What drives public support for policies to enhance electric vehicle adoption?

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Abstract
Decarbonizing the transportation sector is crucial to limiting global warming, but faces severe political feasibility challenges due to widespread opposition by those who incur the costs. With respect to private motorized vehicles, which account for the largest share of emissions from transportation, various studies show that pull measures, such as subsidies for electric vehicles (EVs) and charging infrastructure, attract more public support than push measures, such as carbon taxes or regulation to phase out fossil fuel cars. Based on a choice experiment with a large, representative sample (N = 5325) of car holders in Switzerland, we reassess and add to these findings. We empirically focus on Switzerland because its newly registered cars have the worst emissions record in Europe. First, we reassess the presumably stronger support for pull measures by studying whether such support is (negatively) affected by revealing the cost implications in terms of means for funding these policy measures. Second, a unique feature of our study is that we examine support for policies to promote EVs both amongst non-EV and EV holders. Our hypothesis is that EV holders are likely to be more supportive of such policies, even when cost implications become apparent. Our key finding is that support for pull measures, which is high amongst non-EV holders, and even higher amongst technology adopters (EV holders), remains stable even when policy funding is revealed. This suggests that more ambitious pull measures in this area are politically feasible, even more so as the share of EV-adopters increases. Our research also provides a methodological template for similar research in other countries.

1. Introduction
The transportation sector is currently one of the largest contributors to global CO₂ emissions (Abergel et al 2017) and accounts for around 14% of total anthropogenic greenhouse gas emissions (Intergovernmental Panel on Climate Change 2014). Decarbonizing transportation poses enormous challenges (Rogelj et al 2015, Schellnhuber et al 2016, Rockström et al 2017), such as replacing internal combustion engine vehicles with vehicles that do not rely on fossil fuel, such as battery electric vehicles (EVs) in conjunction with energy from renewable sources (Ajanovic and Haas 2016). This is widely regarded as indispensable and technically feasible, but also very difficult to achieve politically because conventional cars are widely considered convenient, fast, offer privacy and luggage space, and are regarded as a status symbol (Gärling and Schuitema 2007).

Global comparisons of EV adoption rates show that such adoption, for the time being, hinges strongly on policy interventions (Green et al 2014, Curtin et al 2017, Hardman et al 2017, Lévay et al 2017, Hardman 2019). Current EVs adoption rates are generally low in countries with no or weak policy interventions in this area, and higher in countries with strong policies (Sierzchula et al 2014, Hardman 2019, Rietmann and Lieven 2019), which suggests that policy interventions can contribute to changing behaviour (Tummers 2019). Policy interventions include tax...
rebates, purchase subsidies, parking space privileges, or exceptions from road or car ferry prices, but also disincentives concerning the purchase of combustion engine cars (feebates, bans).

Government intervention is usually justified for the purpose of promoting technological innovation aimed at reducing negative externalities (such as emissions from conventional cars) (Sierzchula et al 2014). The absence or weakness in many countries of policies to promote EV adoption also suggest that implementing such policies is far from easy. The main obstacle, arguably, is opposition by those parts of society that are or would be incurring high costs, and in particular owners of conventional vehicles. In view of the fact that public support is quintessential to the political feasibility of policy interventions (Page and Shapiro 1983, Wezien 1995, Anderson et al 2017, Schuijtema and Bergstad 2018), it is quite surprising that only few studies (Huber et al 2019, Wicki et al 2019a, 2019b) have, thus far, examined public opinion with respect to EV policies.

