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Conference Paper

More than just a Price Decrease: Field Experimental Evidence on the Mechanisms of an Energy Efficiency Subsidy

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2022: Big Data in Economics

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Bartels, Lara; Werthschulte, Madeline (2022) : More than just a Price Decrease: Field Experimental Evidence on the Mechanisms of an Energy Efficiency Subsidy, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2022: Big Data in Economics, ZBW - Leibniz Information Centre for Economics, Kiel, Hamburg

This Version is available at:

<https://hdl.handle.net/10419/264091>

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More than just a Price Decrease: Field Experimental Evidence on the Mechanisms of an Energy Efficiency Subsidy

Lara Bartels¹, Madeline Werthschulte²

Version: February 28, 2022

Abstract

Energy conservation plays a decisive role in climate change mitigation. To boost conservation efforts, policy-makers increasingly rely on energy efficiency subsidies. Yet, it is not well understood why subsidies affect demand. We conjecture two drivers, (i) the decrease in purchasing price and (ii) the normative recommendation for action implicit in policy regulation. We use a framed field experiment to test a subsidy on an energy-saving showerhead, and compare its effectiveness to a pure price decrease. We find that both the price decrease and subsidy significantly increase demand for the energy-saving showerhead. Yet, the demand response to the subsidy is 7 percentage-points stronger. An analysis of the underlying channels suggests that this additional demand response is explained by a shift in the individual perception of the social desirability of the showerhead. Results imply that an energy efficiency subsidy gives more value than the money spent.

JEL Classification: C93, D9, H23, Q40

Keywords: Subsidy, price and non-price effects, energy efficiency, water consumption, field experiment

Acknowledgements: We are grateful for the numerous insightful discussion with Carlo Gallier, Martin Kesternich and Jörg Lingens. We further thank seminar participants at Mannheim, Bochum, GfeW 2021 and AURÖ 2021 for helpful comments during the design phase of the project. 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

Energy conservation plays a decisive role in addressing climate change (IPCC, 2018). In response, energy efficiency policies have been widely adopted by governments around the world. In that realm, policy-makers increasingly rely on energy efficiency subsidies (e.g., Bundesministerium der Finanzen, 2021). These offer the advantages of not raising distributional side effects as taxes, being a mean to stimulate economic growth, and being more easily to agree on in the political process.

Yet, there is surprisingly little evidence on the mechanisms underlying a subsidy's effectiveness. Recent literature (Rees-Jones and Rozema, 2020) suggests that two factors drive demand responses of pricing strategies. First, the price change impacts individuals' budget constraint and alters the demand for the subsidized or taxed product via income and substitution effects. Second, by implementing a regulation that either encourages or discourages the usage of a good, policy-makers express socially desirable behavior. This expression may affect individuals' information, beliefs and norms, and therefore directly utility.

As novelty, we identify such price and non-price effects implicit in an energy efficiency subsidy using a framed field experiment. We recruit citizens living in a large German city, and ask them to purchase either an energy-saving or a standard showerhead. Participants make two purchase decisions, (i) at baseline prices and (ii) at a reduced price for the energy-saving showerhead. In a *Price* treatment, this second purchase decision is presented without further information about the change in prices. In a *Subsidy* treatment, we inform participants that the price decrease stems from a subsidy on the energy-saving showerhead.

Our results reveal a significantly stronger demand response of the subsidy compared to the pure price decrease. Specifically, we identify a price elasticity of -0.2 and a subsidy elasticity of -0.5. Both elasticities are significant – individuals do react to price changes. However, the reaction is 7 percentage-points stronger in the *Subsidy* treatment. The normative appeal implicit in a subsidy thus indeed triggers demand reactions that are additional to the change in price.

We further find evidence that this normative appeal affects demand through impacting the personal norm of what is socially desirable. In contrast, we do not observe effects of the subsidy information on beliefs in the saving potentials of the energy-saving showerhead or on the perceived injunctive social norm. This suggests that the additional demand response of an energy efficiency subsidy is driven by shaping the individual perception of 'right' or 'wrong' behavior.

