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Author(s):
Huber, Robert A.; Wicki, Michael; Bernauer, Thomas

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Public Support for Environmental Policy Depends on Beliefs Concerning Effectiveness, Intrusiveness, and Fairness

Robert A. Huber*‡, Michael L. Wicki*, Thomas Bernauer*

* *Center for Comparative and International Studies (CIS) and* Institute for Science, Technology and Policy (ISTP), *ETH Zurich, Switzerland*

‡ *Political Science, University of Salzburg, Austria*

Corresponding author: Robert Huber, robert.huber@sbg.ac.at

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ABSTRACT

In industrialised countries, emissions from fossil-fuelled vehicles show little sign of abatement, with citizens' opposition to policy interventions arguably the key reason. To better understand the sources of public opinion towards particular types of policy instruments designed to reduce vehicle emissions, we focus on the perceived consequences of such instruments, notably the extent to which they are regarded as effective, fair, and unintrusive. Switzerland is the empirical focus because it lags behind neighbouring European countries. We assess public support for seven policy instruments, identified by existing literature and expert interviews. A survey-embedded experiment with a representative sample of 2034 citizens provides support for the argument that policy instruments perceived as effective, fair, and unintrusive achieve higher levels of public support. These results may help policymakers design interventions that strike a balance between political feasibility and problem-solving effectiveness.

Keywords: Public Policy Support; Political Feasibility; Choice Experiment; Transportation Policy; Policy Instruments

Introduction

Public opinion plays a crucial role in shaping the policy choices of democratic governments (Anderson *et al.* 2017). This applies particularly to policy areas where government action has direct and highly visible consequences for citizens, such as transportation. Since attitudes to private mobility are highly emotional, the capacity of governments to address vehicle emissions depends on how the public evaluates policy interventions. Here, we investigate why some policies for reducing vehicle emissions receive more public support than others.

Though focused on Switzerland, our arguments and empirical results are relevant to other industrialised countries for two reasons. First, Switzerland is among

the worst performers in Europe in terms of progress in vehicle emissions reduction (SFOE 2017). Simultaneously, like other European countries, Switzerland faces problems in reaching targets stipulated in the Paris Agreement (Canzler and Wittowsky 2016), despite robust pro-environment attitudes among the Swiss population (Franzen and Vogl 2013). Second, the Swiss political system of direct democracy allows citizens to challenge governmental policies and propose alternatives. Thus, the feasibility of policy interventions to reduce vehicle emissions directly depends on public support.

We contribute to the existing literature in two ways. First, we offer insights into support for particular policy instruments designed to reduce vehicle emissions. Policymakers may choose from different measures; nevertheless, their selection ultimately involves trade-offs between more effective, efficient, and politically feasible interventions. Joint analysis of various policy instruments can provide more detailed insights into such trade-offs. The current literature, in contrast, has a rather narrow focus, centring mainly on pricing schemes and their public acceptance (Kallbekken *et al.* 2013, Sørensen *et al.* 2014, Dreyer, Teisl, *et al.* 2015, Hansla *et al.* 2017). Second, our findings speak to broader debates such as how beliefs affect support for climate and environmental action (Bechtel *et al.* forthcoming, Bechtel and Scheve 2013, Bernauer and Gampfer 2013, Bernauer *et al.* 2014). Therefore, our findings inform policymaking in other issue areas.

We empirically measure and explain, within a unified analytical framework and empirical model, public support for seven policy interventions that could reduce vehicle emissions. We identified these policy instruments based on a literature review and expert interviews (for details, see Table A4 in the Appendix[1]):

[1] The Appendix is available at https://doi.org/10.7910/DVN/2V2LGK.

- vehicle taxes
- financial purchase incentives
- banning specific types of cars
- parking regulations (and charging stations for EVs)
- information campaigns
- road pricing
- energy labels

These policy instruments are framed either as efforts to promote electric vehicles (EV) or to reduce car emissions in general. To measure policy support, we use a choice experiment where study participants compare and rate sets of two policy proposals side-by-side, indicating the one preferred. This approach is useful for mitigating ad-hoc rationalisation and social desirability bias (Wallander 2009, Hainmueller *et al.* 2014) and distinguishing the measurement of perceived policy consequences and policy preferences. We place survey instruments measuring perceived policy consequences regarding effectiveness, fairness, and intrusiveness before the choice experiment to prevent response rationalisation.

This empirical study design adds a robust element of realism to our research by mimicking a key feature of Swiss politics; initiatives and counter-proposals. Figure 1 summarises the design. The survey was developed by the authors and fielded by Ipsos[2] in December 2017 to a representative sample of 2,034 Swiss citizens above 17 years in all three major languages used in Switzerland.

[Figure 1 about here]

[2] For more information see www.ipsos.com.

The empirical results show that perceived policy consequences explain public support for policies to reduce vehicle emissions. Policy interventions that are regarded as more effective, fairer, and less intrusive garner higher public support.

Existing literature

We speak to two different strands of literature: the broader literature on climate and environmental policy, and the specific literature on transportation policy.

Effectiveness, fairness, and intrusiveness in environmental and climate policy

Although we mostly draw from literature on transportation policies, beliefs on policy consequences have received more general attention in the study of climate and environmental policies. Berglund and Matti (2006) argue that individuals follow both internal and external motives. While the former relates to more general psychological predispositions, the latter refers to perceived incentives of policies. In other words, citizens consider (non-)economic consequences of policies when deciding to behave pro-environmentally. Simultaneously, if actors are not convinced about a policy's necessity, they might be reluctant to support its implementation (Clapp and Swanston 2009, Rietig 2019).

Bernauer and Gampfer (2013) argue that legitimacy, in both input and output, is associated with policy support (Anderson *et al.* forthcoming). Output legitimacy relates directly to our focus here. If the output of policymaking or, specifically, beliefs concerning policy consequences, are positive from the citizen perspective, one should expect higher levels of policy support.

