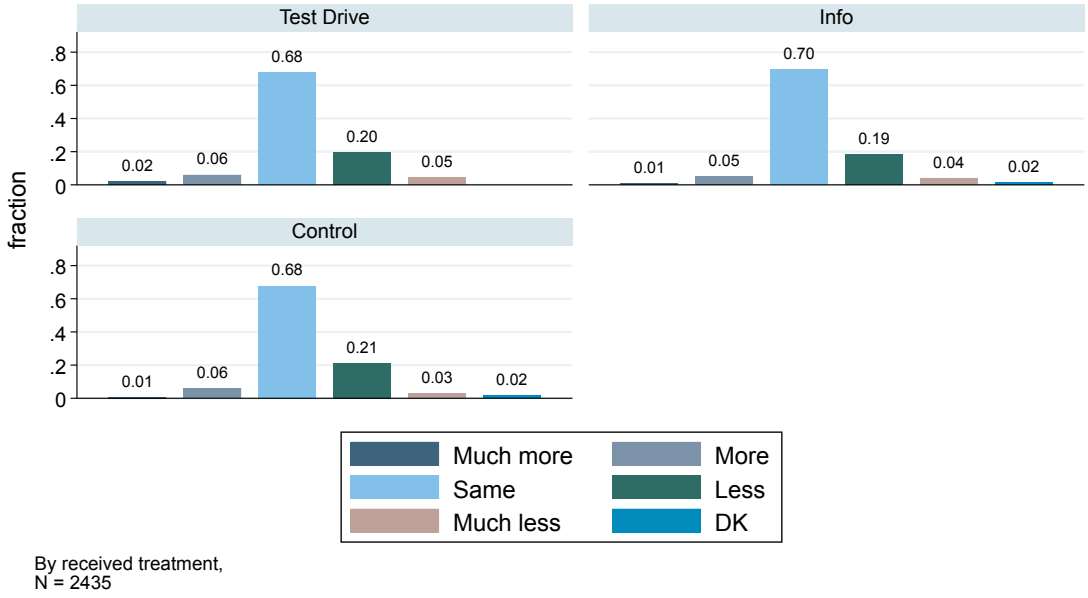
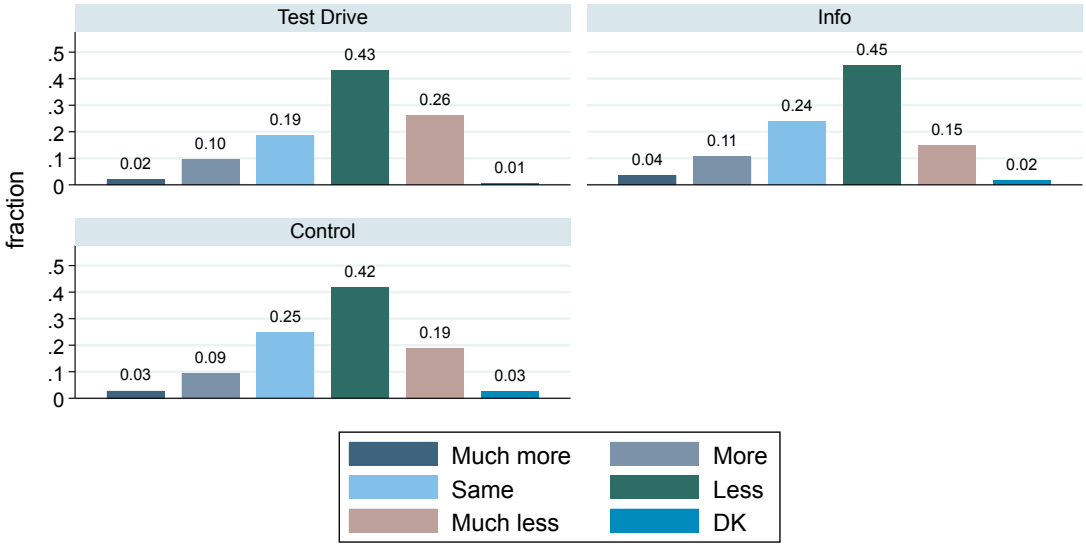



Figure A1: Response to "If you think of the electric cars (battery powered cars only) that you have already seen, how attractive or unattractive do you find them to be? How do you evaluate the design (look) of electric cars compared to cars with gasoline or diesel engines? Electric cars are … (much more attractive… much less attractive)."


By received treatment,
N = 2430

EV lifestyle fit

Figure A2: Response to “How good or bad would an electric car (battery powered car only) suit you as a person and your lifestyle?”




By received treatment,
N = 2434

EV practical compared to ICEV

Figure A3: Response to “If you think about your everyday life and your needs, how practical or impractical would it be for you personally to charge an electric car (battery powered cars only) compared to filling a car with a petrol or diesel engine? Charging electric cars (battery powered cars only) is/would be … (much more practical… much less practical).”