Our study of the non-price mechanisms of a subsidy is motivated by recent empirical literature in the context of taxes. Rees-Jones and Rozema (2020) show for cigarette taxes that not only the pure price effect but also the expressive effect of introducing a new tax law contributes to a decrease in cigarette consumption. Similarly, Taylor et al. (2019) investigate whether consumers react differently to direct regulations – in their case a penny-per-fluid-ounce tax to be paid by distributors of sugar-sweetened beverages – and the proceeding informational campaigns. They find that the proceeding information campaigns have a larger effect on purchasing behavior than the tax itself. In a same manner, Abouk and Adams (2013) find that not a texting ban but instead the announcement of that ban better explains

the decline of accidents. Malani and Reif (2015) and Gruber and Koszegi (2001) find changes in behavior in the context of a tort reform and a cigarette tax prior to their enactments, suggesting behavioral responses to regulation not explained by price changes.³

In a more general sense, the theoretical literature on compliance has shown that individuals do not only comply with law because of the imposed sanctions. Following Sunstein (1996), the effectiveness of law is largely explained by changes in social norms, social meaning and role, and less a consequence of criminal prosecution. A broad range of legal literature (Cooter, 1998; McAdams, 2000b, 2000a; McAdams and Rasmusen, 2007) attribute such non-monetary impacts of law to its “expressive effect.” Laws and regulations express how consumers should value certain goods or bads. Thereby, law and economic instruments can counteract existing, undesirable norms or social meanings, and produce new norms that lead to altered behavior (Sunstein, 1996). We build on this theoretical literature and extend the empirical literature by contributing novel evidence on the monetary and non-monetary effects of a subsidy targeting energy efficiency improvements.

Thereby, this study contributes a nuanced view on the underlying mechanisms of a subsidy within the intensively researched domain of the so-called energy-efficiency gap (Allcott and Greenstone, 2012; Gillingham and Palmer, 2014; Gerarden et al., 2017). As to address this gap and to increase energy efficiency investments, subsidies have been proposed to overcome credit constraints and investment inefficiencies (Allcott et al., 2012; Allcott and Greenstone, 2012; Allcott and Taubinsky, 2013; Allcott et al., 2015; Berkouwer and Dean, 2021). Allcott et al. (2012) 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 compare the efficiency of nudges against price instruments (Allcott and Taubinsky, 2013; Rodemeier and Löschel, 2020). However, this literature models subsidies as well as taxes purely as a change in prices. We extend this view by shedding light on the behavioral, 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 and prone to several behavioral biases of energy consumption. 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 water-saving showerhead can save some considerable amount of energy and water. While existing literature has focused on water conservation behaviors, we take a more transformative approach in directly studying *investments* in energy-efficient showering.

We present our study by first outlining the experimental framework in Section 2. We describe our data analysis in Section 3, which we conduct in three steps. Section 3.1 gives summary statistics of the sample and our main outcomes. In Section 3.2 we turn to the showerhead purchase decisions, and in Section 3.3 we investigate the mechanisms

³ 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.

underlying the non-monetary subsidy effect. Finally, Section 4 discusses our results and concludes.

2. Experimental Framework

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 participant both from an existing Mannheim citizen panel⁴ and by randomly distributing direct mails to 1000 households living in Mannheim.⁵ The invitation letter invited citizens to participate in an online survey on household decision-making. Participants thus did not know that they are taking part in a randomized experiment, in which we scrutinized their purchase behavior. For participation, all subjects received a fixed reimbursement of 10 Euros and had the chance of winning a showerhead.

With the start of the survey, participants were randomized into a *Price* or a *Subsidy* treatment. In each treatment, participants had to make two consecutive purchase decisions between a standard and an energy-saving showerhead (see Appendix Figures 1-3 for the translated decisions screens. Appendix Figure 4 displays the two offered showerheads. Appendix B gives the full translated survey). While the first purchase decision was identical in both treatment groups, the second purchase decision differed between treatments. To incentivize decisions, participants received a shopping budget of 35 Euros for each purchase decision. The respective showerhead costs were subtracted from that budget and the remaining amount was paid out.