Concerning the types of beliefs we focus on, Krosnick *et al*. (2006) argue that perceived effectiveness of climate policy increases policy support, especially if citizens deem the action necessary (Bechtel and Scheve 2013). If individuals, however, believe

that solutions are difficult and, consequently, ineffective, public concern decreases, undermining support for climate policies (Bord *et al.* 2000, O'Connor *et al.* 2002).

Regarding intrusiveness, Durr (1993) and Carman (1998) suggest that citizens oppose strong governmental intervention. Particularly, Durr (1993) theorises that the public is likely to react to a policy's level of intrusiveness by rejecting governmental policies when perceived as invasive.

Writ large, fairness considerations play an important role when citizens form policy preferences. We define fairness as a social norm that induces individuals to reject unfair proposals and sanction individuals who develop them (Fehr and Schmidt 1999). Given the severe distributional consequences of many environmental policies, including climate policy, existing research has given profound attention to fairness considerations. Scholars regard fairness as important to individuals' support for burden sharing (Gampfer 2014) and global climate agreements (Bechtel *et al.* forthcoming, Bechtel and Scheve 2013).

When and why do individuals support transportation policies?

Existing research on transportation policies primarily assesses the aggregated consequences of these policies, including those aiming to reduce vehicle emissions and to promote EVs (Egbue and Long 2012, Langbroek *et al.* 2016, Coffman *et al.* 2017). Disregarding the political feasibility of policies regarding public support at the level of individual citizens, the focus has been on pricing schemes.

Some contributions argue that expectations about a policy's consequences influence attitudes towards that policy (Fishbein and Ajzen 1975, Eagly and Chaiken 1993). Specifically, scholars contend that beliefs on the subjective probability that a policy produces certain outcomes influence individuals' favourable or unfavourable

policy judgment. Beliefs about a policy's distributional, political, or behavioural consequences thus play a key role in individuals' judgment. Consequently, a change in beliefs is likely to result in a change in attitudes towards the policy of interest (Fishbein and Ajzen 1975).

Jakobsson *et al*. (2000) propose a theoretical model explaining the acceptance of road pricing schemes conditional on individual driving behaviour, perceived fairness, and perceived restriction on liberty that the respective policy imposes. Bamberg and Rölle (2003) extend Jakobsson *et al.'s* (2000) model and incorporate perceived effectiveness and individuals' intention to use non-car modes of transport. Subsequent literature has mainly extended these models by concentrating on different types of effectiveness (Schuitema *et al.* 2010) and accounting for fairness (Ittner *et al.* 2003) and intrusiveness (Fujii *et al.* 2004). While transportation economists often consider pricing schemes 'the "obviously correct" solution to externality regulation' (Bamberg and Rölle 2003, p. 235), the literature also points to low public support for such policies. Jordan and colleagues (2003, 2013) argue that governments' dissatisfaction with regulations and perceived superiority of these policies resulted in the experimentation of 'new environmental policy instruments.' Nevertheless, they acknowledge that vested interests and distributional consequences (which directly relate to fairness and intrusiveness) have the potential to hinder the implementation of such instruments.

Other potential policies to reduce vehicle emissions have received less attention. Kallbekken and Sælen (2011) and Rienstra *et al.* (1999) study environmental taxes that increase cost of driving and owning fossil-fuelled vehicles, finding low public support for such policy instruments (Kallbekken *et al.* 2013, Hansla *et al.* 2017). Similarly, Rienstra and Rietveld (1996) assess public approval of speed limits: since speeding is not considered a problem, they find a low willingness to alter limits. Pricing and

regulatory limitations on parking spaces have primarily been discussed in literature focusing on factual consequences on citizens' behaviour (Verhoef *et al.* 1995) and the acceptability (Schlag and Schade 2000) of different pricing schemes for parking. Fuel economy standards have received recent scholarly attention (Dreyer, Teisl, *et al.* 2015, Dreyer, Walker, *et al.* 2015). Altogether, the existing literature tends to concentrate on policy measures in isolation, with some partial exceptions. For example, Hölzer (2003) compares different investment and pricing instruments by comparing their public acceptability, while Schade and Schlag (2000) compare similar pricing schemes across different cities.

Besides the strong focus on pricing schemes, another limitation of existing research is that it mostly uses conventional survey methods to test hypotheses on the drivers of policy support (one notable exception is Janssens *et al.* 2009). The main issue with this approach is the latent potential for social desirability bias in measuring policy support, together with an unclear separation of beliefs regarding the consequences of a particular policy and policy support. The latter creates a problem with *ad-hoc* rationalisation when survey participants express their policy preferences and then fit their assessment regarding policy consequences with their prior policy preference. The literature on choice experiments notes that the experimental approach implemented in our research could mitigate these problems (Wallander 2009, Hainmueller *et al.* 2014).

Policy goals and instruments

Transportation-related greenhouse gas emissions remain an enduring cause of climate change (IPCC 2018). As demand for individual mobility increases (Chen and Kauppila 2017), countries worldwide continue to struggle to decarbonise their mobility sector (Canzler and Wittowsky 2016).

Policy interventions for reducing vehicle emissions are the subject of heated debates and, because of the potential implications in people's everyday lives, encounter stiff opposition. For example, the Swiss Federal Council proposed trials for mobility pricing schemes in several Cantons, met with strong resistance from various interest groups, political parties, and parts of the public administrations, and was ultimately shelved (Tobler 2017).

Given the constraints that public support for costly restrictions impose, governments in Switzerland and other countries are exploring various instruments for reducing vehicle emissions. Since our objective is to measure, explain, and compare public support for a wide range of policy instruments, rather than one such instrument, we conducted ten interviews with stakeholders (representatives of political parties and interest groups, see Table A4 in the Appendix) to identify a limited but relevant set of such instruments.[3]

Based on these interviews and current literature, we identified seven potential policy measures that could serve to promote EVs and reduce car emissions. Table A1 (see Appendix) displays the wording we used for each policy instrument in the survey experiment.[4] We categorise these measures as follows (Vedung 1998, Sager *et al.* 2017):

- informational measures (sermons): information campaigns and energy labels;

[3] For a detailed description of our qualitative approach, see the Appendix.

