// NO.23-022 | 06/2023

DISCUSSION PAPER

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‘More Bang for the Buck’? Evidence on the Effectiveness of an Energy Efficiency Subsidy

Leibniz Association

ZEW

'More Bang for the Buck'? Evidence on the Effectiveness of an Energy Efficiency Subsidy

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June 22, 2023

Abstract

With the aim of limiting global warming, environmental subsidies are a popular public finance instrument to reduce carbon emissions. However, there is little evidence on why subsidies are effective in increasing demand for the goods subsidized. We use a framed field experiment to disentangle and study the relative importance of the price and non-price effects implicit in a subsidy encouraging an energy-efficiency investment. In the experiment, participants decide on purchasing a low-flow showerhead and are either confronted with the introduction of a subsidy or a same-sized price decrease. We find a demand increase of about 3-percent when the price decreases and a significantly larger demand increase of about 9-percent when the subsidy is introduced. An analysis of the underlying channels rules out changes in beliefs and norm perceptions. Positive spill-over effects of the subsidy on other pro-environmental behaviors rather suggest that the non-price effect is explained by a crowding in of intrinsic motivation.

JEL Classification: C93, D90, H23, Q49
Keywords: Behavioral public economics, subsidies, spill-over, energy efficiency, field experiment

Acknowledgments: We thank Marius Alt, Astrid Dannenberg, Carlo Gallier, Martin Kesternich, Jörg Lingens and seminar participants at Mannheim, Bochum, Kassel, St. Gallen, GfeW 2021, AURÖ 2021, MCEE 2022, AFE 2022, EAERE 2022, VfS 2022 and EMEE 2023 for helpful comments. Leon Landes, Benjamin Pfreundschuh and Ole Samuel Cordes provided excellent research assistance. IRB approval was obtained by the GfeW (Certificate No. W66WxnE1). The experiment was pre-registered at the AEA RCT Registry as trial AEARCTR-0008493. This work has been funded by the German Ministry of Education and Research (BMBF) through the project INTEGRATE (FKZ: 01LP1928B).
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1 Introduction

With the aim of limiting global warming, countries around the world are implementing pricing strategies that provide incentives to reduce carbon emissions. While economists favor carbon taxes, these generally receive little public support (e.g., Carattini et al. 2019, Mildenberger et al. 2022). Policy-makers are therefore often tempted to subsidize low-carbon behaviors instead, in particular when it comes to investment choices such as the adoption of photovoltaic panels, electric vehicles or the energy-efficient renovation of a dwelling. Most prominently, the Inflation Reduction Act provides 43 billion USD for investments in clean energy.[1] Although such subsidies have proven effective in altering decision-making, there is little research examining the mechanisms underpinning this success.

This is the first study disentangling and studying the relative importance of the price and non-price effects implicit in a subsidy meant to encourage investments in energy efficiency. Optimal tax or subsidy levels are usually determined through calculation of price elasticities inferred from market price changes. In the presence of non-price effects, demand response to the introduction of a public policy price instrument will differ from the demand response to "organic" market price changes. As a consequence, the set tax or subsidy level will deviate from the optimum. Further, when the goal is a long-term shift in behaviours, public policies may act as catalyst that induces changes in demand that go beyond the pure price effect.

We implement a framed field experiment to estimate a price elasticity resulting from market price changes and a price elasticity resulting from the introduction of a subsidy. To this end, citizens of a large German city were recruited and asked them to make two purchase decisions between either a low-flow or a standard showerhead, at (i) baseline prices and (ii) a reduced price for the low-flow showerhead[2]. While the baseline decision is constant across treatments, the second purchase decision differs by treatment. In a Price treatment, the second purchase decision is presented without further information about the origins of the change in prices – akin to a standard multiple price list. In a Subsidy treatment, we inform participants that the price decrease stems from a subsidy on the low-flow showerhead. The subsidy is introduced because the low-flow showerhead contributes to the energy and climate protection goals of the German federal government. This experimental design allows us to decompose the energy-efficiency subsidy into its price and non-price mechanisms by holding one of these constant.

Our results reveal a significantly stronger demand response to the subsidy compared to the same-sized price decrease. Specifically, we identify an elasticity of –0.2 for the Price treatment and a price elasticity of –0.5 in the Subsidy treatment. Both elasticities are significant but the demand response is 7 percentage points stronger in the Subsidy treatment. To put these numbers into perspective, we calculate the equivalent price metric following Allcott and Taubinsky (2015), i.e., the price decrease needed to obtain the same demand effect as the subsidy. Accordingly, our 5 Euro subsidy has the same effect as a 12.95 Euro price decrease. In other words, the price decrease

[1] https://www.mckinsey.com/industries/public-and-social-sector/our-insights/the-inflation-reduction-act-heres-whats-in-it (last retrieved 02/23/2023). In Germany, where we conducted our experiment, the federal government introduced a funding volume of 31.5 billion Euros for pro-environmental subsidies in 2022 https://www.bundesfinanzministerium.de/Content/DE/Pressemitteilungen/Finanzpolitik/2021/08/2021-08-18-zukunftsorientierte-subventionspolitik-bundesregierung.html (last retrieved 02/23/2023).

[2] The showerheads are identical in all characteristics except for the water-, and thereby energy-, saving attribute of the low-flow showerhead. This ensures that the difference in valuation of the showerheads is driven solely by the low-flow characteristic.

accounts for about 39 percent of the total subsidy effect — an estimate that is well in line with the results from observational studies on taxes (e.g., Rees-Jones and Rozema 2023, Andersson 2019).

Further survey evidence helps elucidate the mechanisms underlying the non-price subsidy effect. Results of a survey conducted after the experiment do not show any significant impact of the Subsidy treatment on incentivized measures of the perceived monetary, carbon or water savings of the low-flow showerhead, nor on the extent to which the purchase of the low-flow showerhead is perceived as a social norm. In contrast, we find evidence of positive spill-over effects. The Subsidy treatment triggers more pro-environmental behaviors, even beyond showering. Likewise, participants in the Subsidy treatment report a greater trust in the federal government. Both findings are in line with the subsidy crowding *in* intrinsic motivation to act pro-environmentally, as individuals perceive the subsidy as supportive action by the government.

Our study contributes to a growing literature that concerns behavioral responses that strengthen or weaken the effectiveness of public policies.[3] Accounting for behavioral responses to public finance instruments is critical to understanding the effectiveness of such instruments and for designing optimal tax or subsidy schemes. One branch of recent literature investigates tax perception biases and documents evidence of misperceptions of and inattention to taxes (e.g., Chetty et al. 2009, Feldman et al. 2016, Taubinsky and Rees-Jones 2018, Rees-Jones and Taubinsky 2020). Another research branch concerns the question whether taxes or subsidies affect utility, and if so, in which direction.

This study contributes to the latter branch and relates most to Li et al. (2014), Rivers and Schaufele (2015) and Andersson (2019). These studies use observational data to compare the demand change of market-based price changes to the demand change of a gasoline or carbon tax, and find the tax to exceed the effectiveness of price changes. In line with this, Taylor et al. (2019) and Rees-Jones and Rozema (2023) study soda and cigarette taxes, and again show an amplification of the price effect by non-price effects accompanying the introduction of the policy.[4]

Such evidence is consistent with theoretical arguments in legal scholars' literature, according to which public policies have an expressive effect that alters social norms, social meaning and beliefs (Cooter 1998, Sunstein 1996, McAdams and Rasmusen 2007). Specifically, by expressing governmental intentions, governmental policies give information and reduce uncertainty about socially appropriate behavior, thus influencing the utility of following the policy's desired behavior (Kübler 2001, Galbiati et al. 2021, Bowles and Polania-Reyes 2012). Through such value-signalling, the impact of subsidies or taxes may go beyond the impact of a pure monetary incentive and instead amplify the effectiveness of the implied price change.

While the evidence cited above relies on observational data, we conduct a framed field experiment in the context of a subsidy to promote energy efficiency. Our experimental design builds on Goeschl and Perino (2012) and Perino et al. (2014). Goeschl and Perino (2012) conduct a pen-and-paper experiment with students to compare the effectiveness of an environmental tax and a standard with a simple price change. Perino et al. (2014) conduct a framed field experiment comparing the effectiveness of a subsidy on environmentally-friendly grocery products to a same-sized non-labelled price change. The same data is used by Lanz et al. (2018). Contrary to the cited findings from observational data, both studies document evidence that the price instruments are *less* effective than the non-labelled price changes. They interpret this evidence as consistent with

[3] See Bernheim and Taubinsky (2018) for an overview.

[4] Likewise, Karlan and List (2020) find in the context of charitable giving that naming the donor of a matching grant increases donations compared to a pure grant without further information. Following the authors' argumentation, this is because the donors' name reveals information and impacts the beliefs of the potential donors.

the motivational crowding literature, according to which financial incentives crowd out intrinsic motivation to act pro-socially (Frey 1992, 1993). While some evidence supports such motivational crowding (Gneezy and Rustichini 2000b,a, Frey and Oberholzer-Gee 1997)[5], recent evidence fails to replicate a crowding out in the context of vaccination payments (Campos-Mercade et al. 2021).

Our study advances the experiment of Goeschl and Perino (2012) by taking the experimental design to a field context. We advance the field experimental set-up in Perino et al. (2014) and Lanz et al. (2018) by incentivizing baseline decisions and implementing the price discount directly, as opposed to a monetary refund. Further, our survey elucidates the discussion on expressive effects vs. motivational crowding underlying the non-price effects of public policies.

By studying an energy efficiency policy as application, our results are also of importance to the intensively-researched domain of the so-called energy efficiency gap (Allcott and Greenstone 2012, Gillingham and Palmer 2014, Gerarden et al. 2017). To address this gap and to increase energy efficiency investments, subsidies have been proposed to overcome credit constraints and investment inefficiencies (Allcott et al. 2014, Berkouwer and Dean 2022). Allcott et al. (2014) show, for example, that when consumers have homogeneous investment inefficiencies and vary only in utilization of the durable good, the first-best policy involves a subsidy for the energy efficient good. Further literature in that domain compares the efficiency of nudges against price instruments (Allcott and Taubinsky 2015, Rodemeier and Löschel 2020). However, this literature models subsidies and taxes purely as a change in prices. We extend this view by shedding light on the non-price mechanisms of a subsidy.

Lastly, we contribute to the literature that investigates energy conservation in the context of showering using experimental approaches (Tiefenbeck et al. 2018, Fang et al. 2020, Byrne et al. 2021). Showering is a highly resource-intensive activity. Tiefenbeck et al. (2018) state that the average shower consumes four times as much energy as a modern refrigerator needs per day. Thus, switching to a low-flow showerhead can save a considerable amount of energy and water. While existing literature has focused on water conservation behaviors during showering, we study investments in energy-efficient showering.

We present our study by first outlining the experimental framework in Section 2. Section 3 gives summary statistics of the sample and our main outcomes. We describe our data analysis in Section 4, which we conduct in three steps. In Section 4.1 we investigate the reduced-form treatment effects on the likelihood to select the low-flow showerhead. In Section 4.2, we calculate the price change that would yield the same demand response as the subsidy, and in Section 4.3 we investigate potential mechanisms underlying the non-price subsidy effect. Finally, Section 5 discusses our results and concludes.

2 Experimental Design

This study bases on a framed field experiment that we conducted in November 2021. The field experiment was implemented using an online survey created with LimeSurvey. We recruited participants from an existing panel comprised of residents of Mannheim, Germany. This panel had been previously assembled by the Centre for European Economic Research (ZEW) through identifying individuals willing to take part in surveys and experiments. Residents of Mannheim and the surrounding Rhine-Main area were recruited tothat panel via random direct mailing. The last recruitment wave before our experiment was conducted in November 2020, when 1,200 direct mails

[5] Bowles and Polania-Reyes (2012) provide an extensive review of experimental studies on crowding.

were distributed across Mannheim, whereupon about 100 recipients registered for participation. The panel has been used by Gallier et al. (2019a), Gallier et al. (2019b), Alt (2022), Bartels and Kesternich (2022). We expanded that panel by another recruitment wave in November 2021 and randomly distributed direct mails to 1,000 households in Mannheim. These mails were equally distributed among four districts in Mannheim from which participants had not yet been recruited. To keep the panel heterogeneous, the districts were selected according to their demographic characteristics and cover all strata of the socioeconomic spectrum.