In the first purchase decision, we offered the standard showerhead for 19 Euros and the energy-saving showerhead for 34 Euros. Choosing the standard showerhead yielded thus an additional payment of 16 Euros, and choosing the energy-saving showerhead yielded 1 Euro. Consequently, participants had an incentive to trade-off the relative prices of the showerheads against their relative utility.

The second purchase decision was framed differently depending on the treatment condition. In both treatments, the energy-saving showerhead was offered at a reduced price of 29 Euros (a 15 percent decrease compared to the first decision). In the *Price* treatment, however, we did not inform participants about reasons behind this price reduction.⁶ In the *Subsidy* treatment, we explained that the energy-saving showerhead contributes to the energy and climate protection goals of the German government and is therefore subsidized and costs less. The costs of the respective chosen showerhead were gain subtracted from the 35 Euros shopping budget. Compared to the first purchase decision, the relative price of the energy-saving head is decreased in both treatments. The additional subsidy information may however have a direct impact on utility, thus favoring not only a shift in the relative prices but also in relative utility towards the energy-saving option.

⁴ The Mannheim citizen panel was created by the ZEW as a pool of participants that are willing to take part in surveys and experiments. Participants to that panel were recruited by random direct mails in Mannheim and the surrounding Rhine-Main area. Only in November 2020, about 1.200 recruitment letters were distributed across Mannheim, which yielded about 100 new registered participants.

⁵ These letters were equally distributed among four districts in Mannheim we have had not recruited participants before. To keep the panel heterogeneous, the districts were selected according to their characteristics and cover a relatively wealthy as well as poor population.

⁶ The set-up was thus similar to a classic Multiple Price List that varies the price of the offered options along the rows without information about why the price varies (e.g., Allcott and Taubinsky 2014).

Before participants made the purchase decisions, both treatment groups received the same information about the two showerhead types, in particular information about the respective water consumption. The energy-saving showerhead reduces the water flow from 18 liters/minute to 9 liters/minute. The investment in the energy-saving showerhead thus reduces water consumption and, as water is usually heated for showering, also energy consumption. Importantly, both showerheads only vary in the water-saving attribute and are otherwise completely identical. We highlighted this fact to participants. Thereby, we ensure that the valuation of the showerheads is driven solely by the water- and energy-saving option and not contaminating factors, such as design or brand name.

Using showerheads as purchase decision offers a number of further advantages. A showerhead is a durable good and can be stored for future use if not needed immediately. We thereby avoid the concern that consumers may not receive any utility from the showerheads and just select the cheaper option. We further reduced this threat by informing participants about (i) the possibility to store the showerhead and (ii) a recommendation by the German Lung Foundation to replace the showerhead regularly due to associated bacteria.⁷ In addition, a showerhead is easily replaceable for all participants as the connection to the shower tube is standardized based on EU legislation.

At the end of the survey, we randomly selected 60 participants for whom one of the purchase decisions was implemented. Therefore, one of the two purchase decisions was chosen at random, we paid the remaining shopping budget of that decision and sent the chosen showerhead by mail. Thus, decisions should be made carefully and reflect true preferences.

After the experimental part, the survey proceeded with eliciting beliefs that may shed light on the channels underlying the effect of the subsidy treatment on purchase decisions. In particular, we used incentivized measures to elicit beliefs about the monetary-, water- and carbon-savings from the energy-saving showerhead. Likewise, we used an incentivized elicitation of the perceived injunctive norm (Krupka and Weber, 2013) and an elicitation of the personal norm to purchase the energy-saving head. We further asked for expected changes in showering habits when selecting the energy-saving head, and for the support of energy efficiency policies in general.

The survey also served to elicit factors that may moderate the treatment effects. This concerns in particular the trust in governmental institutions, and the trust in research and media. Based on Falk et al. (2016; 2018), the survey also covered the well-established and validated Global Preference Survey measures to identify preferences (risk, patience, neg. reciprocity, altruism, and trust); 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). Finally, the survey concluded with questions on general socio-demographics as well as participants' current living situation, their working status, educational background net income and voting behavior.

⁷ Online statement at <https://www.lungenaerzte-im-netz.de/news-archiv/meldung/article/vor-allem-lungenkranke-sollten-brausekoepfe-regelmaessig-austauschen/> (last retrieved 26.01.2022). The statement refers to Feazel et al. (2009).