[4] Table A2 in the Appendix provides the original wording in German of all items displayed in Table A1 and used in our contribution. For omitted policies see the corresponding section in the Appendix.

- disincentivising measures (carrots with disincentive): car taxes depending on emissions and road pricing scaled to emissions;
- incentivising measures (carrots with incentive): dedicated parking spaces for fuel-efficient/EVs[5] and subsidies when buying eco-friendly cars; and
- regulations (sticks): *de facto* bans on certain types of cars by making registration dependent on certain thresholds for vehicle emissions.

Theoretical arguments

The following section elaborates on how public support for a policy depends on individuals' beliefs, the type and framing of policies.

Policy type

We anticipate that policy costs are likely to be associated with support levels. Stadelmann-Steffen (2011) has shown that regulatory instruments (sticks) attracted higher support compared to market-based instruments (carrots). Stadelmann-Steffen follows Kirchgässner and Schneider (2003), who argue that individuals disproportionately weight short-term costs of policies. Thus, individuals oppose market-based policies and support regulation, where costs are less obvious than for market-based policies. However, to some extent this argument is at odds with Stadelmann-Steffen (2011), as she expects market-based environmental bonuses to receive less support than regulations. However, one would anticipate that citizens prefer obvious gains compared to less obvious costs. We anticipate that, if Kirchgässner and Schneider's argument is correct, support should increase with lower (or negative)

[5] Parking space policy adds charging infrastructure in the EV frame.

imposed costs: that is, incentivising carrots would garner more support than regulations, while disincentivising carrots would receive lower support than regulations.

Expectations for information-related measures, such as information campaigns and energy labels, are less clear. In all likelihood, they are more popular than costly measures such as car bans, car taxes, and road pricing, but less popular than financially incentivising policies such as environmental bonuses.

Framing

Beyond policy type, policy framing may affect policy support. We follow Rein and Schön (1993, p. 146) in defining frames as 'a way of selecting, organizing, interpreting, and making sense of a complex reality to provide guideposts for knowing, analyzing, persuading and acting'. Fletcher (2009, p. 801) argues that framing '*can enrol a majority of stakeholders and citizens in collective action*' and thereby facilitate cooperation on climate action, especially if policymakers use persuasive frames (Lenschow and Zito 1998, Palmer 2015). At the same time, framing could draw the public's attention away from climate change if other frames gain centre stage (Skovgaard 2014).

Our study focuses on framing policies in terms of gains or losses. Policies are either framed as promoting EVs or reducing emissions from cars. Following prospect theory (Kahneman and Tversky 1979), we anticipate that frames highlighting losses (by disincentivising high emission vehicles) garner less support.

Beliefs on policy consequences

Building on the existing literature, we argue that perceived effectiveness, intrusiveness, and fairness of policy instruments drive support for or opposition towards it. Although interrelated, a first empirical correlation analysis suggests that the three different beliefs

remain distinct enough to discuss them separately (see Appendix).

Perceived effectiveness

Perceived effectiveness refers to an individual's beliefs concerning whether a policy instrument is capable of achieving a given goal. In line with existing literature, we expect that individuals, on average, prefer effective solutions to problems over ineffective ones (Bamberg and Rölle 2003). This expectation rests on theories of status quo biases (Samuelson and Zeckhauser 1988). If individuals support regulation within a given policy field, they prefer effective over ineffective solutions. Simultaneously, if regulation is unwanted, they would rather oppose proposals than support ineffective solutions.

Effectiveness could also influence policy support indirectly. Ittner *et al.* (2003) discuss the relationship between fairness considerations and perceived policy effectiveness, arguing that perceived effectiveness strongly interacts with fairness. For instance, road pricing might seem unfair for car drivers since it effectively increases the individual's costs.

This leads to our first hypothesis (H1): The more effective individuals perceive a policy instrument to be, the more likely they are to support that policy instrument.

Perceived intrusiveness

Policy interventions involve certain degrees of government coercion towards citizens (Sager 2009). Intrusiveness will depend on the type of policy intervention. For example, government information campaigns tend to be less intrusive than bans on the registration of certain cars (Krebs *et al.* 2007, p. 42). Several studies show that policy support decreases with increasing levels of intrusiveness (Hagman *et al.* 2015).

Perceived intrusiveness is likely to vary considerably from one individual to another. Individuals' policy support is then likely to be a function of perceived intrusiveness for two reasons. First, intrusiveness comes with individual-level costs. Conditional on mobility behaviour, such as yearly mileage or car dependence, intrusive policies impose substantial costs on individuals (ego-tropic costs), since individuals who rely on a car are far more affected by government restrictions than individuals who do not. Second, individuals might fear that intrusive policies could harm others, e.g. by limiting options or imposing costs (socio-tropic concerns). This could potentially coincide with fairness considerations and related social norms.

Cherry *et al*. (2012) have examined potential trade-offs between policy support and coercion. They argue that objections against coercion are a social norm (which relates to socio-tropic concerns about coercion). They show that a policy's economic benefits do not necessarily compensate for the adverse effects of perceived coerciveness. Individuals are inclined to reject coercive or intrusive policies, regardless of potential gains, and could abandon support for policy measures (Baron and Jurney 1993, Coad *et al.* 2009).

This leads to our second hypothesis (H2): The more intrusive individuals perceive a policy instrument to be, the less likely they are to support that policy instrument.

Perceived policy fairness

Perceived fairness relates to the general evaluation of a policy as fair or unfair among different societal groups (Tyler 2000). We empirically capture perceived fairness by asking study participants whether a policy would be fair to society in general, thereby explicitly defining this variable as socio-tropic.