These direct mails invited households to participate in an online survey on household decision-making. Panel members received an identical invite via email. Participants thus did not know that they are taking part in a randomized experiment, in which we scrutinized their purchase behavior. Participants were incentivized by way of a fixed reimbursement of 10 Euros for participation and the chance to receive a showerhead through a probabilistic incentive scheme, according to which 10 percent of the sample (i.e., 60 participants) received the showerhead(Charness et al. 2016).

With the start of the survey, participants were randomized into a Price or a Subsidy treatment and informed that they will have to make two consecutive purchase decisions between a standard and a low-flow showerhead. Prior to the purchase decisions, both treatment groups received the same information: i) both showerheads are from the same popular brand; ii) the heads are identical in appearance and specification except for the water- and energy-saving low-flow attribute; and iii) the low-flow showerhead reduces the water flow from 18 litres/min in the standard version to 9 litres/min. Participants were informed that this water flow reduction reduces both the water and energy costs for consumers.[6] Identical appearance and specification ensure that the valuation of the showerheads is driven solely by the low-flow feature and no other contaminating factors, such as design or brand name.

On the next screen, we informed participants about the possibility to store the showerhead for later usage[7] and about a recommendation by the German Lung Foundation to regularly replace showerheads due to potentially harmfull bacteria.[8] We do so to ensure that participants value the showerheads and not merely select the cheapest option.

In the first purchase decision, we offered the standard showerhead for 19 EUR and the low-flow showerhead for 34 EUR.[9] In the second purchase decision, the low-flow showerhead was offered at a reduced price of 29 EUR. This corresponds to a 15 percent price decrease compared to the first decision. The price for the standard head remained constant.

To incentivize decisions, participants received a shopping budget of 35 Euros for each purchase decision. For participants selected as 'winners' under the probabilistic incentive scheme, one of the two purchase decisions was chosen at random. The costs of the respective showerhead selected in that purchase decision were subtracted from the budget, the remaining budget was paid out and the showerhead was shipped to participants' home address. Participants were made aware of this procedure in advance. Thus, in the first decision, choosing the standard (low-flow) showerhead yielded a payment of 16 (1) EUR. In the second purchase decision, choosing the standard (low-flow) showerhead yielded an additional payment of 16 (6) Euros. Consequently, participants had

[6] See Appendix Figures A.2-A.4 for the translated decision screens. Appendix Figure A.1 displays the two offered showerheads. Appendix C gives the English-translated survey.

[7] See Allcott and Taubinsky (2015) for a similar argument in the context of lightbulbs.

[8] Online statement at https://www.lungenaerzte-im-netz.de/news-archiv/meldung/article/vor-allem-lungenkranke-sollten-brausekoepfe-regelmaessig-austauschen/ (last retrieved 01/26/2022). The statement refers to Feazel et al. (2009).

[9] We conducted two pre-tests to determine showerhead prices that reflect market prices but also enable variation in selecting the low-flow head across purchase decisions.

an incentive to trade-off the relative prices of the showerheads against their relative utility.

The Subsidy and Price treatments were introduced with the second purchase decision and vary the explanation for the low-flow head being offered at a reduced price compared to the first purchase decision. In the Price treatment, we did not accompany the price reduction with information about the reasons for the price change. Akin to a classic multiple price list (e.g., Allcott and Taubinsky 2015), the low-flow showerhead was merely presented at a lower price point. In the Subsidy treatment, we included the information "The low-flow shower head contributes to the energy and climate protection goals of the German government. The low-flow shower head is therefore subsidized costing 29 EUR instead of the actual 34 EUR."[10]

Thus, compared to the first purchase decision, the relative price of the low-flow head is lower in both treatments. The additional subsidy information may affect utility from the low-flow head, thus favoring not only a shift in the relative price but also in relative utility towards the energy-saving option.

The communication of a real-world energy efficiency subsidy inspired the design of the subsidy information text. Following related literature, the introduction of governmental policies is regularly accompanied by discussions in press, media or lobbying activities (e.g., Rees-Jones and Rozema 2023, Taylor et al. 2019, Abouk and Adams 2013). All of these discussions increase the public's awareness about the reasons and motivations underlying the policy. Thus, fully mimicking a real-world subsidy would involve providing more information than we did. Yet, given our framed-field context, any information provided will be more salient as it would be in everyday life. Thus, we decided to mimic the information provided in a simple press release, i.e., the fact that a subsidy is being introduced and a brief reason of why it is introduced. We view this as a lower bound of information which typically accompanies such policies. This design choice is also consistent with the subsidy information text implemented in the framed field experiment by Perino et al. (2014) and Lanz et al. (2018).

After the experimental part, the survey proceeded to elicit the beliefs of participants to discern the mechanisms underlying the effect of the Subsidy treatment on purchase decisions. In particular, we used incentivized measures to elicit beliefs about the yearly monetary-, water- and carbon-savings of the low-flow showerhead compared to the standard showerhead. Likewise, we used an incentivized elicitation of the perceived injunctive norm (Krupka and Weber 2013), i.e. participants' beliefs regarding other participants' opinion on the social desirability of the low-flow showerhead. We further asked for intended usage of the showerhead if the participant is selected for disbursement (i.e. installing , storing, selling, no usage), prior knowledge about the i) existence and ii) advantages of low-flow showerhead. We also elicited participants' anticipated changes in showering behavior (frequency and duration) conditional on using the low-flow head.

Lastly, we elicited participants' trust in government, science and media, as well as the support of energy efficiency policies and voluntary climate protection measures. The survey concluded with questions on general demographics and socio-economic characteristics such as participants' current living situation, their working status, educational background and net income. We also included two questions from the self-monitoring scale by Snyder (1974) to control for experimenter demand reactions (Allcott and Taubinsky 2015). These variables are described in more detail and analyzed in Sections 4.3.1 and 4.3.2.[11]

[10]The German federal government plans to increase final energy productivity by 2.1 percent per year until 2050, and to reduce building heating demand by 20 percent compared to 2008 levels (Bundesministerium für Wirtschaft und Energie (BMWi) 2021).

[11]See also Table A.1 for a detailed description of all variables.

For participants recruited via the existing panel, we additionally consider preference measures for the analysis, which we previously elicited in 2020 (Bartels and Kesternich 2022). These includes risk, time and altruistic preferences like those in the Global Preference Survey (Falk et al. 2016, 2018); as well as the New Ecological Paradigm (NEP) Scale that covers ecological beliefs and perceptions about how humans handle and relate to the environment (Dunlap et al. 2000).

3 Sample Description

A total of 614 participants started the survey, and 595 completed it. For those who completed the survey, the average survey duration time totalled 30 minutes. Spread across treatment group is close to equal, with 295participants assigned to the Price and 319 to the Subsidy treatment. Table 1 tests the balance of the covariates across the two treatment conditions.

The average participant is 40 years old, married, and has a net income between 2,000-2,500 EUR per month. The share of men among our participants is slightly higher (56 percent) than the share of women. The majority of our sample has a university degree, is employed and does not own property.[12]

We do not find significant differences in demographic and socio-economic characteristics between treatment groups. (see Appendix Table A.4 for a comparison of participants from the existing panel and the newly recruited participants). Yet, we observe an imbalance in the first purchase decision across treatments. When adjusting for multiple hypothesis testing (List et al. 2019), the significance vanishes (cf. Table 1 (4)). Still, we control for the first purchase decision in all regressions to avoid potential selection concerns[13]. The last four rows test the balance across the preference pre-survey measures that we observe for the sample recruited via the existing panel, and again document no systematic difference between the two treatments.

[12] Appendix Table A.2 gives detailed summary statistics of all variables, A.3 compares our demographic and socio-economic sample averages to the German and Mannheim averages. While our sample is well comparable in terms of gender, age and property ownership, the fraction individuals with university degree is higher in our sample. Likewise, our sample consists of more green voters. Only slight differences exist in a larger fraction being in a partnership and smaller fraction being employed in our sample.

[13] The first purchase decision and the proceeding screens were completely identical for both treatments which is why we did not expect a difference between groups in the first decision. Table A.4 indicates, that the imbalance is only prevalent for the existing panel. One potential explanation might be an unlucky allocation into treatment. For randomization, we used the LimeSurvey software and programmed it to randomly allocate participants into treatments. For the existing panel, we however observe that at the beginning of the data collection, LimeSurvey allocated more participants into the Subsidy treatment (see Appendix Figure A.5). In a robustness check, we exclude participants of the existing panel that signed up in the first five hours. Then, the imbalance in the first decision becomes insignificant ($p = 0.199$) while all other tested characteristics remain balanced (joint $F - test = 0.714$). In addition, the main treatment effect, the difference in the second purchase decision between Price and Subsidy, persists ($p = 0.002$).

Table 1: Balance Table

	(1) Price	(2) Subsidy	(3) Difference (1)-(2)	(4) Adj. p-value of difference (2)-(1)
Purchase low-flow in 1 (1=yes)	0.62	0.70	0.08	0.259
	(0.49)	(0.46)	(0.04)	
Age (in years)	39.42	39.82	0.40	0.93
	(13.23)	(14.74)	(1.16)	
Female (1=yes)	0.42	0.45	0.03	0.89
	(0.49)	(0.50)	(0.04)	
Married (1=yes)	0.62	0.67	0.05	0.69
	(0.49)	(0.47)	(0.04)	
Tenant (1=yes)	0.73	0.68	-0.05	0.69
	(0.45)	(0.47)	(0.04)	
Employed (1=yes)	0.74	0.71	-0.04	0.83
	(0.44)	(0.46)	(0.04)	
University degree (1=yes)	0.74	0.73	-0.01	0.98
	(0.44)	(0.45)	(0.04)	
Income (1-8)	5.40	5.36	-0.04	0.82
	(2.17)	(2.21)	(0.19)	
N	295	319	614	614
Pre-survey: Time (0-10)	7.39	7.32	-0.07	0.91
	(1.75)	(1.74)	(0.18)	
Pre-survey: Risk (0-10)	5.34	5.40	0.07	0.75
	(2.16)	(2.14)	(0.22)	
Pre-survey: Altruism (GPS)	58.63	61.84	3.22	0.95
	(66.99)	(65.78)	(6.70)	
Pre-survey: NEP (1-5)	3.66	3.70	0.04	0.91
	(0.46)	(0.49)	(0.05)	
N	191	209	400	400

Note: The balance table indicates the mean values and standard deviations for selected variables for the Price (1) and Subsidy (2) treatment group. Column (3) displays the difference in means, standard errors are reported in parenthesis. Column (4) gives the multiple hypothesis testing adjusted p-value of the treatment difference as defined in Remark 3.7 in List et al. (2019). The pre-survey preference measures were elicited as part of another experiment in 2020. Since a fraction of our sample participated in that experiment, we are able to merge these preference measures with our experimental data. Yet, the number of observation decreases (N=400), since not all of our participants were part of the 2020-experiment. Time and risk preferences are survey statements as in Falk et al. (2016, 2018). Higher values indicate a greater willingness to take risks and greater patience, respectively. Altruism is the weighted sum of two survey statements as in Falk et al. (2016, 2018); a higher value indicates greater altruism. The NEP score is elicited as in Dunlap et al. (2000). See Appendix Table A.1 for a detailed description of variables.

4 Data Analysis

4.1 Subsidy vs. Price Decrease: Energy Efficiency Choices

We observe a high share of participants choosing the low-flow showerhead in the first purchase decision: 62 percent of the Price treatment group and 70 percent of the Subsidy treatment group. As discussed in Section 3, this difference is only significant before adjusting for multiple hypothesis testing. In the second decision the share of low-flow showerhead choices increases to 65 percent of the Price and 78 percent of the Subsidy treatment groups upon the introduction of the treatment. Thus, the fraction selecting the low-flow head increases by 3 percentage points in the Price treatment and by 8 percentage points in the Subsidy treatment. The difference between treatment groups is significant at the 1-percent level (χ^2-test p-value: 0.00).

We then test for differences between the Subsidy and Price treatment groups' inclination to purchase the low-flow showerhead using the following linear probability model:

$$\textit{Purchase low-flow in 2}_i = \gamma_1 + \gamma_2 \textit{Subsidy}_i + \gamma_3 \textit{Purchase low-flow in 1}_i + \mu_i, \tag{1}$$

where *Purchase low-flow in 2*$_i$ is an indicator for whether participant i selected the low-flow showerhead in the second purchase decision. $Subsidy_i$ is the treatment indicator equaling one if the participant is in the Subsidy group and zero if in the Price group. We control for baseline purchase decisions, *Purchase low-flow in 1*$_i$, to adjust for differences in the first purchase decision between treatment groups. μ_i denotes the error term.