3. Data Analysis

3.1. Sample Description and Summary Statistics

We have a total of 614 responses, of which 595 completed the survey. Participants are close to equally split in treatments, 295 are in the *Price* and 319 in the *Subsidy* treatment.⁸

The average participant is male, 40 years old, married, and has a net income between 2,000-2,500 Euros per month. The majority of our sample has a university degree, is employed, would vote for the Green party if there were elections and does not own property. Further notable is that the majority of the sample (61 percent) plan to exchange their existing showerhead for the selected head if winning the lottery. The second largest fraction (34 percent) plan to store the showerhead for later usage. 68 percent knew about the existence, and 62 percent knew about the advantages of water-saving showerhead. On average, participants do believe that the energy-saving showerhead (E-head) and the standard showerhead (S-head) perform alike regarding shower comfort.

Participants have a good intuition for the savings potential of the water-saving head. The average participant believes that a one-person-household would save between 56 - 110 Euros, 151 - 300 kg CO₂ and 10,001 - 20,000 liters of water per year. While both the carbon and water savings are correctly estimated, the average participant underestimates the monetary savings. The average participant believes that the purchase of the water-saving showerhead is perceived by society as “rather socially desirable” (injunctive norm). At the same time, the average participant finds the purchase of the water-saving showerhead as being “rather socially desirable.”

These results may already partly explain the high popularity of the water-saving showerhead. In the first purchase decision already 62 percent in the *Price* treatment and 70 percent in the *Subsidy* treatment selected the water-saving showerhead (see Figure 1). This difference is significantly different⁹ (Chi2-test p-value: 0.04). In the second decision - with the introduction of the treatment, the share of water-saving showerheads increases for both treatment groups (78 percent in *Subsidy*, 65 percent in *Price*; Chi2-test p-value: 0.00). However, we see that this share is slightly higher in *Subsidy* compared to *Price*. In *Subsidy*, 91 percent remained with their first choice, while 9 percent changed from the standard to the water-saving showerhead. In *Price*, 95 percent remained with their first choice. This difference is statistically significant (Chi2-test p-value= 0.061).

Table 1 tests the balance of covariates across the two treatment conditions. Accordingly, we cannot find significant differences in demographic and socio-economic characteristics as well as basic preferences between treatment groups. Also a joint F-test is insignificant. Yet, since we observe an imbalance in the first purchase decision across treatments, we control for this first purchase decision in all regressions.

⁸ Appendix Table 1 gives a detailed description of all variables, Appendix Table 2 detailed summary statistics.

⁹ Based on our design and our successful randomization (see Table 1), we expected no differences in the first treatment decision. The first purchase decision and the proceeding screens/information were completely identical for both treatments. One potential explanation might be an unlucky allocation into treatments. For randomization, we used the LimeSurvey software and programmed it to randomly allocate participants into treatments. We however observe that at the beginning of the data collection, LimeSurvey distributed more participants into the *Subsidy* treatment (see Appendix Figure 5). We hypothesize that particularly motivated participants directly reacted to our invitation mail and that these may have been more inclined to the energy-saving showerhead.

Figure 1: Share of chosen water-saving showerheads in both decisions over treatments