In general terms, the literature suggests different ways for reducing externalities (in our case air-pollution, noise, and CO₂ emissions caused by fossil-fuelled vehicles), notably (Pigouvian) taxes, subsidies, and regulation. From a purely economic viewpoint, the effectiveness and efficiency of different policy instruments may be similar, depending on their design. But they are likely to vary in terms of their political feasibility, proxied by public opinion, which is our primary focus here. Existing research shows that policy interventions to disincentivise specific behaviours are usually quite unpopular (e.g. Tobler et al 2012, Sørensen et al 2014, Stadelmann-Steffen and Dermont 2018). Those interventions are usually called push measures (e.g. fuel taxes, road pricing). In contrast, policy interventions to incentivize desired behaviour, often called pull measures, tend to attract considerably more public support. Cherry et al (2012), e.g. find that public support for subsidies that correct for an externality is greater than support for taxes (see also Leiserowitz et al 2011). Rhodes et al (2017) show that pull measures, such as subsidies for purchasing low-carbon technologies, receive more support than taxes to discourage the purchase of carbon-intensive technology. Steg et al (2006) also find that pull measures (e.g. subsidies) enjoy more public support.

Higher levels of public support for pull measures or incentive-based policies (e.g. subsidies) are usually explained in terms of their voluntariness, (low) perceived costs and (high) perceived benefits. Pull measures are voluntary in the sense that they make the incentivized behaviour relatively cheaper (or otherwise more attractive) without limiting or eliminating the alternative choice of ‘undesired’ behaviours. Pull measures’ perceived costs also tend to be lower. Perhaps unsurprisingly, subsidies are preferred over taxes and regulations, even though subsidies also incur costs that are borne by taxpayers, citizens, and voters (Cherry et al 2012).

We examine whether support for pull measures decreases when the policy funding is revealed. We focus on two types of seemingly popular but costly pull measures for EVs: purchase subsidies and charging infrastructure expansion. Subsidies as well as charging infrastructure are regarded as key to enhancing EV uptake (Sierzchula et al 2014). Both policy measures are voluntary, in the sense that they are not directly disincentivizing the use of conventional cars. Another pull measure that we also study, information requirements on cars’ energy consumption, is a less costly pull measure.

In a stylized economic market model, (efficient) forms and levels of policy interventions can be identified by researchers. In the real world, citizens and voters take different types of policy interventions (e.g. amounts of subsidy) into consideration when forming policy preferences and shaping policy-choices. These choices may, and often do, deviate from the market-equilibrium internalizing the externality. After all, in democracies voters have an indirect (via elections) or direct (via referenda) say when it comes to enacting and implementing particular policies.

Real-world policy interventions often come in the form of sets of policy instruments, rather than a single policy instrument in isolation (Wicki et al 2019a). Our study design mimics this by identifying preferences with respect to policy proposals consisting of several policy instruments. Specifically, we rely on a conjoint experiment in which car holders (with and without EV) evaluate different policy options for promoting EVs.

Switzerland, in which we sampled the car holders for our experiment, is an interesting case for such a study for several reasons. A high share of the country’s electricity is already from renewables (mostly hydro-power) and the government is planning to replace all remaining non-renewable energy sources, including nuclear energy, with renewables by 2050 (Swiss Federal Office of Energy 2018). This would increase the environmental benefits from EV use (Ajanovic and Haas 2016). EV purchase decisions are endogenous to our experiment and are influenced by many factors, such as perceived performance, environmental attitudes, views on technology, prestige, risk, socio-demographics, as well as cost-benefit-considerations (Higgins et al 2012, Smith et al 2017). Currently, EV adoption rates in Switzerland are very small: only 1.7% of new car registrations in 2018 (Swiss Federal Office of Energy 2019) were (pure) EVs, despite Switzerland’s high GDP/capita (IMF, International Monetary Fund 2018) and generally strong pro-environmental attitudes (Franzen and Vogl 2013) and support for renewable energy (Plum et al 2019). This appears paradoxical because high income and environmental attitudes are usually regarded as being positively related to EV adoption (Sierzchula et al...
2014, Brückmann et al 2019). Moreover, EV adoption should also be facilitated by cost-parity between EVs and conventional cars, which can be reached after 30 000-65 000 km of usage (Bloomberg 2019, Swiss eMobility, 2019).

The remainder of the paper is structured as follows. First, we review the current literature and highlight theories that are central to our arguments and hypotheses. Thereafter, we outline the study design, present the results, and discuss their implications.