We further estimate treatment effects within the Price and Subsidy treatment as to derive price elasticities and inverse demand functions using the following difference-in-difference specification:

$$\textit{Purchase low-flow}_{it} = \beta_1 + \beta_2 Treatment_i + \beta_3 Price_i X Post_t + \beta_4 Subsidy_i X Post_t + \varepsilon_{it}. \tag{2}$$

Accordingly, we observe each participant i in the two purchase decisions $t \in [1;2]$. *Purchase low-flow*$_{it}$ equals one if the participant selected the low-flow head for a given decision, $Treatment_i$ is a treatment group indicator that equals one for the Subsidy group, and accounts for different choices in the first purchase decision between groups. $Price_i X Post_t$ and $Subsidy_i X Post_t$ denote interaction terms between being in the Price or Subsidy group and the second purchase decision. That is, $Post_t$ equals one if $t = 2$. ε_{it} gives the error term. Standard errors are clustered on the subject level. The coefficient β_3 gives then the effect of the price reduction and β_4 the effect of the subsidy introduction. We will also test whether β_3 is statistically different from β_4.

Table 2 gives the results of both regressions. Column (1) displays the results of the regression model (1). The Subsidy treatment significantly increases the likelihood to purchase the low-flow showerhead by 7 percentage points in the second decision when compared with the Price treatment – holding constant choices in the first purchase decision. The additional information provided by a subsidy thus indeed affects demand, which is itself robust to the inclusion of covariates in column (2).

Columns (3) and (4) display the results following specification (2). In the Price treatment, the decrease in the purchasing price by 15 percent from the first to second decision increases demand by 3.4 percent. This demand increase is significant at the 5-percent level and implies a –0.2 price elasticity of demand. If the 15 percent price decrease is accompanied with the subsidy information, demand for the low-flow showerhead increases by 8.8 percent. This change in demand is significant at the 1-percent level and implies a –0.5 price elasticity of demand. When testing the interaction terms against each other, we can reject the null hypothesis of no difference at the 5-percent level.

Table 2: Regression Results of Purchase Decisions on Treatment

	(1)	(2)	(3)	(4)
	Purchase low-flow in 2		Purchase low-flow	
Subsidy	0.072***	0.087***		
	(0.021)	(0.024)		
Purchase low-flow in 1	0.769***	0.767***		
	(0.029)	(0.034)		
Treatment			0.079**	0.117***
			(0.038)	(0.041)
PriceXPost			0.034**	0.032**
			(0.015)	(0.016)
SubsidyXPost			0.088***	0.089***
			(0.016)	(0.018)
Controls	No	Yes	No	Yes
p-value $\beta_3 = \beta_4$			0.016	0.016
N	614	509	1228	1018

Note: The model of columns (1) and (2) is specified in equation (1), the model of columns (3) and (4) in equation (2). All regressions are estimated using linear probability models. Controls: Gender, age, marital status, being a tenant, employment status, university degree, and income. Robust standard errors in parentheses. In columns (3) and (4) standard errors are clustered on the subject level. Significance levels: $^{*}: p < 0.10$, $^{**}: p < 0.05$, $^{***}: p < 0.01$.

We also test for heterogeneous effects of the Subsidy treatment by selecting for socio-economic characteristics, but do not find significant interaction effects (cf. Appendix A.2).[14] We neither find that females react differently to the Subsidy treatment compared to males, nor that low-income participants react differently than high-income participants (proxied via income, employment status, tenancy or educational degree).

Importantly, we also test for heterogeneous effects by indicators that likely predict experimenter demand effects. We therefore elicited participants' self-assessment on whether their behavior is influenced by the desires of others, and whether it is important to them to adapt to their social group. If the effect of the Subsidy treatment is only driven by participants who want to align with our expectations, the interaction between Subsidy and those participants who care more about others' expectations should be significant. This is however not the case (cf. Table A.6). Furthermore, the finding of limited experimenter demand effects is in line with Allcott and Taubinsky (2015), De Quidt et al. (2018) and Mummolo and Peterson (2019).

[14] Appendix A.1 explores which determinants, conditional on treatment, explain the decision to switch from a standard head in the first decision to the low-flow head in the second decision.

4.2 The Equivalent Price Metric of the Subsidy

The results of Section 4.1 show that a subsidy is an effective tool for policy-makers as to increase demand. As the *PriceXPost* and *SubsidyXPost* coefficients of Table 2(3) show, the price effect explains about 39 percent of the total subsidy effect. This estimate compares well to the estimates of observational studies, that estimate the price effect to explain about 50 percent of a cigarette tax (Rees-Jones and Rozema 2023) and about 25-33 percent of a carbon (Andersson 2019, Rivers and Schaufele 2015) and gas (Li et al. 2014) tax.

Figure 1 visualizes the relationship between the subsidy and the pure price decrease. The figure displays the inverse demand functions, charting relative prices against the share of participants in the respective treatment group who selected the low-flow head. While we use actual data from the Price treatment, we imputed the Subsidy demand curve by assuming demand in the first purchase decision to be the same as in the Price group. In both conditions, demand increases as the price decreases – but more so in the Subsidy treatment where the slope is flatter and demand more price elastic (see coefficients in Table 2(3)).

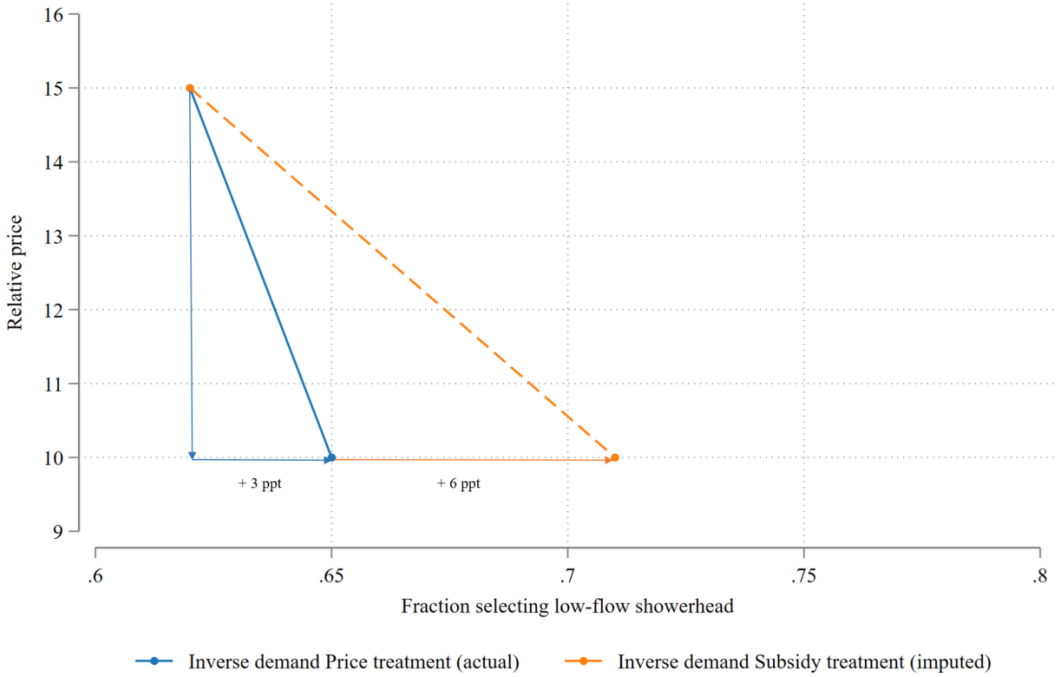
To better understand the monetary implications of the non-price effect of the subsidy, we calculate the Equivalent Price Metric (EPM). This metric gives the price decrease that causes the same demand response as the subsidy. Following Allcott and Taubinsky (2015), we estimate the EPM as:

$$EPM = \frac{D_S(p_1) - D_S(p_2)}{D'_P(p)} = \frac{\beta_4}{\frac{\beta_3}{\Delta p}}, \tag{3}$$

where $D_S(p_1)$ and $D_S(p_2)$ denote the demand of the Subsidy group for the low-flow showerhead at purchase decision 1 and 2, respectively. The difference is given by β_4 as specified in equation (2) and estimated in Table 2(3). $D'_P(p)$ denotes the slope of the demand curve of the Price group. In our design, this is given by the change in demand (i.e., β_3 as specified in equation (2) and estimated in Table 2(3)) divided by the change in prices from decision 1 to decision 2 ($\Delta p = 5$).

The resulting EPM is 12.95 EUR. This means that the 5-Euro-subsidy alters demand as much as a 12.95 price decrease would. The economic returns from introducing a subsidy are about two- to three-times as large as a same-sized price decrease. This result is consistent with theoretical arguments on the expressive effect of policies (e.g., Sunstein 1996, Kübler 2001). Still, our finding is at odds with the motivational crowding-out of intrinsic motivation when pro-social behavior is financially incentivized (Frey and Jegen 2001, Perino et al. 2014, Lanz et al. 2018). To better understand the potential mechanisms underlying the subsidy effect, we next explore our survey data.

Figure 1: Inverse demand functions of the Price and Subsidy treatments



Note: Estimated effects are from 2(3). The inverse demand function of the Subsidy treatment is imputed assuming demand to be identical to the Price treatment in the first purchase decision.

4.3 Potential Mechanisms

4.3.1 Subsidy vs. Price Decrease: Belief and Norm Perceptions

As outlined in the introduction, behavioral responses to public policies could stem from expressive effects inherent to governmental actions and regulations (e.g., Sunstein 1996, Kübler 2001). While our results show that the demand response to a subsidy-induced price decrease exceeds that of a pure price decrease, the channel underlying this additional demand change is not clear.

We thus included questions in our post-experimental survey that help to shed light onto this. Following the arguments from Rees-Jones and Rozema (2023) orAbouk and Adams (2013), the Subsidy treatment may lead to a more positive evaluation of potential savings of the low-flow showerhead. This may be due to the information provided, that the low-flow head contributes to the energy and climate protection goals of the government. We therefore investigate potential shifts in saving beliefs. To elicit these saving beliefs, we asked participants about their financial, CO_2 and water savings expectations from the low-flow head. To ease the belief elicitation, we gave participants four answer categories each covering a different range of possible savings. Responses were incentivized in that participants had the chance to earn 1 Euro for each correct answer in the three belief questions. The average participant indicated that a one-person-household would save between 56 - 110 Euros (i.e., category 2), 151 - 300 kg CO_2 (i.e., category 2) and 10,001 - 20,000 liters of water (i.e., category 2) per year. While both the carbon and water savings are correctly estimated, the average participant underestimated the likely monetary savings by one answer category.

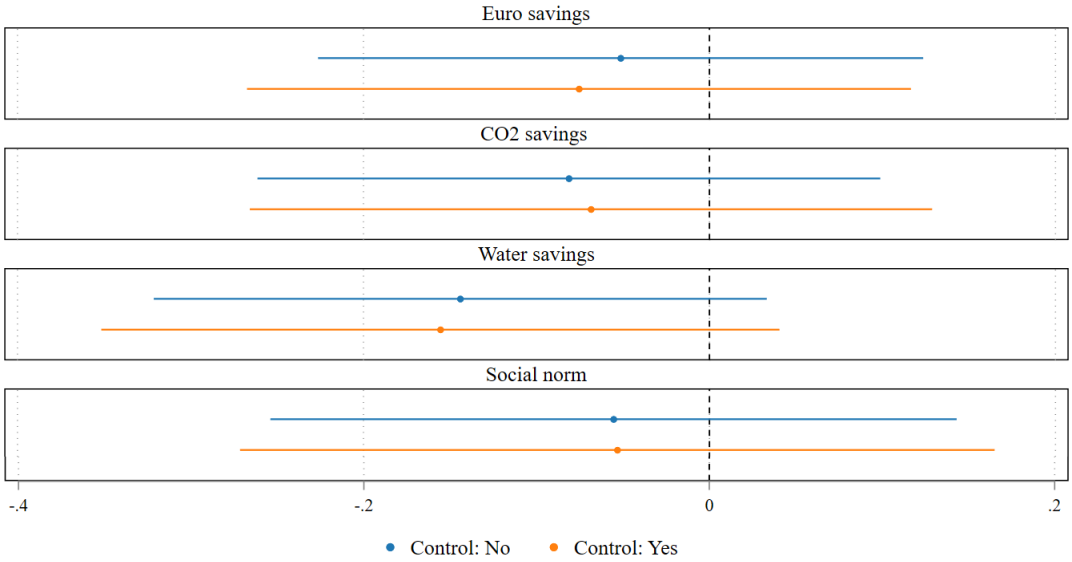
In addition to the potential change in saving beliefs, the expressive effects literature also suggests that the expression of governmental intentions alters behavior by affecting social norm perceptions. For example, Lane and Nosenzo (2019) find a causal effect of drinking age legislation on the perceived social norm of selling alcohol to minors. To test for this, we elicited the per-

ceived social norm of purchasing the low-flow showerhead in an incentivized manner, using the Krupka-and-Weber mechanism (Krupka and Weber 2013). Participants were asked to guess the social desirability valuation of the low-flow showerhead by the majority of the other participants. As outlined by Krupka and Weber (2013), this elicitation resembles a coordination game where each participant has to guess the modal response of all other participants. If the participant's guess was correct, s/he again had the chance to earn 1 Euro. The model response to that question is that the majority of participants perceives the purchase of the low-flow head as "rather socially desirable" (i.e., category 3). The average participant correctly guessed that 'social norm.'