Emmerink *et al*. (1995) argue that concerns about road pricing's fairness might be responsible for weak public support for this policy instrument (Eriksson *et al.* 2006). We submit that, if a policy is regarded as unfair it will receive less individual support. Conversely, if individuals believe that a proposed policy instrument is fair, this should lead to higher levels of support (Ittner *et al.* 2003). Montada (2003) argues that fairness and justice considerations are essential social norms that most individuals share. Consequently, violating these norms tends to induce lower policy support (Montada and Kals 2000, Syme *et al.* 2000).

This leads to our third hypothesis (H3): If individuals perceive a policy instrument as fair, they are more likely to support that policy instrument.

Study design

Case selection

Empirically, we focus on Switzerland for three reasons. First, it allows us to examine policy support, rather than policy acceptability and acceptance. Since initiatives and referenda are commonly practiced in Switzerland's direct democracy, framing transportation policies as initiatives to survey respondents is plausible, and it allows us to capture policy support in the form of vote choice. This equips our study with a robust element of realism and is important in light of recent criticism regarding the conflation of acceptance and support (Dreyer and Walker 2013, Dreyer, Teisl, *et al.* 2015). Jaensirisak *et al*. (2005, p. 149), for instance, note that while '[v]arious definitions of acceptability have been used, […] little reference has been made to respondents' willingness to vote for a road pricing scheme.' Dreyer *et al.* (2015) argue that (passive) acceptability of certain policies tends to be higher than (active) support. This is relevant for Switzerland, where active consent to a policy is necessary for its implementation.

Political systems like those in The Netherlands and Sweden are prominent in the existing transportation literature, however, policymakers in these countries require citizens' passive acceptance, rather than active consent in order to make the implementation of policy measures politically feasible.

Second, the empirical focus on Switzerland allows us to employ a choice experiment with high context validity. While policymaking procedures in other countries rarely match the logic of a conjoint experiment, the Swiss case explicitly allows for this setup because of the possibility of initiatives with counter-proposals. We discuss this in more detail below.

Third, the Swiss case is somewhat empirically puzzling, and thus interesting. On average, citizens are remarkably environmentally friendly (Franzen and Vogl 2013) and willing to behave pro-environmentally (Huber *et al.* 2018). By contrast, emissions from the transportation sector are consistently high and apparently exceptionally difficult to reduce (FOEN 2017). Notably, Switzerland performs worst amongst all European countries concerning average emissions of newly registered cars (SFOE 2017, Vedlugaitė and European Environment Agency 2017), even though income and public transportation hamper pro-environmental mobility behaviour less than elsewhere.

Sampling

We use data from an online survey to test our hypotheses. We designed a dedicated survey to this end. Ipsos carried out the sampling and interviewed 2,034 Swiss citizens above 17 years, between 8 and 21 December 2017.[6] We applied quota-based sampling and used three interlocked quotas: gender (2-groups), age-group (6-groups), and region

[6] ETH Zurich's institutional ethics review board approved the research for this project (EK-2012-N-41).

(7-groups), making the sample representative of the Swiss population.[7] Additionally, we implemented a parallel quota that distinguishes between urban agglomeration and rural areas (FSO 2014), (see Figures A1 and A2 in the Appendix).

Survey design

We structured the survey as follows (see Figure 1). We started with items for standard demographics such as age, gender, and education. The next section asked respondents about their mobility behaviour. As mentioned earlier, mobility behaviour is presumably essential in explaining individuals' stances on transportation policies (Jakobsson *et al.* 2000).

We then randomly assigned survey participants to two different policy frameworks within whichever policy instruments were presented: promotion of EVs (EV frame) and reduction of emissions from cars (emissions frame). Both frames frequently occur in the political discussion and differences would speak to a broader discussion on transportation policies framing and communication (Anspach and Draguljić 2019).

The survey then asked study participants to respond to questions about their beliefs concerning the seven policy instruments. First, it asked them to read descriptions of each instrument (Table A1 in the Appendix) and indicate perceptions of effectiveness, intrusiveness, and fairness. We randomised the order of policy instruments and items. The choice experiment followed this segment.

Choice experiment

For the experimental part, which captures support for the policy instruments within a

[7] See the Appendix for more details.

unified empirical setup, we exploit a peculiarity of Swiss politics. In Switzerland, proposals signed by 100,000 Swiss voters must be put to a national vote (the so-called 'Initiative'). However, parliament can submit a 'counter-proposal' that is then submitted to citizens as an alternative (Art. 139b of the Swiss constitution). Citizens vote on each proposal separately, where they agree or disagree with either or both, and determine on a tiebreaker question which proposal will enter into effect in case both proposals receive a majority.

We mimic this procedure, which Swiss voters are familiar with, using a choice experiment where respondents compared two proposals side-by-side, each of which consists of one randomly selected policy instrument and proposed year of implementation (see Figure A3 in the Appendix). While not our focus here, we generally anticipate that individuals prefer later implementation of far-reaching policies, in line with standard discounting assumptions. We then asked study participants whether they support or oppose each of the two proposals (rating) and which one they would prefer if both received a majority (choice). These two questions capture the dependent variables for our analyses.[8]

We presume that asking study participants about their beliefs on effectiveness, fairness, and intrusiveness regarding particular policy instruments beforehand, and capturing policy preferences via a choice experiment where respondents are exposed to a wide range of policy instruments with different characteristics afterwards, is likely to mitigate problems of *ad-hoc* rationalization (Wallander 2009, Hainmueller *et al.* 2014). Rienstra et al. (1999, p. 190) in fact argue 'that strategic responses on perceived effectiveness may occur when respondents try to justify their rejection of painful policy

[8] See Table A3 in the Appendix for all attributes used in the choice experiment.

by claiming that they perceive them as ineffective.' Although our approach does not completely prevent *ad-hoc* rationalisation of support levels for specific policy instruments, trading-off different variables at a time substantially hinders participants' ability to rationalise their support. The trade-off induced by the tiebreaker question could mitigate social desirability, as it is much harder for respondents to identify a socially desirable response when trading off two proposals. Additionally, conjoint experiments allow the exploration of the causal effects of several variables (Hainmueller *et al.* 2014).