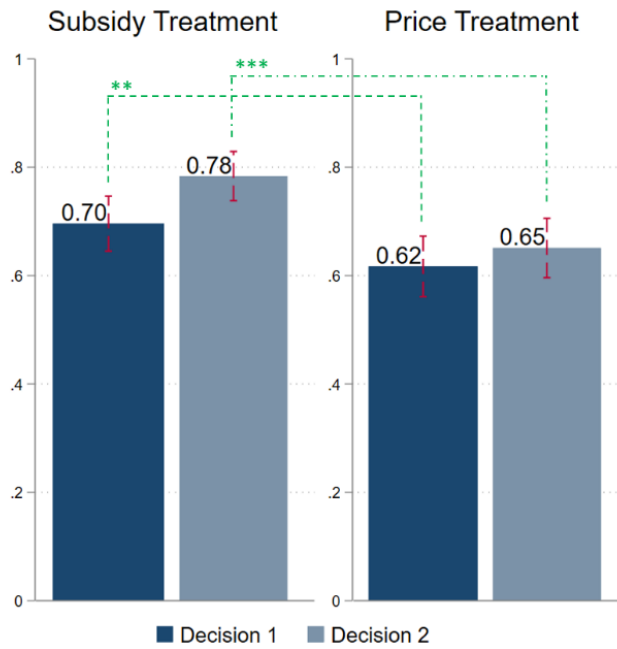


Table 1: Balance Table

		Price (1)		Subsidy (2)		t-test difference
		<i>N</i>	<i>Mean/SD</i>	<i>N</i>	<i>Mean/SD</i>	(1)-(2)
Socio Economics	Female (y/n)	281	0.42 [0.49]	307	0.45 [0.50]	-0.03
	Age	284	39.42 [13.23]	307	39.82 [14.74]	-0.40
	Married (y/n)	283	0.62 [0.49]	306	0.67 [0.47]	-0.05
	Green voter (y/n)	270	0.38 [0.49]	275	0.43 [0.50]	-0.05
	Tenant (y/n)	279	0.73 [0.45]	302	0.68 [0.47]	0.05
	Employed (y/n)	281	0.74 [0.44]	303	0.71 [0.46]	0.04
	Uni degree (y/n)	285	0.74 [0.44]	309	0.73 [0.45]	0.01
	Income	260	5.40 [2.17]	271	5.36 [2.21]	0.04
Survey Indicators	Knowledge about E-head	291	0.68 [0.47]	314	0.68 [0.47]	-0.01
	Knowledge about E-head benefits	287	0.60 [0.49]	308	0.63 [0.48]	-0.03
	NEP Score	263	3.66 [0.47]	284	3.71 [0.47]	-0.04
	Time preferences (GPS)	269	7.41 [1.74]	296	7.40 [1.75]	0.01
	Risk preferences (GPS)	270	5.31 [2.18]	296	5.40 [2.20]	-0.09
	Altruism (GPS)	266	57.57 [62.06]	293	63.68 [64.98]	-6.11
	F-test of joint significance (F-stat)					0.06
F-test, number of observations					444	

3.2. Purchase Decisions

To test for differences *between* the *Subsidy* and *Price* treatment in the likelihood to purchase the water-saving showerhead we use the following linear probability model:

$$Purchase_i^2 = \gamma_1 + \gamma_2 Subsidy_i + \gamma_3 Purchase_i^1 + \mu_i, (1)$$

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

We further estimate the treatment effects *within* the *Price* and *Subsidy* treatment using the following specification:

$$Purchase_{it} = \beta_1 + \beta_2 Subsidy_i + \beta_3 Price_i \times Post_t + \beta_4 Subsidy_i \times Post_t + \varepsilon_{it}. (2)$$

We observe each participant i in the two purchase decisions $t \in \{1; 2\}$. $Purchase_{it}$ equals one if the participant selected the water-saving head in the respective decision, $Subsidy_i$ is the indicator for the subsidy group as to allow for different choices in the first purchase decision between groups. $Price_i \times Post_t$ and $Subsidy_i \times Post_t$ denote interaction terms between being the *Price* or *Subsidy* group and making the second purchase decision. That is, $Post_t$ equals one if $t=2$. ε_i gives the error term. Standard errors are clustered on the subject level. The coefficient β_3 gives then the price effect, i.e. the price elasticity of demand, and β_4 the subsidy effect, i.e. the subsidy elasticity of demand.

Table 2 gives the results of both regressions. Accordingly, the *Subsidy* treatment significantly increases the likelihood to purchase the water-saving showerhead by 7 percentage points compared to the *Price* treatment. The additional information provided by a subsidy thus indeed impacts demand. The non-monetary information provided through a subsidy matters. Table 2(3) and (4) allow to compare the price and subsidy elasticities of demand. The decrease in the purchasing price by 15 percent increases demand by 3.4 percent, which is significant at the 5-percent level and implies a 0.2 price elasticity of demand. In contrast, if the 15 percent price decrease is accompanied with the subsidy information, demand for the E-head increases by 8.8 percent. This change in demand is highly significant and implies a subsidy elasticity of 0.5 percent. When testing both coefficients against each other, we can reject the null hypothesis of no differences at the 5-percent level.¹⁰

Thus, the subsidy elasticity of demand is significantly higher compared to the price elasticity of demand. The returns to introducing a subsidy are larger than the effect purely explained by the price decrease. We next turn to potential mechanisms underlying this subsidy demand effect.