To test for subsidy-induced changes in savings beliefs, we run the regression model (1) on the following set of belief measures as outcomes: the expected (1) monetary savings, (2) carbon savings, and (3) water savings from the low-flow showerhead. As these measures are elicited in four categories, we use an ordered probit model. Strikingly, we do not find evidence that the Subsidy treatment alters savings beliefs. Figure 2 displays the regression coefficients, which are negative but insignificant for the three belief measures. We thus cannot confirm the initial hypothesis of the subsidy information shifting beliefs about monetary, carbon or water savings of the low-flow showerhead. To test for changes in norm perception, we run the regression model (1) with perceived social norm categories as the outcome. The lower panel of Figure 2 shows the results. Again, we do not find significant differences in the perceived social norm between the Price and Subsidy treatment, and even a negative coefficient.

In sum, we find neither an effect of the Subsidy treatment on savings beliefs nor on the perceived social norm of purchasing the low-flow showerhead. This finding is inconsistent with the idea of an effect of public policy inheriting an expressive effect that impacts norms and beliefs. Yet, Frey and Stutzer (2006) propose another channel through which public policies may impact behavior: Consumers may perceive the policy as supportive of their pro-social behavior. The policy thereby strengthens consumers' intrinsic motivation to act pro-socially or pro-environmentally. The next section explores this conjecture.

Figure 2: Estimated Coefficients of a Regression of Perceived Euro, Carbon, Water Savings and Social Norm on Treatment



Note: The horizontal bars indicate 95-percent confidence intervals. All regressions control for the first purchase decision. Controls: Gender, age, marital status, being a tenant, employment status, university degree and income. Table A.7 displays the full regression results.

4.3.2 Subsidy vs. Price Decrease: Pro-Environmental Behaviors and Trust

Frey and Stutzer (2006) argue that subsidies may enhance the intrinsic motivation to act pro-socially, as consumers may perceive the subsidy and the expressed governmental intentions as supportive. If a subsidy enhances intrinsic motivation, we would expect more pro-social behavior in other domains beyond the subsidized one. If consumers feel supported by the government in one aspect, they may also express a greater trust in the government. We utilize survey statements to test these hypotheses. Specifically, we investigate subsidy-induced changes in (i) intended showering behaviors, (ii) pro-environmental attitudes and behaviors, and (iii) trust in varying institutions.

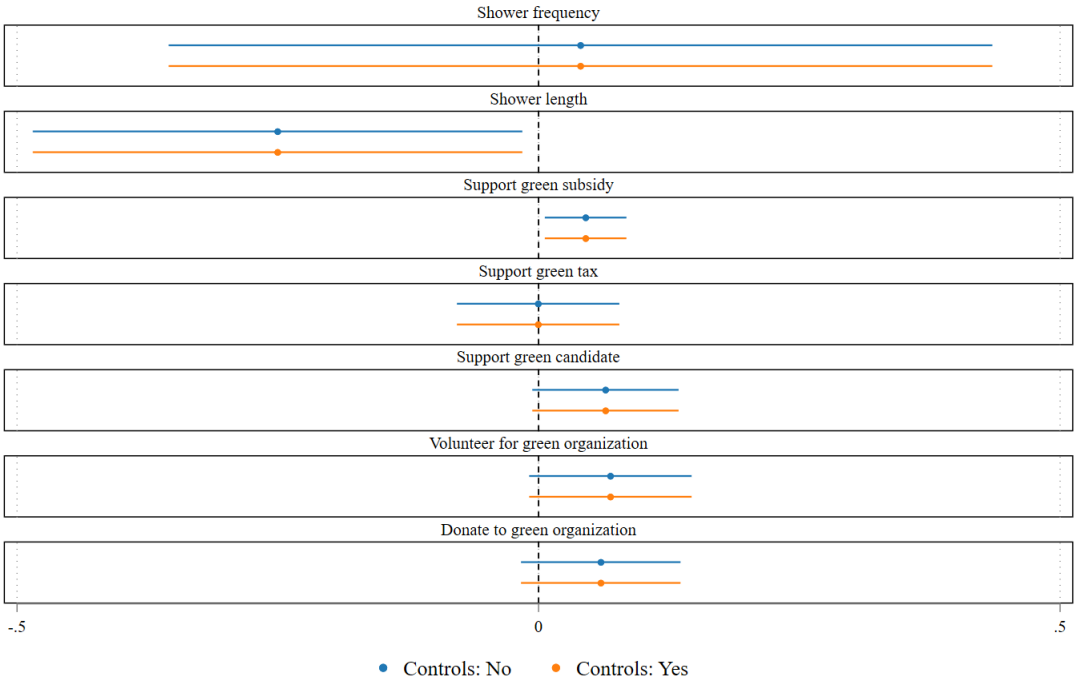
Intended showering behaviors capture anticipated changes in showering frequency and showering length when receiving the low-flow showerhead. Participants could indicate less frequent, more frequent or no change in shower frequency and shorter, longer or no change in shower length. The pro-environmental attitudes and behaviors variables indicate whether participants support the introduction of a subsidy on energy-efficient technologies, of a tax on inefficient technologies, participants' likelihood to support a political candidate because of his or her green agenda, to volunteer for a green organization, and to donate to a green organization. The trust variables measure on a four-point scale participants' trust in government, science and media. We run the regression model (1) on these variables, which are used as outcomes.

Figure 3 displays the coefficients for showering behaviors and pro-environmental outcomes. Regarding the intended showering behaviors, we find no significant difference in the showering frequency between both treatment groups. But we do find a positive spill-over effect on shower length. Participants in the Subsidy group report significantly more often that they would shorten their shower length. Further, participants in the Subsidy treatment are significantly more likely to support the introduction of a subsidy on energy-efficient technologies, are (weakly) more likely to support a political candidate for his or her climate change opinions and to volunteer for an organization that engages in climate change mitigation activities. Yet, there is no significant difference in

the support of introducing a tax on energy-inefficient technologies or in the likelihood to donate to an organization that engages in climate change mitigation activities.

These results are suggestive of positive spill-over effects of the Subsidy treatment. Participants are willing to reduce their showering length, are more likely to support other pro-environmental subsidies or to engage in other pro-environmental activities. This is consistent with the Frey and Stutzer (2006) conjecture of a subsidy crowding in intrinsic motivation.

Figure 3: Estimated Coefficients of a Regression of (i) Showering Behaviors and (ii) Pro-Environmental Attitudes and Behaviors on Treatment

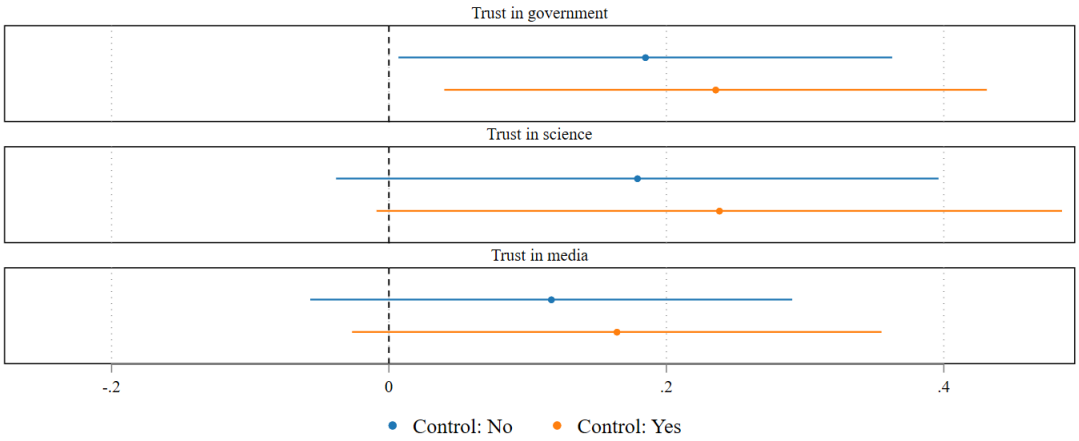


Note: The horizontal bars indicate 95-percent confidence intervals. All regressions control for the first purchase decision. Controls: Gender, age, marital status, being a tenant, employment status, university degree and income. Tables A.8 and A.9 display the full regression results.

With regards to trust, we find a significant increase in trust in the federal government by the Subsidy treatment. There are no robust impacts on trust in science or media. These results are in line with the subsidy information that attributes the subsidy to the energy and climate protection goals of the federal government. Figure 4 plots the corresponding regression coefficients. Again, this result is consistent with the idea of a feeling of being supported by the governmental subsidy (Frey and Stutzer 2006).

In sum, our results are in line with the conjecture by Frey and Stutzer (2006). The energy efficiency subsidy potentially amplified the intrinsic motivation to act pro-environmentally because the governmental regulation was perceived as supportive. In contrast, extrinsic factors, i.e., potential savings, or social norm perceptions do not seem to be the mechanisms underlying the change in demand that is additional to the price decrease effect.

Figure 4: Estimated Coefficients of a Regression of Trust Measures on Treatment



Note: The horizontal bars indicate 95-percent confidence intervals. All regressions control for the first purchase decision. Controls: Gender, age, marital status, being a tenant, employment status, university degree and income. Table A.10 displays the full regression results.

5 Conclusion

This study contributes to a better understanding of the price and non-price mechanisms underlying an environmental subsidy. Specifically, we conducted a framed field experiment to test whether a subsidy triggers larger — or smaller – demand reactions than a pure price decrease. Our results provide evidence that the energy efficiency subsidy alters demand through both price and non-price mechanisms. We find a demand increase of about 3-percent when the price decreases and a demand increase of about 9-percent when the subsidy is introduced. Thus, the demand response to a subsidy exceeds the response to a price decrease.

This result has important implications for policy-makers. The impact of a subsidy is larger than implied by the money spent. Specifically, assuming linear demand, a 5-Euro-subsidy alters demand as much as a 12.95-Euro-price decrease would. In other words, the price decrease explains only 39 percent of the total subsidy effect. A subsidy is therefore a highly effective tool for policy-makers to increase demand, which is good news in the context of climate change and increased governmental spending to lower carbon emissions. For example, if our estimates hold for the Inflation Reduction Act, the 43 billion Dollar provided for clean energy investments will generate demand effects that equal the effects of a 111.37 billion Dollar price decrease.

Further analyses of a post-experimental survey contribute to an ongoing discussion on the non-price mechanisms of a subsidy. Literature on the expressive effects of law (Sunstein 1996) has argued that governmental actions and regulations express governmental intentions and thereby influence beliefs and social norms. We do not find support for this hypothesis in our data; our Subsidy treatment affects neither perceived monetary, carbon or water savings from the low-flow showerhead nor the perceived social norm associated with such a purchase. Nevertheless, we find positive spill-over effects of the Subsidy treatment on pro-environmental attitudes and behaviors as well as an increased trust in the federal government.

We interpret this finding as suggestive evidence that the Subsidy treatment crowds in intrinsic motivation, consistent with the conjecture posted by Frey and Stutzer (2006). This finding is important to keep in mind, when the policy goal is a long-term shift in behaviours. Considering that subsidies may lead to a crowding in of intrinsic motivation, public policy may indeed act as catalyst

that induces changes in demand that go beyond the pure price effect.