2. Theory and empirical expectations

In view of the important role public opinion plays in shaping environmental policy choices (Anderson et al 2017, Bakaki et al 2019, Huber et al 2019, Marquart-Pyatt et al 2019), many studies have examined the determinants of public support for particular types of environmental policies. And some have done so with respect to policies for promoting electric vehicles. Several studies (e.g. Steg et al 2006, Bjerkan et al 2016, Rhodes et al 2017) show that pull measures enjoy more public support than push measures (Drews and van den Bergh 2016; see also De Groot and Schuitema 2012, Harrison 2010, Wicki et al 2019a, 2019b). The underlying theoretical logic is that pull measures are less coercive and reduce the costs of the desired, environmentally friendly behaviour (Steg et al 2006). Our first hypothesis reflects this argument.

H1: Pull measures enjoy more public support than push measures.

Existing evidence shows that car purchase subsidies for EVs, a prominent pull measure, are quite popular in Switzerland (EBP 2016), our country of study. Yet, results of a laboratory study show that receiving information about the cost implications of such subsidies might affect public support (Heres et al 2017). This suggests that support for pull measures may result from a lack of attention to societal cost-societal costs. Kallbekken and Aasen (2010), for instance, argue that citizens express rather strong support for government subsidies because of a ‘fiscal illusion’ (for more details on this, see SI 1 (available online at stacks.iop.org/ERL/15/094002/mmedia)). Fiscal illusion means that people systematically underestimate the costs of public services and that, therefore, demanded public spending exceeds the willingness-to-pay for it (Winter and Mouritzen 2001). Harrison (2010) describes this issue in terms of the indirect and less visible nature of costs for consumers that will not provoke electoral opposition. Not only information about the amount of costs but also attention payed to costs may explain the ‘fiscal illusion’ (Baekgaard et al 2016). In our study, we focus on salience of the funding of costly pull measures.

Heres et al (2017) propose that subsidies receive more support due to uncertainty about the budgetary process. Receiving subsidies is deterministic, because a pre-defined condition implies eligibility. For example, everyone buying an EV could obtain a purchase subsidy. At the same time, it is uncertain ex ante how the government will collect the funds for the subsidy. One option here could be shifting the financial burden to future taxpayers. This (un)certainty contrasts in particular with Pigouvian taxes: paying them is deterministic, whereas if and how collected taxes will be returned to voters is uncertain. Loss aversion (Tversky and Kahneman 1991) thus helps explain support for subsidies (Heres et al 2017) when evaluations are based on personal gains and losses depending on a proposed policy.

Hence we argue that obtaining more information on funding diminishes the fiscal illusion (and hence the uncertainty) concerning pull measures. Hypothesis 2 reflects these arguments.

H2: With information on how policy interventions would be funded, support for pull measures decreases and the difference between support levels for pull and push measures diminishes.

We also expect some differences between the preferences of conventional car and EV holders regarding EV policies. Their tastes for policy are likely to differ for several reasons.

First of all, these two populations differ from another in several ways (Axsen et al 2016, Westin et al 2018, Brückmann et al 2019). EV holders are more familiar with the technology and its (societal) benefits because of their own experience. Current users, already voluntarily, in the absence of strong political interventions, decided to adopt it. Second, the costs of behavioural change in the direction of politically incentivized behaviour are lower for EV users (Diekmann and Preisendörfer 2003, De Groot and Schuitema 2012). Finally, self-serving bias implies that people tend to support policies appearing beneficial for themselves (Caplan 2007). This is likely to be the case with policies to promote new charging infrastructure.

Taken together, these arguments (familiarity, lower behavioural costs, and self-serving bias) can be summarized in Hypothesis 3:

H3: Technology adopters (EV holders) are more supportive of push and of pull measures than non-adopters (non-EV holders).

3. Study design

3.1. Sampling and data collection

To test the above arguments, we rely on original survey data. The survey was fielded to a random sample of car holders in the German-speaking Swiss Cantons of Aargau, Schwyz, Zug, and Zurich. 2 5000 non-EV car holders were randomly selected in each canton (20 000 in total), plus all EV-holders in these cantons.