¹⁰ While the difference slightly diminishes when adding control variables, it remains significant at the 10-percent level. Yet, this reduction in significance may well be explained by the reducing in the number of observations.

Table 2: Regression results of purchase decisions on treatment

	(1) Purchase in 2 (0/1)	(2) Purchase in 2 (0/1)	(3) Purchase (0/1)	(4) Purchase (0/1)
Subsidy	0.072*** (0.021)	0.076*** (0.026)	0.079** (0.038)	0.112*** (0.043)
Purchase in 1 (0/1)	0.769*** (0.029)	0.742*** (0.038)		
Price X Post			0.034** (0.015)	0.040** (0.017)
Subsidy X Post			0.088*** (0.016)	0.088*** (0.019)
Controls	No	Yes	No	Yes
p-value of $\beta_3 = \beta_4$	-	-	0.016	0.062
N	614	449	1228	898

Note: Linear probability models. Controls: Gender, age, marital status, being a tenant, employment status, university degree, income, being a green voter, time, risk preferences and altruism from GPS, environmental preferences as measured from the NEP. Robust standard errors in parentheses. In specifications (3) and (4) standard errors are clustered on the subject level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

3.3. Mechanisms

To explore potential mechanisms of why a subsidy leads to stronger demand effects compared to the price decrease, we investigate shifts in saving beliefs and perceived social norms. We therefore run the regression model (1) on the following set of belief measures: the expected (1) monetary savings, (2) carbon savings, and (3) water savings from the water-saving showerhead (see Table 3). As measures are elicited in four categories that are increasing in expected savings, we use an ordered probit model.

Strikingly, we do not find evidence of the *Subsidy* treatment altering the saving beliefs from purchasing the water-saving head. Table 3 displays the regression coefficients, which are *negative* but mostly insignificant for the three belief measures. This weak tendency among the *Subsidy* group to underestimate savings compared to the *Price* group is inconsistent with the results we get from the purchase decisions.

Table 3: Regressions results of saving beliefs on treatment

	(1) Beliefs: Euro	(2) Beliefs: Euro	(3) Beliefs: CO ₂	(4) Beliefs: CO ₂	(5) Beliefs: Liter	(6) Beliefs: Liter
Subsidy	-0.051 (0.089)	-0.118 (0.105)	-0.081 (0.092)	-0.107 (0.108)	-0.144 (0.090)	-0.220** (0.107)
Purchase in 1 (0/1)	0.077 (0.095)	0.104 (0.115)	0.130 (0.099)	0.165 (0.120)	0.173* (0.097)	0.196* (0.118)
Controls	No	Yes	No	Yes	No	Yes
N	593	446	578	437	592	446

Note: Ordered probit models. Controls: Gender, age, marital status, being a tenant, employment status, university degree, income, being a green voter, time, risk preferences and altruism from GPS, environmental preferences as measured from the NEP. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Next, we run our regression model on the perceived injunctive social norm and on the personal norm of purchasing the water-saving head. Outcomes are again measured in four categories, from ‘not at all socially desirable’ to ‘very socially desirable.’

As for the saving beliefs, we do not observe a shift in the perceived social norm when receiving the subsidy information. Table 4 displays no significant differences between *Price* and *Subsidy* treatment, and – as with the saving beliefs – even a negative coefficient. However, the subsidy information does alter the personal norm of the social desirability of purchasing the water-saving head. While this relation is just marginally significant without control variables, significance increases to the 5-percent level when adding controls.