These findings raise the question of how much of the effect can be attributed to our specific subsidy design. First, our results are well in line with the results from observational studies, e.g., on carbon and gas taxes Li et al. (2014), Rivers and Schaufele (2015), Andersson (2019). Second, while it may be fruitful to investigate the non-price impacts of a subsidy in a natural field experiment, such designs come at the difficulty of implementing a "pure" price decrease. In a natural setting, any price decrease will be accompanied with individual beliefs and perceptions about the origin of that decrease (e.g., concerns regarding quality or lack of demand). Our framed field setting in contrast provided the unique combination of being able to only alter the purchase price, as is commonly done in such type of experiments, without forfeiting the ability to observe the reactions of regular citizens to the introduction of a subsidy.

Future research should examine our suggestive finding of a crowding in of intrinsic motivation more closely. This concerns particularly the question under which circumstances a crowding-in occurs, which factors deem a policy to be perceived as supportive and in which domains the crowding-in materializes. For example, the non-price effects accompanying taxes may differ from the non-price effects we identify in the context of subsidies. Likewise, the functional relation between the subsidy level and the non-price effect need to be explored further. Considering the signalling aspect, there might well be non-linearities. On a related note, the effects of removing a subsidy deserve further investigation. While price effects may be similar, the removal of a policy may send a stronger signal than its introduction. Given that governmental budgets may not allow for environmental subsidies to be financed for extended time periods, the non-price effects resulting from subsidy removal – and how these can be mitigated – need to be understood.

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Online Appendix (Not for Publication)

A Tables and Additional Analyses

Table A.1: Variable Description

Variables	Description
Main variables	
Subsidy	Has the value 1 if the participant is in the Subsidy treatment group, and 0 if the participant is in the Price treatment group
Purchase low-flow in 1	Has the value 1 if the participant chose the low-flow showerhead for 34 EUR, and has the value 0 if the participant chose the standard showerhead for 19 EUR.
Purchase low-flow in 2	Has the value 1 if the participant chose the low-flow showerhead for 29 EUR, and has the value 0 if the participant chose the standard showerhead for 19 EUR.
Demographic and socio-economic characteristic	
Age	Indicates the age of the participant.
Female	Has the value 1 if the participant is female, and the value 0 if the participant is male.
Married	Has the value 1 if the participant is married or lives in a long-term relationship and the value 0 if the participant is single, divorced or widowed.
Tenant	Has the value 1 if the participant lives for rent (house or flat), and the value 0 if the participant lives in own property (house or flat).
Employed	Has the value 1 if the participant is employed, and the value 0 if the participant is not working or is retired.
University degree	Has the value 1 if the participant has a university degree, and the value 0 if not. This includes having no degree, having graduated from the different German school types, or have finished an apprenticeship.
Income	Indicates participant's net income. *[1 = $\leq$ 500 EUR, 2 = 500 - 1.000 EUR, 3 = 1.000 - 1.500 EUR, 4 = 1.500 - 2.000 EUR, 5 = 2.000 - 2.500 EUR, 6 = 2.500 - 3.000 EUR, 7 = 3.000 - 3.500 EUR, 8 = $\geq$3.500 EUR]*
Low income	We define participants that have a net income below 1.500 EUR as 'low-income'. Following this definition, 20% of our sample are low-income.
High income	We define participants that have a monthly net income of above 2.500 EUR as 'high-income'. Following this definition, 59% of our sample are low-income. In Germany, persons with a monthly net income of 2,739 euros are among the richest 25 percent.
Showerhead indicators	
Usage	Indicates participant's intended usage of the showerhead if selected for win. *[1 = "New head as no usage for me", 2 = "Store new head for later usage", 3 = "Sell new head", 4 = "Exchange and use new head"]*

Continued on next page

Table A.1: Variable Description

Variables	Description
Knowledge low-flow	Has the value 1 if the participant knew about the existence of low-flow showerheads, and 0 otherwise.
Benefit low-flow	Has the value 1 if participant knew about the advantages of low-flow showerheads, and 0 otherwise.
Shower frequency	Indicates the participant's belief on how his/her showering frequency would change regarding the shower length when using a low-flow shower head. *[1 = Shower less often; 2 = No change; 3 = Shower more often]*
Shower length	Indicates the participant's belief on how his/her showering behavior would change regarding the shower length when using a low-flow shower head. *[1 = Shower shorter; 2 = No change; 3 = Shower longer]*
Belief measures	
Euro savings	Indicates participant's beliefs on the monetary savings of the low-flow showerhead compared to the standard showerhead, in Euros and assuming a one-person household, showering of 5 times a week for 11 minutes at 38 degrees water temperature. *[1 = 0 - 55 EUR; 2 = 56 - 110 EUR; 3 = 111 - 165 EUR; 4 = 166 - 220 EUR]*
CO_2 savings	Indicates participant's beliefs on the CO_2 savings of the low-flow showerhead compared to the standard showerhead, in kilogram and assuming a one-person household, showering of 5 times a week for 11 minutes at 38 degrees water temperature. *[1 = 0-150kg; 2 = 151-300kg; 3 = 151-300kg; 4 = 451-600kg]*
Water savings	Indicates participant's beliefs on the water savings of the low-flow showerhead compared to the standard showerhead, in liters and assuming a one-person household, showering of 5 times a week for 11 minutes at 38 degrees water temperature. *[1 = 0 -10.000 L; 2 = 10.001-20.000 L; 3 = 20.001 – 30.000 L; 4 = 30.0001 – 40.000 L]*
Social norm	Indicates participant's beliefs on the perceived social desirability (i.e., in accordance with morally and socially right behavior) of the low-flow showerhead by the majority of all other participants *[1 = Socially highly desirable, 2 = Socially desirable, 3 = Socially undesirable, 4 = Socially strongly undesirable]*
(Pro-environmental) Attitudes and behaviors	
Influenced by others	Has the value 1 if the participant either agreed or agreed strongly to the statement 'My behavior is influenced by what others want me to do.'
Adapt to others	Has the value 1 if the participant either agreed or agreed strongly to the statement 'For me, it is important to adapt to my social group.'
Support green subsidy	Has the value 1 if the participant 'agrees' or 'rather agrees' to the introduction of a subsidy on energy efficient technologies. Has the value 0 when s/he indicated to 'rather disagree' or to 'disagree.'

Continued on next page

Table A.1: Variable Description

Variables	Description
Support green tax	Has the value 1 if the participant 'agrees' or 'rather agrees' to the introduction of a tax on energy inefficient technologies. Has the value 0 when s/he indicated to 'rather disagree' or to 'disagree.'
Support green candidate	Has the value 1 if the participant would 'definitely' or 'probably' vote for a candidate based on his/her position on global warming. Has the value 0 if s/he indicated to vote 'probably not' or 'definitely not.'
Volunteer for green organization	Has the value 1 if the participant would 'definitely' or 'probably' volunteer for an organization that engages in climate protection. Has the value 0 if s/he indicated to volunteer 'probably not' or 'definitely not.'
Donate to green organization	Has the value 1 if the participant would 'definitely' or 'probably' donate to an organization that engages in climate protection. Has the value 0 if s/he indicated to donate 'probably not' or 'definitely not.'
Trust measures	
Trust in government	Indicates the level of trust the participant has in the government *[1 = Strong mistrust; 2 = A little mistrust; 3 = A little trust; 4 = Strong trust]*
Trust in science	Indicates the level of trust the participant has in science *[1 = Strong mistrust; 2 = A little mistrust; 3 = A little trust; 4 = Strong trust]*
Trust in media	Indicates the level of trust the participant has in the media *[1 = Strong mistrust; 2 = A little mistrust; 3 = A little trust; 4 = Strong trust]*
Pre-survey preferences	
Pre-survey: Time	Based on the Global Preference Survey question (Falk et al. 2016, 2018). Indicates the extent to which the participant is willing to give up something that benefits him/her today in order to benefit you more in the future on a scale from 0 to 10. Elicited in 2020 for participants recruited via the Mannheim citizen panel.
Pre-survey: Risk	Based on the Global Preference Survey question (Falk et al. 2016, 2018). Indicates the extent to which the the participant is willing to take risks on a scale from 0 to 10. Elicited in 2020 for participants recruited via the Mannheim citizen panel.
Pre-survey: Altruism	Constructed based on two Global Preference Survey questions (Falk et al. 2016, 2018) on altruism using the following formula: Altruism = 0.6350048 × 'Question on willingness to give to good causes on a scale from 0 to 10' + 0.3649952 × 'Question on hypothetical donation'.
Pre-survey: NEP	Indicates the 'pro-ecological' worldview of the participant. The score is constructed as mean of the nine NEP questions (Dunlap et al. 2000). A score above three is considered as the boundary between an anthropocentric and a pro-ecological worldview.

Table A.2: Detailed Summary Statistics

	All					Price					Subsidy				
	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N
Main variables															
Subsidy (1=yes)	0.52	0.50	0	1	614	0	0	0	0	295	1	0	1	1	319
Purchase low-flow in 1 (1=yes)	0.66	0.47	0	1	614	0.62	0.49	0	1	295	0.70	0.46	0	1	319
Purchase low-flow in 2 (1=yes)	0.72	0.45	0	1	614	0.65	0.48	0	1	295	0.78	0.41	0	1	319
Demographic and socio-economic characteristics															
Age (in years)	39.63	14.03	19	83	591	39.42	13.23	19	83	284	39.82	14.74	19	83	307
Female (1=yes)	0.44	0.50	0	1	590	0.42	0.49	0	1	283	0.45	0.50	0	1	307
Married (1=yes)	0.65	0.48	0	1	589	0.62	0.49	0	1	283	0.67	0.47	0	1	306
Tenant (1=yes)	0.70	0.46	0	1	581	0.73	0.45	0	1	279	0.68	0.47	0	1	302
Employed (1=yes)	0.72	0.45	0	1	584	0.74	0.44	0	1	281	0.71	0.46	0	1	303
Uni degree (1=yes)	0.73	0.44	0	1	594	0.74	0.44	0	1	285	0.73	0.45	0	1	309
Income (1-8)	5.38	2.19	1	8	531	5.40	2.17	1	8	260	5.36	2.21	1	8	271
Showerhead indicators															
Usage (1-4)	3.22	1	1	4	602	3.21	1.01	1	4	289	3.24	0.99	1	4	313
Knowledge low-flow (1=yes)	0.68	0.47	0	1	605	0.68	0.47	0	1	291	0.68	0.47	0	1	314
Benefit low-flow (1=yes)	0.62	0.49	0	1	595	0.60	0.49	0	1	287	0.63	0.48	0	1	308
Shower frequency (1-3)	2.01	0.16	1	3	602	2.01	0.14	1	3	289	2.01	0.17	1	3	313
Shower length (1-3)	2.08	0.38	1	3	589	2.12	0.40	1	3	283	2.04	0.35	1	3	306
Belief measures															
Euro savings (1-4)	2.08	0.87	1	4	593	2.09	0.85	1	4	285	2.06	0.89	1	4	308
CO2 savings (1-4)	1.94	0.91	1	4	578	1.97	0.91	1	4	275	1.91	0.90	1	4	303
Water savings (1-4)	2.04	0.93	1	4	592	2.10	0.94	1	4	284	1.99	0.91	1	4	308
Social norm (1-4)	3.28	0.50	2	4	592	3.29	0.53	2	4	282	3.26	0.48	2	4	310

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Table A.2: Detailed Summary Statistics

	All					Price					Subsidy				
	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N
(Pro-environmental) Attitudes and behaviors															
Influenced by others (1=yes)	0.36	0.48	0	1	614	0.38	0.49	0	1	295	0.34	0.47	0	1	319
Adapt to others (1=yes)	0.49	0.50	0	1	614	0.51	0.50	0	1	295	0.46	0.50	0	1	319
Support green subsidy (1=yes)	0.93	0.25	0	1	614	0.91	0.29	0	1	295	0.96	0.21	0	1	319
Support green tax (1=yes)	0.61	0.49	0	1	614	0.61	0.49	0	1	295	0.61	0.49	0	1	319
Support green candidate (1=yes)	0.73	0.45	0	1	614	0.69	0.46	0	1	295	0.76	0.42	0	1	319
Volunteer for green org. (1=yes)	0.45	0.50	0	1	614	0.41	0.49	0	1	295	0.49	0.50	0	1	319
Donate to green org. (1=yes)	0.63	0.48	0	1	614	0.59	0.49	0	1	295	0.66	0.47	0	1	319
Trust measures															
Trust in gov. (1-4)	2.90	0.84	1	4	580	2.82	0.87	1	4	277	2.97	0.80	1	4	303
Trust in science (1-4)	3.69	0.66	1	4	592	3.65	0.67	1	4	283	3.72	0.65	1	4	309
Trust in media (1-4)	2.68	0.91	1	4	586	2.63	0.92	1	4	283	2.74	0.90	1	4	303
Pre-survey preferences															
Pre-survey: Time (0-10)	7.35	1.74	0	10	398	7.39	1.75	0	10	190	7.32	1.74	2	10	208
Pre-survey: Risk (0-10)	5.37	2.15	0	10	400	5.34	2.16	0	10	191	5.40	2.14	0	10	209
Pre-survey: Altruism (GPS)	60.32	66.30	0	370.71	394	58.63	66.99	0	370.71	187	61.84	65.78	0	370.71	207
Pre-survey: NEP-score (0-10)	3.68	0.48	2.22	4.89	387	3.66	0.46	2.33	4.56	187	3.70	0.49	2.22	4.89	200

Note: Displayed are means, standard deviations, minimum and maximum values as well as the number of observations for all variables used. See Appendix Table A.1 for a detailed description of variables.