2This selection is justified in more detail in the SI 2.
Table 1. Conjoint attributes and attribute values.

| Attribute                                                                 | Attribute values (one of each is randomly assigned) |
|---------------------------------------------------------------------------|-----------------------------------------------------|
| **Charging infrastructure provision** for electric vehicles at public parking spaces | • 100 out of 1000 parking spaces  
• 10 out of 1000 parking spaces  
• 1 out of 1000 parking spaces  
• No new additional charging infrastructure |
| **Purchase subsidy** for new electric vehicles                             | • Subsidy of 5000 CHFa  
• Subsidy of 3000 CHF  
• Subsidy of 1000 CHF  
• No subsidy |
| **Information requirements** on fuel consumption, CO₂ emissions, and energy efficiency of cars (e.g. energy labels, information in advertisements and sales brochures) | • Stricter information requirements: energy labels must show additional fuel consumption data from real driving and visibility must be increased  
• Abolish current information requirements on fuel consumption, CO₂ emissions, and energy efficiency of cars  
• Maintain current information requirements: energy label attached to newly sold cars |
| **Registration of highly fossil fuel consuming cars** (above 7 l of gasoline/diesel per 100 km) | • Forbid registration from 2020 onward  
• Allowed |
| **Funding** of these measures (only randomly displayed to half of the respondents) | • Price increase for motorway vignette from 40 to 100 CHF  
• General federal budget with an increase in income taxes  
• Fee (malus) of CHF 4000 when purchasing a car with gasoline/diesel engine  
• General federal budget without an increase in income taxes (savings in other areas of the budget)  
• No additional fundingb |

aNote: 1 CHF (Swiss Franc) is approx. 1.03 US Dollar or 0.94 Euros (as of February 2020).  
bShown if and only if the policy proposal jointly included «No additional charging infrastructure» and «No subsidy». When these two attribute values were displayed jointly, funding was always «No additional funding». This is the only restriction in this fully randomized conjoint design, see SI 5. The information in this table footnote was not displayed to respondents.

The total was 22,627 survey invitees. The four cantonal car registries randomly sampled and provided the postal addresses.

5325 invitees completed the survey, which included a choice experiment (see below), yielding a (The American Association for Public Opinion Research 2016) response rate of 23.5%. The survey was fielded between May 22, 2018, and October 2, 2018. In the SI, we discuss to what extent our sample represents the entire population of car holders (SI 3), describe in detail the survey flow (SI 4), and show the survey instrument (SI 8). The study was approved by ETH Zurich’s ethics committee (decision EK 2017-N-85).

3.2. Choice experiment

For the experiment, we used a two-step design (Sen 2017, Kirkland and Coppoock 2018, Beiser-McGrath and Bernauer 2019). We first randomly assigned study participants to two groups: one received information in the choice experiment on how pull measures will be funded, the other group received no such funding information. In the conjoint choice experiment (Hainmueller et al 2014) study participants then had to express their preferences with regards to policy options consisting of specific sets of policy measures (attributes). The list of attributes is shown in table 1.

The conjoint experiment started with an overview of all attributes and all potential values (levels) of these attributes (table 1). The first four attributes shown in table 1 include three pull (charging infrastructure, purchase subsidy, information/energy labelling requirements) and one push measure (phasing out cars with high fuel consumption via new registration rules). Since our emphasis is on understanding how cost information affects support for pull measures we decided to include more pull than push measures in the experiment while using a limited number of attributes in order to minimize the cognitive burden on participants, so as to obtain meaningful responses. The fifth attribute in table 1 concerns funding. As noted above, study participants were randomly assigned to choice experiments that always included or always omitted this attribute. The choice of this method is justified in more detail in SI 6.