Table 4: Regression results of norm perception on treatment

	(1)	(2)	(3)	(4)
	Social norm	Social norm	Personal norm	Personal norm
Subsidy	-0.055 (0.101)	-0.104 (0.121)	0.177* (0.102)	0.245** (0.122)
Purchase in 1 (0/1)	-0.075 (0.106)	0.018 (0.131)	1.023*** (0.112)	0.862*** (0.134)
Controls	No	Yes	No	Yes
N	592	444	583	439

*Note: Ordered probit models. Controls: Gender, age, marital status, being a tenant, employment status, university degree, income, being a green voter, time, risk preferences and altruism from GPS, environmental preferences as measured from the NEP. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.*

While participants do not alter their belief of how socially desirable *others* perceive the water-saving showerhead, the subsidy information induces them to increase their *own* evaluation of how socially desirable the head is. Thus, the demand increase of the *Subsidy* group can be explained by the subsidy information influencing one’s own evaluation of what is ‘good’ behavior. In contrast, extrinsic factors – such as potential savings or social pressure – do not seem to be the mechanisms underlying the change in demand.

4. Discussion and Conclusion

This study improves our understanding of the mechanisms underlying a subsidy. Specifically, we conducted a field experiment to test whether a subsidy triggers larger demand reactions than a pure price decrease. In the field experiment, participants decided between a standard and an energy-saving showerhead. Purchase decisions are made in an environment where either only the price of the energy-saving showerhead is being decreased or both the price is decreased and information about the subsidy-nature of the price decrease is given. In particular, in this *Subsidy* treatment, we informed participants that the energy-saving showerhead contributes to the energy and climate protection goals of the German government and that the energy-saving showerhead is therefore subsidized.

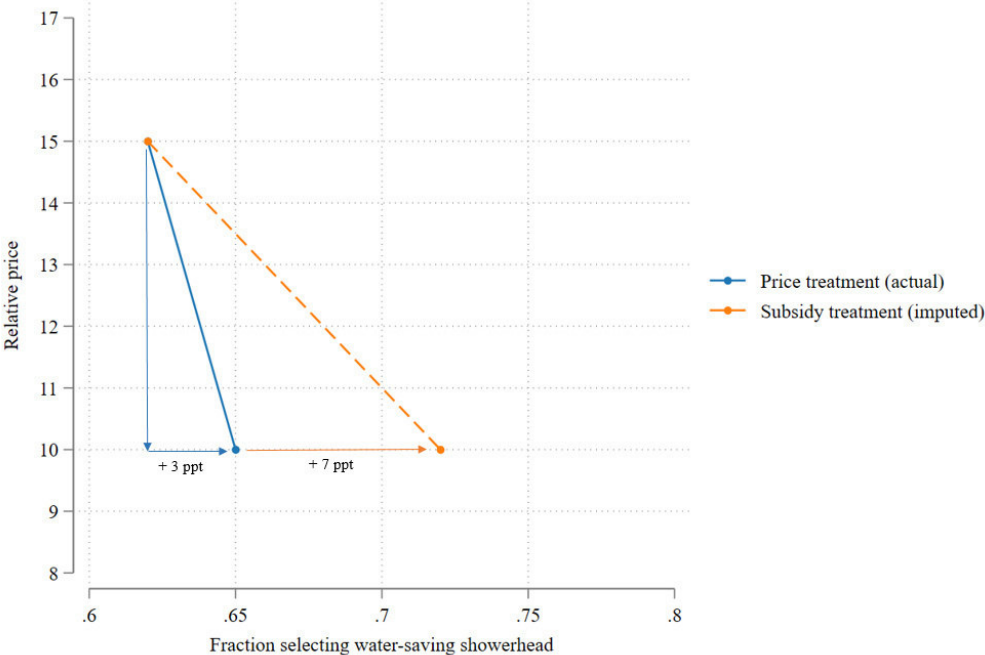
Our results provide first evidence that energy efficiency subsidy alters demand by both decreasing the purchasing price and sending a normative signal to individuals. We find a demand increase of about 3-percent when the price decreases and a demand increase of about 9-percent when the subsidy is introduced. The demand response of a subsidy is 7-percentage points stronger compared to a pure price decrease. Further analyses reveal the channels of these non-monetary subsidy effects. We do not observe altered saving beliefs or altered perceived social norms among participants that received the subsidy information.