Table A.3: Sample Comparison with Representative Census 2011 Data for Germany and Mannheim

	Germany	Mannheim	Sample
Females (in %)	51,2%	41,1%	43,7%
Age (mean)	44,6	43,4	39,6
University degree (in %)	15%	17%	73,4%
Living in partnership (in %)	54,8 %	42,5%	64.52%
Employed (in %)	95,3%	94,3%	72,4%
Ownership rate (in %)	45,9%	29,8%	30%
Voting behavior (in %)			
CDU / CSU	28.5%	19,9%	8,8%
SPD	26.4%	26,3%	14,7%
AfD	10.1%	9,8%	2,2%
FDP	8.7%	10,6%	19,4%
Linke	5.0%	4,8%	6,4%
Grüne	14.0%	22,5%	40,6%
Others	7.2%	6,0%	5,3%

Note: We use the 2011 census data for comparison. The exception is voting behavior, which instead reflects the actual voting results of the 2021 federal election.

Table A.4: Comparison of Participants from Existing Panel and Newly Recruited Participants

	(1) Price & New Mean (SD)	(2) Price & Existing Mean (SD)	(3) Subsidy & New Mean (SD)	(4) Subsidy & Existing Mean (SD)	p-values of difference (1)-(2)	(3)-(4)	(1)-(3)	(2)-(4)
Purchase low-flow in 1 (1=yes)	0.60	0.70	0.70	0.69	-0.10	0.01	0.10**	-0.01
	(0.49)	(0.46)	(0.46)	(0.47)	(0.08)	(0.08)	(0.04)	(0.10)
Age (in years)	40.20	34.67	40.86	32.64	5.52**	8.22***	0.67	-2.03
	(13.21)	(12.52)	(14.60)	(13.81)	(2.24)	(2.49)	(1.23)	(2.96)
Female (1=yes)	0.43	0.36	0.43	0.62	0.07	-0.19**	-0.00	0.26**
	(0.50)	(0.49)	(0.50)	(0.49)	(0.09)	(0.08)	(0.04)	(0.11)
Married (1=yes)	0.62	0.63	0.68	0.58	-0.01	0.10	0.07	-0.05
	(0.49)	(0.49)	(0.47)	(0.50)	(0.08)	(0.08)	(0.04)	(0.11)
Tenant (1=yes)	0.73	0.69	0.65	0.84	0.04	-0.19**	-0.08**	0.15
	(0.44)	(0.47)	(0.48)	(0.37)	(0.08)	(0.08)	(0.04)	(0.10)
Employed (1=yes)	0.75	0.70	0.72	0.62	0.05	0.10	-0.03	-0.08
	(0.43)	(0.46)	(0.45)	(0.49)	(0.07)	(0.08)	(0.04)	(0.11)
University degree (1=yes)	0.77	0.57	0.74	0.62	0.19***	0.13*	-0.02	0.04
	(0.42)	(0.50)	(0.44)	(0.49)	(0.07)	(0.08)	(0.04)	(0.11)
Income (1-8)	5.52	4.67	5.42	5.00	0.86**	0.42	-0.11	0.33
	(2.05)	(2.68)	(2.18)	(2.41)	(0.39)	(0.40)	(0.20)	(0.61)
N	251	44	277	42	295	319	528	86

Note: The balance table indicates the mean values and standard deviations of selected variables for the Price treatment and newly recruited participants (1), the Price treatment and pre-existing participants (2), the Subsidy treatment and newly recruited participants (3), and the Subsidy treatment and pre-existing participants (4). The last four columns display the difference in means between the new-recruited vs. pre-existing participants and the Price vs. Subsidy treatment groups, standard errors are reported in parenthesis. See Appendix Table A.1 for a detailed description of variables. Significance levels: $^{*}: p < 0.10$, $^{**}: p < 0.05$, $^{***}: p < 0.01$.

A.1 Non-Experimental Predictors of the Purchase Decisions

We analyze whether conditional on treatment different determinants explain the decision to switch from a standard head in the first decision to the low-flow head in the second decision. In the Subsidy treatment, the only significant predictor are risk preferences, indicating that participants with more risk-taking attitudes are more likely to switch. In the Price treatment, participants who would use the showerhead immediately are more likely to switch, and participants who had prior knowledge about the low-flow head are less likely to switch. These differential correlations with the switching decision are in that sense interesting, as they suggest that the Subsidy treatment helped some participants to overcome barriers towards investing in the low-flow head – in particular the argument of not needing the low-flow head immediately and having strong (negative) prior beliefs.

Table A.5: Regression Results of the Decision to Switch from Standard to Low-Flow Head

	Subsidy			Price		
	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Switch choice					
Demographic and socio-economic characteristics						
Age	-0.00			-0.00		
	(0.00)			(0.00)		
Female	-0.05			0.02		
	(0.04)			(0.03)		
Married	-0.01			-0.00		
	(0.05)			(0.03)		
Tenant	0.03			-0.02		
	(0.05)			(0.04)		
Employed	-0.01			0.03		
	(0.05)			(0.03)		
University degree	0.04			-0.03		
	(0.05)			(0.04)		
Income	-0.01			-0.01		
	(0.01)			(0.01)		
Pre-survey preferences						
Pre-survey: Time		0.00			-0.00	
		(0.01)			(0.01)	
Pre-survey: Risk		0.02**			0.00	
		(0.01)			(0.01)	
Pre-survey: Altruism		0.00			0.00	
		(0.00)			(0.00)	
Pre-survey: NEP		-0.09*			-0.00	
		(0.05)			(0.03)	
Showerhead indicators						
Usage (base = no usage)						
Store new head for later			-0.05			0.03

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Table A.5: Regression Results of the Decision to Switch from Standard to Low-Flow Head

	Subsidy			Price		
	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Switch choice					
			(0.20)			(0.02)
Sell new head			-0.00			0.01
			(0.25)			(0.01)
Exchange and use new head			-0.06			0.05**
			(0.20)			(0.02)
Knowledge low-flow			0.06			-0.09***
			(0.10)			(0.03)
Benefit low-flow			-0.06			0.02
			(0.10)			(0.02)
Constant	0.15	0.32	0.14	0.16*	0.01	0.06*
	(0.11)	(0.26)	(0.20)	(0.08)	(0.11)	(0.03)
N	257	198	307	252	182	280
Adjusted R^2	-0.010	0.026	-0.011	0.005	-0.011	0.008

Note: Linear probability model of the decision to switch from standard in decision 1 to low-flow head in decision 2 (1=yes, 0=no) by treatment group. The categorical variable "Usage" describes the intended usage with the new shower head. The base category for the usage of the new head is "the new showerhead has no usage for me." "Knowledge Low-Flow" and "Benefit Low-Flow" are indicators on whether participants knew about low-flow heads and the benefits of low-flow heads, respectively. See Appendix Table A.1 for a detailed description of variables. Robust standard errors in parentheses. Significance levels: $^{*}: p < 0.10$, $^{**}: p < 0.05$, $^{***}: p < 0.01$.

A.2 Heterogeneous Effects of the Subsidy Treatment

We also tested for heterogeneous effects of the Subsidy treatment by selected socio-economic characteristics (columns (1)-(6)) and indicators for the experimenter demand effect (columns (7)-(8)). Previous research has shown that females are more responsive to treatments encouraging pro-social behavior (e.g., DellaVigna et al. 2013). Likewise, energy subsidies are ought to be a way for low-income households to invest in energy efficiency (e.g., Berkouwer and Dean 2022). Yet, Allcott et al. (2015) find that subsidies are often regressive. Subsidies preferentially accrue to wealthier consumers that possess knowledge on energy-related matters and therewith fail to address credit constraints. However, in our context we do not find any significant interaction effects.

This also holds for the indicators of the experimenter demand effect. If the effect of the Subsidy treatment is driven by participants who only want to align with our expectations, we would see that those participants who are sensitive to others' expectations react more strongly to the Subsidy treatment. However, this is not the case as columns (7) and (8) show.

Table A.6: Regression Results of Purchase Decisions on Treatment Interactions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Purchase low-flow in decision 2							
Subsidy	0.08***	0.08***	0.08***	0.11***	0.05*	0.07**	0.07***	0.06**
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)
Purchase in low-flow in 1	0.76***	0.78***	0.77***	0.77***	0.76***	0.76***	0.77***	0.77***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Subsidy*Female	-0.01							
	(0.03)							
Subsidy*Low income		0.01						
		(0.04)						
Subsidy*High income			-0.02					
			(0.03)					
Subsidy*Employed				-0.05				
				(0.03)				
Subsidy*Tenant					0.05			
					(0.03)			
Subsidy*Uni Degree						0.01		
						(0.04)		
Subsidy*Influenced							0.01	
							(0.03)	
Subsidy*Adapt								0.03
								(0.03)
Controls	No	No	No	No	No	No	No	No
N	590.00	531.00	614.00	584.00	581.00	594.00	614.00	614.00

Note: Linear probability models based on regression specification (1). See Appendix Table A.1 for a detailed description of variables. Robust standard errors in parentheses. Significance levels: $^{*}: p < 0.10$, $^{**}: p < 0.05$, $^{***}: p < 0.01$.

Table A.7: Regression Results of Perceived Euro, Carbon, Water Savings and Social Norm on Treatment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Euro savings		CO_2 savings		Water savings		Social norm	
Subsidy	-0.05	-0.08	-0.08	-0.07	-0.14	-0.15	-0.06	-0.05
	(0.09)	(0.10)	(0.09)	(0.10)	(0.09)	(0.10)	(0.10)	(0.11)
Purchase low-flow in 1	0.08	0.09	0.13	0.20*	0.17*	0.22**	-0.07	-0.13
	(0.10)	(0.11)	(0.10)	(0.11)	(0.10)	(0.11)	(0.11)	(0.12)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
N	593	506	578	495	592	506	592	503

Note: Ordered probit models based on regression specification (1). See Appendix Table A.1 for a detailed description of variables. Controls include: Gender, age, marital status, being a tenant, employment status, university degree and income. Standard errors in parentheses. Significance levels: $^{*}: p < 0.10$, $^{**}: p < 0.05$, $^{***}: p < 0.01$.

Table A.8: Regression Results of Intended Shower Frequency and Length on Treatment

	(1)	(2)	(3)	(4)
	Shower frequency		Shower length	
Subsidy	0.04	0.13	-0.25**	-0.27**
	(0.20)	(0.29)	(0.12)	(0.13)
Purchase low-flow in 1 -0.14	-0.10	-0.66***	-0.77***	
	(0.21)	(0.29)	(0.13)	(0.14)
Controls	No	Yes	No	Yes
N	602	505	589	496

Note: Ordered probit models based on regression specification (1). See Appendix Table A.1 for a detailed description of variables. Controls include: Gender, age, marital status, being a tenant, employment status, university degree and income. Standard errors in parentheses. Significance levels: $^{*}: p < 0.10$, $^{**}: p < 0.05$, $^{***}: p < 0.01$.

Table A.9: Regression Results of Pro-Environmental Behaviors and Attitudes on Treatment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Support green subsidy		Support green tax		Support green candidate		Volunteer in green organization		Donate to green organization	
Subsidy	0.05**	0.04*	-0.00	0.01	0.06*	0.06	0.07*	0.08*	0.06	0.06
	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Purchase low-flow in 1	0.03	0.04	-0.06	-0.05	0.16***	0.17***	0.21***	0.19***	0.15***	0.14***
	(0.02)	(0.03)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
N	614	509	614	509	614	509	614	509	614	509

Note: Linear probability models based on regression specification (1). See Appendix Table A.1 for a detailed description of variables. Controls include: Gender, age, marital status, being a tenant, employment status, university degree and income. Robust standard errors in parentheses. Significance levels: * : $p < 0.10$, ** : $p < 0.05$, *** : $p < 0.01$.