Our experimental design randomly exposes study participants to sets of treatment conditions in terms of a combination of four (or five, including funding information) variables whose values are
experimentally manipulated. These attribute values were randomly allocated. For every policy measure (attribute) the status quo is one possible attribute value, e.g. no new chargers. This allows participants to compare each proposed attribute value to the status quo. Displaying random attribute values allows us to estimate the causal impact of these treatment conditions on the outcome (dependent variable) of interest, i.e. policy preferences. The latter are captured through a binary choice (whether policy option A or B is preferred) and a 7-point Likert scale. Two side-by-side policy proposals each had to be rated in five choice tasks (leading to 10 policy proposals evaluated per participant). Figure 1 illustrates one of these choice tasks with two exemplary policy proposals. The order of attributes was randomized per participant, and then held constant across the five choice tasks to limit the cognitive burden.

The decision to use a stated-preference conjoint experiment, with binary choice and rating, for this research is motivated by two considerations. First, respondents face a trade-off, as the forced choice between two alternative policies implicates ‘costs of foregone alternatives’. Second, ratings of each proposed policy, irrespectively if chosen or not, provide further, more nuanced information (see also Hainmueller et al 2015).

In terms of sample size, this setup generates a maximum of $N = 53 \times 250 \times 5325$ respondents $\times 2$ policy proposals $\times 5$ choice tasks. The data is clustered on individuals, as each participant performs five choice tasks. Omissions due to item non-response occur. We use OLS$^3$ to estimate the coefficients of the average marginal component effects (AMCEs) and marginal means (Leeper et al 2019). We report only marginal means as they display the rate at which the dependent variable (i.e. policy proposals’ choice probabilities or ratings) changes with a change in the independent variable, holding the other predictor variables at a constant level. They directly result from AMCEs. Support for policy proposals serves as the dependent variable and different experimentally manipulated policy attributes serve as the independent variables. We estimate the following two equations, where variables are labelled and ordered according to the description in table 1 and figure 1 above:

$^3$Hainmueller et al (2014) show that OLS is an appropriate estimator for the AMCE and produces very similar estimates compared to binary logit or probit.
Charging infrastructure provision at parking spaces
EV purchase subsidy
Car information requirements
Registration of highly fossil fuel consuming cars

Figure 2. Marginal means for binary choice between policy proposals. Non-EV holders who did not receive any information on policy funding (subsample of n = 1897). The bars represent 95% confidence intervals. The dashed line marks a 50% policy choice probability.

\[
\text{Choice} = \beta_0 + \beta_1 \text{Chargers} + \beta_2 \text{Subsidy} + \beta_3 \text{Information} + \beta_4 \text{Registration} + \varepsilon
\]

\[
\text{Choice} = \beta_0 + \beta_1 \text{Chargers} + \beta_2 \text{Subsidy} + \beta_3 \text{Information} + \beta_4 \text{Registration} + \beta_5 \text{Funding} + \varepsilon
\]

4. Results

First, we look whether our data, when policy funding is omitted, supports the hypothesis that pull measures receive more support than push measures. Therefore, we only look at respondents who did not receive any information on policy funding and focus on conventional car (non-EV) holders (the results for EV holders are discussed further below). Figure 2 displays policy support in terms of marginal means for different levels of policy attributes for the binary choice between two alternatives. Marginal means describe the level of support for a specific attribute level, all else equal. For the binary choice, this can be interpreted as the probability that a participant chooses a proposal given the respective policy attribute level is included (Leeper et al. 2019).

As shown in figure 2, respondents clearly prefer more charging infrastructure (58% and 59% choice probability all else equal, for 10 and 100 chargers per 1000 parking spaces, respectively). This charger density is very high and far more than currently installed in Switzerland. Installing no or very few
Figure 3. Marginal means for binary choice between policy proposals (non-EV holders, subsample of n = 3768). Filled triangles indicate that funding was displayed, empty triangles indicate that funding was excluded. The bars represent 95% confidence intervals. The dashed line indicates a 50% choice probability.

new chargers results in support levels of less than 0.5, indicating opposition. These results show that even non-EV holders, who currently do not benefit from charging infrastructure, strongly prefer more charging infrastructure and strongly oppose maintaining the status quo (no new chargers). Another pull measure, purchase subsidies, receives considerably less support, which is rather surprising in view of previous research. Only small subsidies of CHF 1000 are viewed positively (52% choice probability), as they are preferred over the status quo (no subsidy). The third pull measure, information provision such as energy labels, is viewed positively in its current form (status quo) and stricter information requirements have a positive effect (55% choice probability) on policy support. Completely abandoning information requirements and energy labels induces rather strong opposition (42% choice probability).