Our experimental design generates data where the unit of analysis is the policy proposal. With the experimental design described above, each respondent receives sets of two policy proposals five times. With 2,034 study participants, this produces 2*5*2,034 (proposals*iterations*respondents) = 20,340 observations. To assess the effects of beliefs and the two frames on support for the 7 policy instruments, we utilised linear mixed-effects regressions with random intercepts and handled individuals as groups (Gelman and Hill 2007), thereby accounting for the respondent-clustered data structure.[9] Lastly, in estimating the effects of interest, we include the quotas, education, political ideology and the mobility profile as control variables as they tend to explain and predict environmental attitudes (Beiser-McGrath and Huber 2018).[10] The equation below summarises the empirical approach (for the rating outcome):

$$Rating_{i,j} = \beta_0 + \beta_1 Eff_i + \beta_2 Int_i + \beta_3 Fai_i + \beta_4 Frame_j + Controls_j$$

[9] We additionally estimated our models using clustered standard errors and individual-fixed-effects. The results remain substantially robust (Table A6 and A7 in the Appendix).

[10] All steps from recoding to the analyses are done in *R* (R Core Team 2015). Appendix, RScripts and the raw data are available at https://doi.org/10.7910/DVN/2V2LGK. Consult the Appendix and the replication material for more information on the R packages we used.

$$with\ \xi_j \sim N(0, \psi)$$

where *i* denotes policy-specific measures and *j* denotes individual level measures.

Results

First, we present descriptive evidence on how individuals perceive different policy instruments. Second, we present the results from the choice experiment, followed by the analysis of how beliefs affect policy support.

Policy consequence perceptions

[Figure 2 about here]

Figure 2 shows how study participants observe the consequences of the seven policy instruments, distinguished by the two frames. The dotted line marks the middle category on the 7-point Likert scale. The ranges, with rectangles, show perceived policy consequences for the EV frame. On average, study participants believe that road pricing with reduced rates for EVs is the most effective policy instrument for fostering EVs, while participants perceive all other instruments, except the energy label, to be rather ineffective. Interestingly, the picture changes for the emission reduction frame (ranges with dots). Here, participants regard parking spaces for low emission cars as effective, while road pricing is not perceived to be particularly effective.

As to perceived intrusiveness, participants view road pricing as intrusive in both policy frames, while all other policies are not perceived to be particularly intrusive. One notable exception is parking privileges, which are perceived to be intrusive in the emission reduction frame. Participants see information campaigns, energy labels, and the environmental bonus as being rather unintrusive in both frames. Intriguingly, the

largest variation of beliefs shows up for intrusiveness. The least intrusive measure, information campaigns, is rated one point less intrusive than the most intrusive measures, road pricing and parking spaces (in the emission frame).

Perceived fairness tends to mirror perceived intrusiveness. Whereas participants regard road pricing and parking spaces (in the case of the emission frame) as rather unfair to society, they view information campaigns (energy labels) and the environmental bonus as fair. Generally, they assess policies in the emissions frame as being slightly fairer.

Table A5 in the Appendix summarises correlates of beliefs. The findings are in line with Figure 2 and demonstrate that policy instruments themselves drive perceptions of effectiveness, intrusiveness, and fairness. While other variables do not affect variation in beliefs, there are two notable exceptions. First, tertiary education increases perceptions of effectiveness and fairness. Second, and perhaps more important, beliefs are strongly correlated with individuals' mobility profile. Nevertheless, possibly due to ego-tropic reasons, this correlation is not surprising since those who rely more on a car perceive these policies as less effective and fair, and more intrusive.

Experimental evidence

Figure 3 summarises the main results from our choice experiment. As noted above, we asked participants to indicate whether they support or oppose a policy proposal, five times in sets of two proposals (rating task). Respondents could support or oppose, either one or both proposals. In line with the tiebreaker question in Swiss direct democratic initiatives, which include a counter-proposal, respondents then had to indicate which policy they prefer should both proposals receive a majority of the votes. This question forces individuals to decide which policy proposal they support, even if they dislike

both (binary forced choice task). As the results for both ways of measuring support/opposition turned out to be remarkably similar, we discuss them together.

[Figure 3 about here]

Observed treatment effects, capturing relative support levels for particular policy instruments, do not differ much along lines of cost implications. While the environmental bonus receives most support, other measures imposing costs (besides road pricing) receive substantial support. Informational measures are more popular than road pricing, but less popular than other costly measures. To some extent, this suggests that road pricing, in the Swiss context, is highly contested.

In line with observed beliefs concerning effectiveness, fairness, and intrusiveness, as Figure 2 shows, and congruent with our theoretical argument on such beliefs, road pricing is the least popular policy instrument. That is, participants perceive it to be somewhat effective, but also rather intrusive and unfair. All other policy instruments receive more support. The energy label and information campaign gather substantially less public support than the most preferred policy, the environmental bonus. The reason for this result could be that our study participants do not perceive these policy instruments to be particularly effective, whereas they perceive them as fair and unintrusive. Compared to road pricing, study participants are 20% more likely to support the environmental bonus. Surprisingly, bans of cars with high emissions and admission taxes, are quite popular. We consider this finding quite surprising due to the common perception of such policy interventions as intrusive. Nonetheless, our participants do not perceive these policy instruments to be particularly intrusive or unfair. Fairness considerations are the most important type of belief that might explain this pattern (see below).

With regards to the timing of policy implementation, the findings are counterintuitive. Respondents prefer policy action sooner than later. While the effect size is small, proposing to implement a policy instrument by 2045 compared to the baseline of 2025 reduces the likelihood of support by 5%.