Table A.10: Regression Results of Trust Measures on Treatment

	(1)	(2)	(3)	(4)	(5)	(6)
	Trust in government		Trust in science		Trust in media	
Subsidy	0.18**	0.24**	0.18	0.24*	0.12	0.16*
	(0.09)	(0.10)	(0.11)	(0.13)	(0.09)	(0.10)
Purchase low-flow in 1	0.15	0.16	0.23**	0.23*	0.11	0.15
	(0.10)	(0.11)	(0.11)	(0.13)	(0.09)	(0.10)
Controls	No	Yes	No	Yes	No	Yes
N	580	496	592	504	586	499

Note: Ordered probit models based on regression specification (1). See Appendix Table A.1 for a detailed description of variables. Controls include: Gender, age, marital status, being a tenant, employment status, university degree and income. Standard errors in parentheses. Significance levels: $^{*}: p < 0.10$, $^{**}: p < 0.05$, $^{***}: p < 0.01$.

B Figures

Figure A.1: Showerheads (as displayed to participants)

Figure A.2: First Purchase Decision (both treatments)

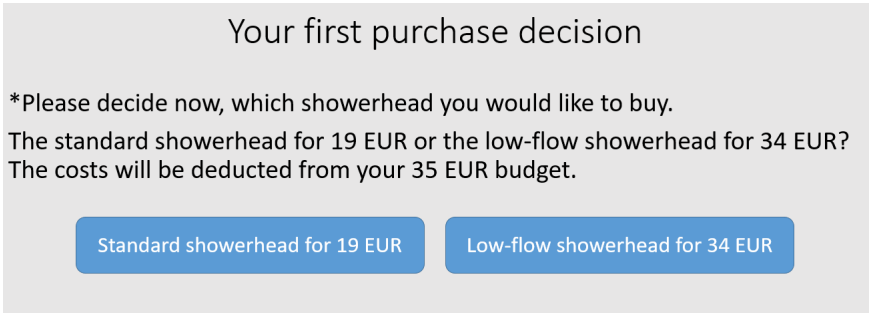


Figure A.3: Second Purchase Decision (Price treatment)

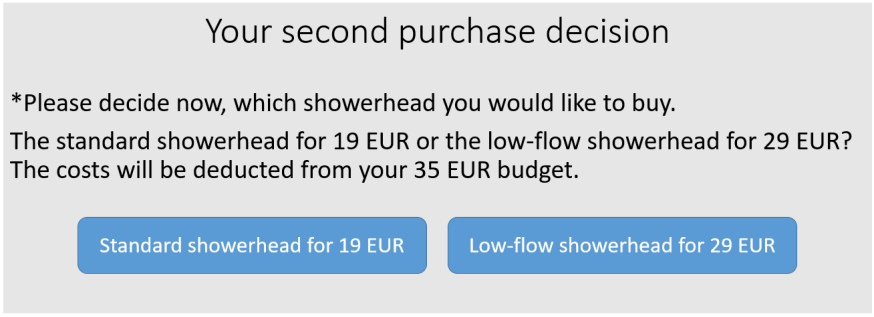


Figure A.4: Second Purchase Decision (Subsidy treatment)

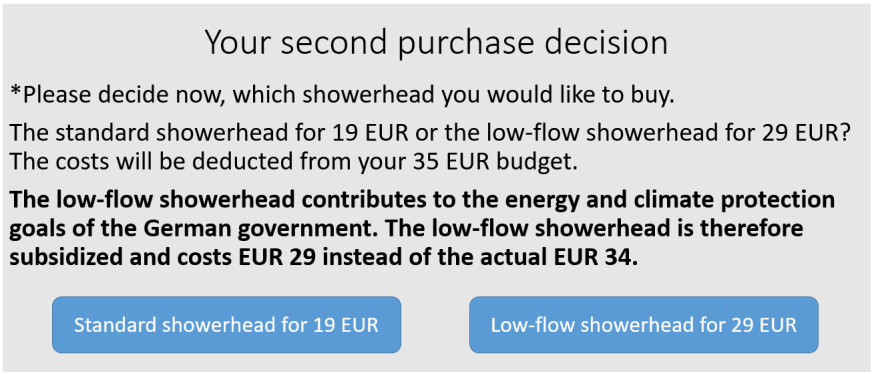
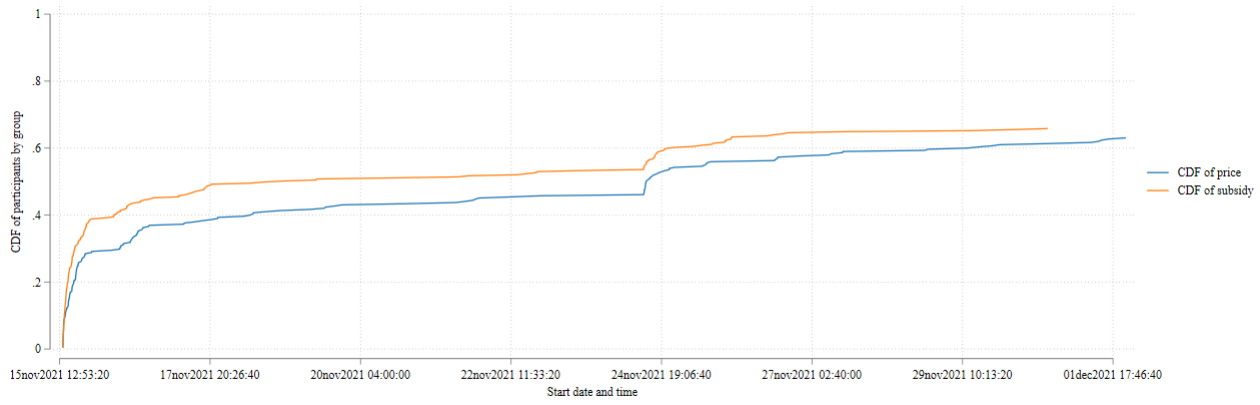


Figure A.5: Cumulative Density Functions of Treatment Assignment



C Translated Survey

– Screen 1 –

Dear participants,

Thank you for your interest in our survey! By conducting this survey, we try to better understand purchase decisions in the household. For this,you will make two purchase decisions in the first part of the survey. In a second part, we will ask you a series of questions about yourself, as well as your attitudes and opinions. You will be able to start with the survey shortly. To begin with, these are the most important basic points for your participation:

- Participation takes around 15 minutes.
- Your personal data will only be used for scientific purposes. Passing your personal data to any third party is excluded.
- Participation is voluntary and can be canceled at any time.
- For the completely filled in survey, you will receive an participation allowance of 10 euros.
- In addition, 60 participants will receive a "Hansgrohe" brand showerhead.

Please note: When navigating from one screen to the next, always use the "continue" button on your screen, not your internet browser. Otherwise, a successful completion of your survey cannot be guaranteed.

– Screen 2 –

Who is behind this study?

This study is part of a research projekt of the ZEW – Leibniz Centre for European Economic Research in Mannheim. The ZEW is a non-profit research institute and member of the Leibniz Association. The research project is financed by the Federal Ministry of Education and Research.

What happens to my personal data?

Your personal data will only be used for scientific purposes and evaluated in anonymous form. You can find our comprehensive data privacy notice here: ftp.zew.de/dsgvo/umw/XXXX.pdf

How is my participation allowance determined?

You will receive for a completely filled in questionnaire a participation allowance of 10 euros. Additionally, 60 participants will be selected randomly and receive a shower head from the brand "Hansgrohe".

How is my participation allowance paid out?

To enable you to receive the participation allowance without giving us your bank data, the payout in this experiment will be via PayPal. Please only continue with the questionnaire if you have a PayPal account and agree to the payment via PayPal. If you want to create a PayPal account, you can pause the questionnaire and continue later. At the end of the survey, you will be asked to give us the email address you use for your PayPal account.

Shipping of showerheads

We will select the people who will receive a shower head after closing the survey on xx.22.2021 and notify them by email. If you are selected, please provide us with a postal address to ship the showerhead. There are no additional shipping costs. This information will only be used for payment and shipping of the showerhead. We will delete your addresses after the survey is completed.

– Screen 3 –

The survey will begin on the following screen. Please read the following questions carefully and answer as truthfully as possible. In this questionnaire, there are no 'right' or 'wrong' questions. You do not need to be an expert to adequatly answer the questions.If you are unsure, pick the answer that most applies to you.

– Screen 4 –

This first part of the survey is about two purchase decisions between two showerheads each. In these two purchase decisions, the cost for both showerheads varies. For every one of these purchase decisions, you will receive a budget, from which to purchase the showerheads. At the end of the survey, in total 60 participants will be selected randomly and one of the two purchase decisions will be implemented. These people will receive the showerhead and the remaining purchase budget.

– Screen 5 –

Both showerheads, the purchase decisions are about, are shown below. There are two versions of a hand shower from Hansgrohe – either the standard version or with a water-saving function. The water-saving function reduces waterflow from 18 litres/min in the standard version to 9 litres/min. Thereby, your costs for water and energy consumption are lowered. Except for the water-saving function, both showerheads are identical. Both showerheads offer these jet settings: rain, normal jet, shampoo jet, massage jet.

More information, such as technical specifications, are available for the standard version (here) and for the version with water-saving function (here).

– Screen 6 –

You have a purchase budget of 35 euros for each of the two purchase decisions. For both purchase decisions, costs for the showerhead are lower than your purchase budget. If you are one of the 60 selected:

1. One of your purchase decisions will be selected randomly. Every purchase decision has the same probability of being selected.
2. And you will receive:

- your 10 euros participation allowance
- the showerhead of your choice
- the remaining purchase budget (35 Euros - cost showerhead)

For example: You have chosen a showerhead costing 19 euros. You receive this showerhead by mail. The remaining budget of 35 euros - 19 euros = 16 euros will be payed out to you in addition to your participation allowance of 10 euros. In total, you will receive 26 euros to your PayPal account.

Please note: Even if you currently do not need a new showerhead, you can store it for later use. Additionally, a US study has shown that certain bacteria can thrive inside showerheads. Pneumologists of the German Lung Foundation recommend replacing the showerhead regularly.

– Screen 7 –

The purchase decisions will begin on the next screen. Remember: Either of the two purchase decisions can be valid for you!

– Screen 8 –

Please now decide which showerhead you prefer. The standard showerhead for 19 EUR or the water-saving showerhead for 34 EUR? The costs will be deducted from your 35 EUR budget.

Answering options: Standard showerhead for 19 EUR / Water-saving showerhead for 34 EUR

– Screen 9 –

Please now decide which showerhead you would prefer. The standard showerhead for 19 EUR or the water-saving showerhead for 29 EUR? The costs will be deducted from your 35 EUR budget.

[Only in Subsidy treatment: The water-saving showerhead contributes to the energy and climate protection goals of the German government. The water-saving showerhead is therefore subsidized and costs 29 EUR instead of 34 EUR.]

Answering options: standard showerhead for 19 EUR / water-saving showerhead for 29 EUR

– Screen 10 –

Thank you for your purchase decisions. Now begins the second part of the survey.

- [If participant chose at least one time the water-saving showerhead] Why did you choose the water-saving showerhead?

  Answering options: I want to save the environment / I want to save costs for water and energy consumption / It is the cheapest option / It is subsidized [Only if in subsidy treatment] / I want to try something new / No answer

- How important are the following advantages of the water-saving showerhead to you in your purchase decision?

  - Prevention of global climate change
  - Prevention of national emissions
  - Prevention of a local water shortage

Answering options: Very important / Important / Neither important nor unimportant / Unimportant / Very unimportant/ I do not see a correlation / No answer

- How would the water-saving showerhead change your showering behaviour?
  - I would… *Answering options: Shower longer / No change / Shower shorter / No answer*
  - I would… *Answering options: Shower more often / No change / Shower less often / No answer*
- Before starting the survey, did you know….
  - … about water-saving showerheads in general?
  - … about the advantages of water-saving showerheads?

  Answering options: Yes / No / No answer

– Screen 11 –

- How would you rate the showering comfort of the water-saving showerhead compared to the standard showerhead?