As to push measures, there is only a minor difference between still allowing (51%) and banning (49% choice probability) high consumption fossil fuel cars. Given that banning new registrations for highly-emitting cars is a rather strong push instrument, this level of support is surprising.

With respect to Hypothesis 1, our results thus show that pull measures are viewed positively, and more positively than push measures. The main caveat, however, is that we included only one fairly radical
push measure in the experiment because we are interested mainly in examining whether funding information affects support for pull measures. The next step in the analysis then is to examine whether revealing costs and funding reduces support.

Figure 3 summarizes the results for conventional car holders, differentiated by treatment status (funding information hidden or revealed). Funding information is revealed when the triangle on the bars in the figure is filled, and hidden when the triangle is outlined. Figure 3 again displays marginal means (interpreted as choice probabilities, all else constant) for each policy attribute level.

Starting with the first attribute category, recharging infrastructure, we observe that providing no or only very few new chargers becomes somewhat more popular when funding is revealed but support for no or only few new chargers is still low (e.g. 35% to 38% choice probability for no new chargers, confidence intervals do not overlap). For higher levels of new charging infrastructure provision, we observe no significant difference when funding is revealed, and support levels remain very high (from 58% to 57% choice probabilities). This result is very surprising and indicates strong and robust support for policies providing for a large-scale expansion.
of charging infrastructure irrespective of funding hidden or revealed.

As to purchase subsidies, somewhat surprisingly we observe less support for the baseline of no subsidy when funding is omitted (50% choice probability) compared to when funding is revealed (52%), though the difference is insignificant. New subsidies are always slightly more supported when funding is revealed, but the differences are insignificant. These findings indicate that there is robust, but not very strong support (51% and 52% choice probability when financing is revealed) for purchase subsidies in the order of CHF 1000 - an amount substantially lower than governmental subsidies currently in place in the neighbouring country Germany or the neighbouring canton of Thurgau (2020)\textsuperscript{5}, for instance.

With regard to the third pull measure, vehicle energy information requirements, we observe no significant differences between the two funding information conditions. This result is less surprising than the results for chargers and purchase subsidies, because the cost implications in terms of government spending are probably much smaller and study participants may have noted that. The same holds for

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure5.png}
\caption{Binary choice between policy proposals (all car holders with funding revealed, \( n = 2442 \)) with different attribute. Green circles refer to EV holders (\( n = 571 \)), while purple triangles refer to other car holders (\( n = 1871 \)). The bars represent 95\% confidence intervals. The dashed line is 50\%.}
\end{figure}

\textsuperscript{5}Thurgau (2020) provides CHF 3500 in 2020.
the push measure, regulation of high consumption fossil-fuelled cars. Overall, these findings provide no support for Hypothesis 2, which holds that revealing information on funding reduces policy support. SI 7 provides additional results using the policy rating variables. As can be seen there, the results are very similar to the results for the choice variables reported above.

We now take a brief look at the findings for the funding attributes, though they do not directly speak to Hypotheses 2 but are interesting from a policy perspective. The non-EV holders prefer funding via the general government budget (implying savings in other policy areas) (55% choice probability) or via increasing the price on the usage permit (‘vignette’) for Swiss highways (58% choice probability) rather than increasing income tax to fund proposed policy interventions. Respondents are ambivalent about imposing a new lump-sum tax on the registration of fossil-fuelled cars for this purpose. Note, that not providing any new funding cannot be interpreted directly as it is only displayed in the case where no new chargers and no purchase subsidies are proposed.