Effects of perceived policy consequences on policy support

Table 1 summarises the main results of the empirical analysis that speaks to our three hypotheses set forth above. Starting with the baseline models, we observe that all coefficients are in line with our expectations. Citizens are more likely to choose a policy proposal in the tiebreaker question and support it in the rating task if the respective policy instrument is believed to be more effective (H1), less intrusive (H2), and fairer (H3).[11]

We find no systematic effect of the policy proposals' framing. The last three columns in Table 1 show whether the effects of perceived policy consequences on policy support are conditional on framing. We observe substantively small interaction effects, significant at the 5% level. According to these, the effect of perceived effectiveness is slightly stronger and the effect of perceived fairness slightly weaker in the emissions frame. These results show that the effects of interest here are similar in both frames.

[Table 1 about here]

Discussion

Overall, the research presented here sheds light on why citizens support certain policy

[11] See Figures A5, A6, and A7 and the corresponding description for interactions between the beliefs in the Appendix.

interventions by government while opposing others. We focus on the influence of beliefs concerning policy consequences on policy support and concentrate on an area where government policy directly interferes with citizens' everyday lives through costly mechanisms: transportation interventions aimed at reducing vehicle emissions and promoting EVs. In such cases, public policy support is a prerequisite for successful adoption and implementation.

As anticipated, the empirical analysis shows that perceived effectiveness, intrusiveness, and fairness are associated with policy support. *Ceteris paribus*, the more effective (H1), the less intrusive (H2), and the fairer (H3) a policy instrument is perceived to be, the more likely citizens will support it. In our choice experiment, which captures support for specific policy instruments (our dependent variable), we presented policies in two different frames with random allocation of study participants to one of these frames. One frame presented policies as attempts to promote EVs while the other aimed to reduce vehicle emissions. Our main findings do not differ significantly across the frames. This suggests that the results concerning support for the set of policy instruments we study, and the drivers of such support, are robust to diverse framing of the overall policy objectives.

Furthermore, our empirical study design may reduce problems of social desirability bias and *ad-hoc* rationalisation, by measuring beliefs prior to using a choice experiment to capture support for specific policies. This approach mitigates problems of conventional observational study designs (Rienstra *et al.* 1999, p. 190). Our analytical approach provides a useful starting point for analysing beliefs about policy consequences and policy support relations beyond our empirical case study.

Moreover, our analysis provides insights regarding policies for vehicle emissions reductions. While other studies focus on one policy instrument, we focus on a

broader set of instruments within a unified analytical framework. Thereby we systematically compare support for different types of policy interventions. Ultimately, even though it is widely advocated by transportation experts due to its presumed economic efficiency and effectiveness, road pricing appears to be the least popular policy instrument. By contrast, (admission) taxes, bans on certain cars, and financial support for eco-friendly cars enjoy much higher levels of public support. This general finding might help us understand why various countries in Europe are moving towards such policies.

At a more general level, our study highlights that, although economic assessment of policy options with reference to efficiency and effectiveness is imperative, political feasibility in terms of public support is equally important. For instance, our study suggests that even though road pricing may well be the most efficient and effective instrument, it is unlikely to be politically feasible. Further research could clarify *why* (as opposed to *that*) people prefer policy instruments other than road pricing. If such preferences are based on misperceptions, it would be worthwhile to explore how political communication could address them (Anspach and Draguljić 2019).

Further research could move beyond the various limitations of our study. First, our empirical research focused on one country and on policy instruments central to the policy debate within Switzerland. We did not consider policy instruments currently discussed in other countries, such as environmental zones (e.g. Germany) or road-space rationing (e.g. odd-even rule in China and India). Adding such policy instruments (and perhaps dropping others) within our study design is straightforward. Additionally, comparing public policy support across a range of countries could offer further insights.

A second limitation is that comparing several different policy instruments prevented us from simultaneously considering the different characteristics and calibration of each policy instrument. However, specific design choices of a given policy instrument, such as the amount of an environmental bonus or road pricing, may matter in citizens' policy evaluation. Exploring such nuances in policy design could shed additional light on political feasibility.

Third, measuring perceptions of policy consequences prior to capturing policy support in a conjoint experiment might not sufficiently mitigate the problem of *ad-hoc* rationalisation and social desirability bias. While we believe that our study design constitutes a step forward in addressing this problem, further research could explore other methods for mitigating these biases.

Our findings offer new insights into how citizens form attitudes and preferences with respect to costly environmental policy interventions. We lay the groundwork for considering the role of beliefs about particular types of policy consequences in more detail (Schuitema *et al.* 2010; Fujii *et al.* 2004) and combining sets of different policy instruments (Wicki *et al*. forthcoming) to overcome issues of feasibility. At the same time, we provide a useful starting point for policymakers seeking to design interventions that strike a fruitful balance between political feasibility and problem-solving effectiveness.

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Tables

Table 1. Perceived Policy Consequences and Policy Support

	Choice: Baseline	**Choice: Threeway Interaction**	**Rating: Baseline**	**Rating: Threeway Interaction**	**Rating by Frame**
Effectiveness	0.01 (0.00)***	0.05 (0.01)**	0.03 (0.00)***	0.08 (0.01)***	0.03 (0.00)***
Fairness	0.02 (0.00)***	0.02 (0.01)	0.06 (0.00)***	0.08 (0.01)***	0.06 (0.00)***
Intrusiveness	-0.01 (0.00)***	-0.00 (0.01)	-0.03 (0.00)***	0.00 (0.01)	-0.03 (0.00)***
Policy Frame (Ref = EV)			0.00 (0.01)	0.01 (0.01)	-0.01 (0.04)
Eff. x Fair.		-0.01 (0.00)*		-0.01 (0.00)***	
Eff. x Int.		-0.01 (0.00)**		-0.01 (0.00)***	
Int. x Fair.		-0.00 (0.00)		-0.01 (0.00)**	
Eff. x Int. x Fair.		0.00 (0.00)*		0.00 (0.00)***	
Effectiveness x Frame					0.01 (0.00)*
Fairness x Frame					-0.01 (0.01)*
Intrusiveness x Frame					0.00 (0.01)
AIC	29342.63	29381.32	26226.99	26255.26	26248.68
BIC	29390.15	29460.53	26329.95	26389.91	26375.40
Log Likelihood	-14665.32	-14680.66	-13100.49	-13110.63	-13108.34
N. of observations	20340	20340	20340	20340	20340
N. of individuals	2034	2034	2034	2034	2034

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$. Entries are unstandardised coefficients from a linear mixed effects regression. For the full regression tables including covariates see Table A8 in the Appendix.