  Answering options: Significantly worse / Worse / Equal / Better / Significantly better / No answer
- Assuming that you really win a showerhead:

  Answering options: I will replace my current showerhead and use the new one / I will resell the new showerhead / I will store the new showerhead for later use / The new showerhead has no use for me / No answer

– Screen 12 –

Now you have the chance to receive a bonus payout. For this purpose we ask you to answer four estimation questions. In doing so, you can win up to 4 euros extra.

- Bonus question 1: How much money does the water-saving showerhead save per year in comparison to the standard showerhead in a one-person household, if the person showers 5 times a week for 11 minutes at 38 degrees water temperature?

  Answering options on estimated savings: 0 - 55 EUR / 56-110EUR / 111-165EUR / 166-220EUR / No answer
- Bonus question 2: How many kilograms of CO2 does the water-saving showerhead save per year in comparison to the standard showerhead in a one-person household, if the person showers 5 times a week for 11 minutes at 38 degrees water temperature?

  Answering options on estimated savings: 0-150kg / 151-300kg / 151-300kg / 451-600kg / No answer

- Bonus question 3: How many litres of water does the water-saving showerhead save per year in comparison to the standard showerhead in a one-person household, if the person showers 5 times a week for 11 minutes at 38 degrees water temperature?

  Answering options on estimated savings: 0 -10.000 L / 10.001-20.000 L / 20.001 – 30.000 L / 30.0001 – 40.000 L / No answer

- Bonus question 4: What are the opinions of most other participants? How socially desirable (i.e., in accordance with morally and socially right behavior) is the choice of the water-saving showerhead in this decision: Standard showerhead for 19 EUR or water-saving showerhead for 34 EUR.

  If your answer to this question is the same as the answer of most other participants of this survey, and if you are one of the 60 winners, you will additionally receive a 1 euro payout. This is not about how socially desirable you personally view buying the water-saving showerhead – it is rather about how most of the participants see this purchase.

  Answering option: Socially highly desirable / Socially desirable / Socially undesirable / Socially strongly undesirable / no answer

- How do you personally rate the choice of the water-saving showerhead?

  Answering options: Personally very desirable / Personally rather desirable / Personally rater not desirable / Personally not desirable / No answer

– Screen 13 –

- How strongly do you support the introduction of the following policies:
  - Subsidization of energy efficient technologies
  - Taxation of energy efficient technologies.
  - Ban of energy efficient technologies

  Answering option: Strongly / Rather strongly / Rather not strongly / Not strongly / No answer

- What level of trust do you have in the listed institutions?
  - The Federal Government
  - Science (e.g., research institutes, Universities)
  - Media (e.g., press, public broadcasters)

  Answering options: Strong mistrust / A little mistrust / A little trust / Strong trust / No answer

– Screen 14 –

- How likely is it that you will do one of the following?

- Vote for a candidate for public office based on his or her position on global warming.
- Donating money to a organization that campaigns for climate protection.
- Volunteering in an organization that campaigns for climate protection.

Answering options: Definitely / Probably / Probably not / Definitely not //No answer

- In your opinion, how strongly will Germany be affected by the following climatic consequences?
  - The German forest dries up and dies
  - Decline in biodiversity
  - Displacement of animals from their natural habitats with consequences for humans (e.g., infectious diseases)
  - Decline of agricultural production (e.g., crop failures)
  - Droughts or heat waves
  - Extreme weather events, like floods or hurricanes
  - Water shortage

  Answering options: Strongly / Rather strongly / Rather not strongly / Not strongly / No answer

– Screen 15 –

- Please state how much you agree or disagree with the following statements:
  - For me, it is important to adapt to my social group.
  - My behavior is influenced by what others want me to do.
  - I have good intuition in understanding the emotions and motives of other people.
  - I am easily influenced by advertising.

  Answering options: Agree / Rather agree / Rather disagree / Disagree / No answer

– Screen 16 –

- In what year were you born? _____
- What gender do you identify with?

  *Answering options: Divers / female / male / no answer /Other:*_____
- What is your highest level of education?

  Answering options: No degree / Hauptschule / Mittlere Reife / Fachhochschulreife (Graduation from a Fachoberschule) / Abitur (entrance requirement for higher education) / Finished apprenticeship / Graduation from a university /Fachhochschule / No answer

- What is your marital status?

  Answering options: single / registered partnership / married / divorced / widowed / no answer

- What is your current employment status?

  Answering options: Apprentice / student / self-employed / employed / pensioner / unemployed / homemaker / on parental leave / no answer / other:_____

- What is your current housing situation?

  Answering options: apartment (rented) / apartment (owned) / house (rented) / house (owned) / no answer

- If there were federal elections on next Sunday, which party would you vote for?

  Answering options: CDU/CSU / SPD / AFD / FDP / Die Linke / Grüne / other / non-voter / no answer

- How high is your wage or salary after after taxes and after social security contributions?

  Answering options: Up to €500 / 500 up to €1.000 / up to €1.500 / 1.500 up to €2.000 / 2.000 up to €2.500 / 2.500 up to €3.000 / 3.000 up to €3.500 / over €3.500 / no answer /

– Screen 17 –

The questionnaire is now over. We will notify you after the survey closes whether you have won the showerhead from Hansgrohe. In this case, we will transfer to you possible bonus payouts and the remaining purchasing budget in addition to your participation allowance.

- Please give us an email address at which we can notify you:_____

In any case, you will receive your 10 EUR participation allowance. In order to pay without your bank data, you will receive your participation allowance via PayPal. For this purpose, we ask you to enter into the blank field the email address you use for your PayPal account.

- Your PayPal email _____

Note: Your PayPal-email will be used for the payout of your participation allowance and will not be passed to any third parties. After closing the survey, we will arrange the payout of your participation allowance to your PayPal account. If you have any questions on this process, be welcome to contact us at xxxe@xxx.de.

– Screen 18 –

Today you participated in a scientific study of the ZEW for the first time after a longer period or for the first time ever. We hope that you enjoyed participating and that you can imagine participating in further studies of this kind.

- Do you want to be added to, or stay, in our data base in order to be notified about our scientific studies in the future?

  Answering options: Yes, I would like to be added to your data base and be notified at this email address:_____/ No, I am not interested in future scientific studies / Yes, I would like to stay in the data base

Note: Of course, we use your data strictly confidentially and only for scientific purposes. You can find our corresponding data protection notice at: . You can unsubscribe from the data base at any time.

– Screen 19 –

To get to know you better, we would like you to answer a few more questions below. Answering the following questions takes about 10 minutes, for which you will additionally receive 5 euros via PayPal. Would you like to answer more questions?

Answering options: Yes, I would like to answer more questions / No, I would like to finish the survey

If last answer was "No, I would like to finish the survey" the following message appears:

The Leibniz-Centre for European Economic Research (ZEW) thanks you for your participation in this survey. Please press submit to end the survey.

If last answer was "Yes, I would like to answer more questions" the following message appears:

Thank you for your interest. Please carefully read the following questions and answer as truthfully as possible. In this questionnaire, there are no 'right' or 'wrong' questions. You do not need to be an expert to answer the questions adequately. You serve the purpose of this survey best when you answer the questions as truthfully as possible. If you are unsure, please pick the answer that applies most likely to you.

– Screen 20 –

The following questionnaire (screens 20 - 28) only appears if participants indicated that they want to more answer questions

- In the picture, you see a sketch of circles overlapping in different ways. Imagine that you are the left circle in each case, while the right circle represents your city. Please think about how strongly you identify with your city and choose the picture with the fitting overlap among pictures 1-5. Picture 1 stands for 'no identification' and picture 5 for 'complete identification'.

  Answering options: 1 / 2 / 3 / 4 / 5 / no answer

- In which city district* do you live? If your city has no districts, please state your town or village.

  Open ended answering option

- In the picture, you see a sketch of circles overlapping in different ways. Imagine that you are the left circle in each case, while the right circle represents your city. Please think about how strongly you identify with your city and choose the picture with the fitting overlap among pictures 1-5. Picture 1 stands for 'no identification' and picture 5 for 'complete identification'.

  Answering options: 1 / 2 / 3 / 4 / 5 / no answer

– Screen 21 –

- Please state how strongly you as a resident of your city district agree with the following statements.

  – To live in my city district was a conscious decision.
  – I am an active member in local organizations and groups, which consist mainly of residents from my area.
  – I am happy to be living in my city district.

  Answering options: Not at all / Rather not / Partly / Strongly / Very strongly / No answer

– Screen 22 –

- Question: How would you rate the current traffic infrastructure in your city?

  Answering options: Good to very good / satisfactory to sufficient / deficient / no answer

- As part of sustainable and adapted urban concepts, the establishment of traffic-calmed zones and car-free weekends in city centres is being discussed. In your opinion, should this idea be pursued?

  Answering options: Yes / No / No answer

- Do you own a monthly ticket for your city's public transport system?

  Answering options: Yes / No / No answer

– Screen 23 –

- How far is your commute to work (one-way in km)?

  Answering options: _____

- Do you own a car?

  Answering options: Yes / No / No answer

- Are you among those who frequently travel long distances by car?

  Answering options: Yes / No / No answer

– Screen 24 –

- Do you know about your city's climate protection campaigns?

  Answering options: Yes / No / No answer

- Do you agree with the following statements?

  - My city campaigns enough for environmental and climate protection
  - I am committed to environmental and climate protection
  - I get motivated to commit to environmental and climate protection when my surroundings get involved.
  - Areas designed as part of a Federal Garden Exhibition raise the quality of life in cities.

  Answering options: Not at all / Rather not / Partly / Strongly / Very strongly / No answer

- Please arrange the following environmental regulatory policies according to your preferences (by which of these regulatory measures would you like to see environmental behavior regulated). Please rank your most preferred choice at the top and your least preferred choice at the bottom.

  Answering options: behavioral appeals/ information campaigns / fines / bans / no regulation / monetary incentives

- Stricter environmental policies mean limitations for the citizens' freedom of action. Should the city initiate stricter environmental policies as soon as possible?

  Answering options: I totally agree / I mostly agree / Partly / I rather disagree / I totally disagree / No answer

– Screen 25 –

- Imagine the following situation: You went shopping in an unfamiliar city and realize that you got lost. You ask a stranger for directions. The strangers offers to give you a ride in his car to your destination.
  The journey takes about 20 minutes and costs the stranger in total around 20 euros. The stranger is not asking for money. You have got with you 6 bottles of wine. The cheapest bottle costs 5 euros, the most expensive 30 euros. You decide to thank the stranger by gifting him one of the bottles. Which bottle do you give to the stranger?

  Answering options: €5 bottle/ €10 bottle / €15 bottle / €20 bottle / €25 bottle / €30 bottle / No answer

- Imagine the following situation: Today you unexpectedly received 1,000 euros. How much of the money would you donate to a good cause?

  Answering option: Open ended answering option

– Screen 26 –

- Question: How much do you agree with the following statements?

  - Humans have the right to change their environment to their needs
  - Humans severely abuse the earth
  - Plants and animals have the same rights of existence as humans
  - Nature is strong enough to cope with the effects of modern industrial nations.
  - Humans are intended to rule over the rest of nature.
  - The equilibrium of nature is very sensitive and can be easily damaged
  - In general, people are trustworthy
  - Nowadays you can trust nobody
  - When dealing with strangers, it is better to be cautious before trusting them.
  - When dealing with strangers, it is better to be cautious before trusting them.

  Answering options: Totally disagree / Rather disagree / Undecided / Rather agree / Totally agree / No

– Screen 27 –

We will ask you now about your willingness for certain behavior. Please again use a scale from 1 to 10. 0 means 'not at all willing to do this' and 10 means 'very much willing to do this'. You can use the numbers between 0 to 10 to state where you see yourself on the scale by using the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

- How much would you be willing to give up something that benefits you today in order to benefit you more in the future?
- How much would you be willing to punish someone who treats you unfair, even if this has negative consequences for yourself?
- Much much would you be willing to punish someone, who treats others unfair, even if this means extra costs for you?
- How much would you be willing to give for a good cause without expecting something in return?
- How much are you able to resist temptations?
- How much are you willing to take risks?
- I care what others think of me.
- If somebody does me a favor, I am ready to return it.
- I guess that people only have the best intentions.
- I am good at math.
- I tend to postpone tasks even when I know that it would be better to carry them out immediately.

Answering options: 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / no answer

– Screen 28 –

Thank you very much, you successfully finished the survey. After the completion of the survey, we will arrange the payout to your PayPal account. You will receive for both surveys a €15 participation allowance, plus your remaining purchase budget and the bonus questions, if you are one of the picked 60 persons.

Is there anything else you would like to tell us? Then you have the opportunity to do so here:_____

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