We now move to the analysis of the subsample of EV holders and compare the findings to those for non-EV holders (Hypotheses 3). In contrast to the findings presented so far, the comparison presented here does not reflect causal effects because we did not experimentally manipulate car ownership; hence there might be underlying variables that affect drive-train choices as well as policy preferences. Figures 4 and 5 shows that, overall, EV holders are more supportive of pull measures, notably with respect to (higher) purchase subsidies and (more) charging infrastructure. Similarly, they dislike no subsidy and no new chargers even more than non-EV holders. Moreover, they are more supportive of the push measure, banning fossil-fuel cars, relative to non-EV holders (58% vs. 49% choice probability for both funding treatment categories). From figure 5, when funding is revealed, we also observe that they prefer the push measure (malus for inefficient cars) much more than current fossil-fuelled car holders. Currently, EV ownership in Switzerland is still very diverse, especially in view of different types of BEVs and regarding second car ownership among EV owners. We implemented two additional sample stratifications to assess whether owning a non-BEV car in a BEV household or having a long-range Tesla BEV (Hardman et al 2016, Webb et al 2019) changes policy preferences. In both cases, there were no statistically significant differences for these subgroups (results available from the authors on request). The above-mentioned findings clearly support Hypothesis 3, which expects more support for pull and push measures amongst EV holders.

5. Conclusion

In this paper we examine public support for, and thus the political feasibility of policy options for promoting EV adoption, both in regard to market-based pull measures (purchase subsidies, new charging infrastructure) and regulation (car-specific energy information requirements, phasing out high consumption fossil-fuelled cars). The emphasis was on studying support for costly pull measures when funding them (in different ways) is hidden or revealed. Moreover, we examined differences between EV adopters and conventional car holders in this respect.

Based on a survey embedded choice experiment with a random sample of more than 5000 car holders, we find support for the argument that pull measures attract more public support than push measures. Interestingly, however, and in contrast to what we expected, support levels do not decrease much when funding options are revealed in the choice task. Finally, in line with our expectations, we find stronger support both for pull and push measures amongst EV holders, relative to conventional car holders.

The main policy implication of our findings is that there is considerable political room of maneuver for more ambitious pull measures in this area, such as large-scale expansion of public charging infrastructure, mandatory energy information, and to a more limited extent also EV purchase subsidies. This holds even when citizens/consumers are confronted with the fact that such measures have important cost implications and need to be funded. Moreover, the fact that support levels amongst EV holders are higher implicates that aggregate support levels amongst all car holders are likely to increase with an increasing share of EV holders in the car holding population.

Additional research could focus on several issues in order to further probe into the political feasibility of pull and push policies for promoting EV adoption. First, it would be worthwhile to reassess our main findings in other countries with somewhat different EV policy settings, based on a similar study design. Examples include Australia (with virtually no policies in place in this areas (Webb et al 2019)) and Germany (with moderately ambitious such policies already in place (Federal Ministry for Economic Affairs and Energy 2020)). Second, it would be useful to include a more nuanced set of push measures alongside the pull measures we emphasized. Examples include carbon taxes or road space and parking restrictions for conventional car holders (Volbertus et al 2018). Third, it would be interesting to obtain more information on the assumptions car holders make with respect to paying at new charging infrastructure: whether they would pay (the comparatively low) energy costs for refuelling EVs or high costs (as with fossil-fuels), or whether charging an EV would even be free of...
charge. Depending on such assumptions and others that affect the anticipated total cost of car ownership, car holders’ reactions to various push and pull measures might differ to some extent. Finally, further studies could also examine how sensitive support levels are to various cost implication levels and mixes of funding options, in addition to ways of funding the costs. Besides that, as to the different preferences for technology adopters, it would be interesting to study how technology experience is causally linked to changes in technology policy preferences.

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Conflict of interest

None.

Data availability

The data that support the findings of this study will be openly available at https://doi.org/10.7910/DVN/XF0GD9 following a delay of 24 months from the date of publication.

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