Figures

Figure 1. Survey Design

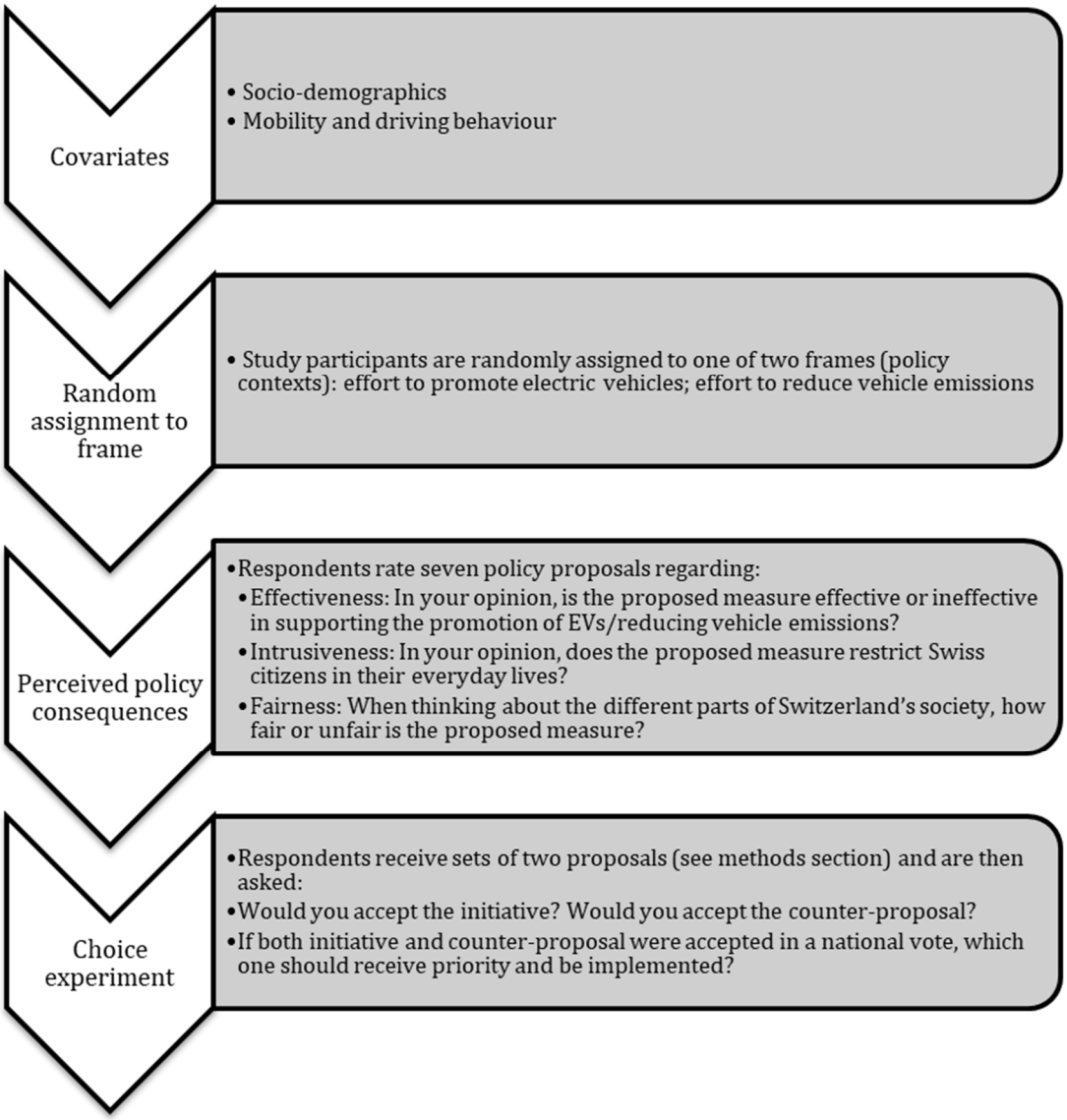
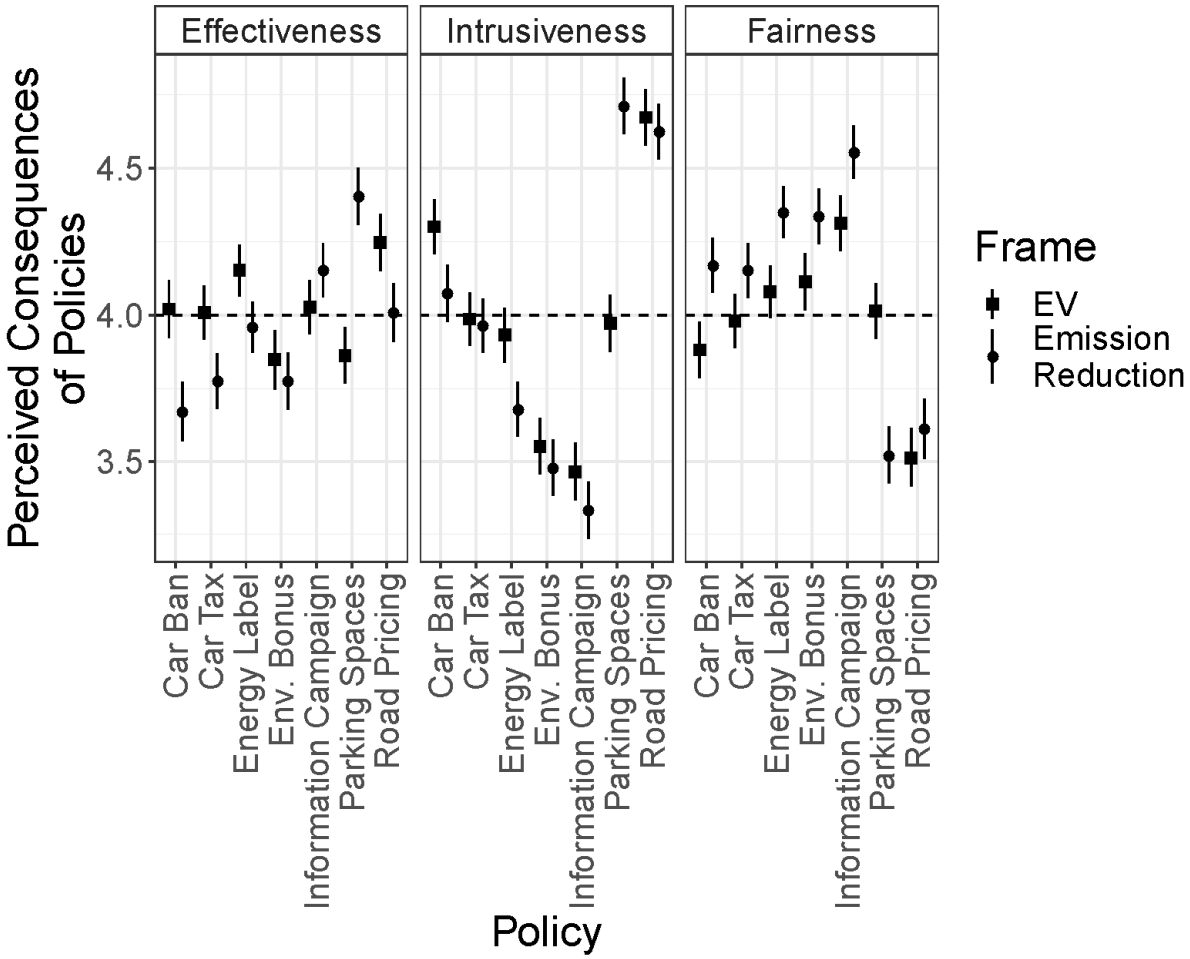
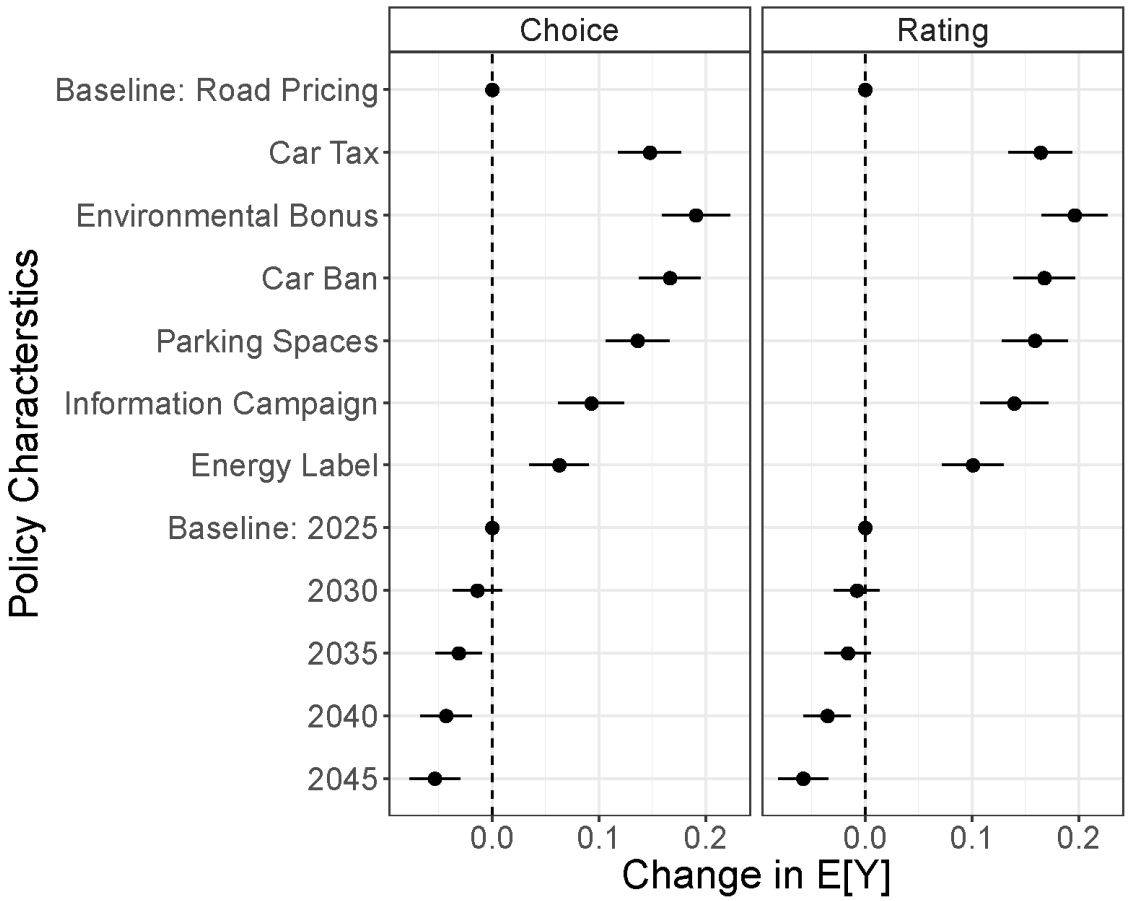


Figure 2. Perceived Consequences of Policy Instruments



Note: Points symbolise the mean evaluation, ranges show 95% confidence intervals.

Figure 3. Public Policy Support



Note: Ranges show 95% confidence intervals.