Instead, the additional information given alters the *personal* evaluation on how socially desirable the energy-saving showerhead is.

This evidence is consistent with theoretical arguments attributing the effectiveness of law to a large extent to their expression of normatively desired behavior (Sunstein 1996). In our experiment, the price decrease explains less than 50-percent of the total subsidy effect. In line with the arguments of that literature, the subsidy regulation affects demand mostly by shaping the individual perception of what is ‘right’ and what is ‘wrong’ behavior.

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 15-Euro-price decrease would. Therefore, a subsidy is a highly effective tool for policy-makers as to increase demand. Figure 2 visualizes these relations between a subsidy regulation and a pure price decrease. The figure displays the fractions purchasing the energy-saving head as demand curves given the relative price of the energy-saving head. While we use actual data from the *Price* treatment, we imputed the *Subsidy* demand curve assuming identical demand in the first purchase decision. 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.

Figure 2: Demand curves of the *Price* and *Subsidy* treatment



These implications raise the question of how much of the effect can be attributed to our specific design of the subsidy. First, our implications are surprisingly in line with the results documented by Rees-Jones and Rozema (2020), who study cigarette taxes using a quasi-experimental approach and naturally occurring data. Second, the information content we decided to give is the result of a trade-off between on the one hand expressing policy-maker intentions and on the other hand not giving more than the very basic information. In contrast, the introduction of real-world subsidy would likely be accompanied with massive press and media coverage – which might even increase the non-monetary subsidy effects beyond our estimates.

While it may be fruitful to investigate the non-monetary 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 perception about the origin that decrease (e.g., concerns regarding quality, lack of demand, or normative signals). Our framed field setting in contrast provided the unique combination of being able to only decrease the purchasing price, as it is commonly done in such type of experiments, but to also observe the reactions of regular citizens to the introduction of a subsidy.

Yet, we acknowledge that future research should investigate the informational components of a subsidy and its specific effects more closely. Surprisingly, we did not see any change in savings beliefs and social norm perception following the *Subsidy* treatment. This result deserves a closer examination in the future. Likewise, the normal appeal of a subsidy may induce spill-over effects. Individuals may not only be keener to invest in energy-efficient showerhead but also in other energy-efficient products. Finally, the effects of *removing* a subsidy deserve further investigation. While price effects may be similar, the removal of a regulation may send an even stronger normative signal.

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Online Supplementary Appendix A

Appendix Table 1: Description of Dependent and Independent Variables

Label	Description
Subsidy (0/1)	Has the value 1 if the participant is in the subsidy treatment, and the value 0 if the participant is in the price treatment
Main Outcomes	
Purchase in 1 (0/1)	Has the value 1 if the participant chose the water-saving showerhead for 34 EUR, and has the value 0 if the participant chose the standard showerhead for 19 EUR.
Purchase in 2 (0/1)	Has the value 1 if the participant chose the water-saving showerhead for 29 EUR, and has the value 0 if the participant chose the standard showerhead for 19 EUR.
Socio-Economics	
Age	Indicates the age of the participant
Female	Indicates that participant is female [1=female, 0=male]
Married	Has the value 1 if the participant is married or lives in a long-term relationship and the values 0 if the participant is single, divorced or widowed.
Uni 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.
Green voter	Has the value 1 if the participant would vote the green party if next Sunday were elections, and the value 0 if the participant would vote any other German party,
Tenant	Has the value 1 if the participant owns property (house or flat), and the value 0 if the participant lives for rent (house or flat).
Employed	Has the value 1 if the participant is employed or not, and the value 0 if the participant is not working or is retired.
Income	Indicates the net income of the participant [1 = <500€, 2= 500-1.000€, 3= 1.000-1.500€, 4= 1.500-2.000€, 5= 2.000-2.500€, 6= 2.500-3.000€, 7= 3.000-3.500€, 8=>3.500€]
Survey Measures	
Knowledge about E-head	Has the value 1 if the participant knew about the existence of water saving showering heads, and 0 otherwise.
Knowledge about E-head benefits	Has the value 1 if participant knew about the advantages of water saving showering heads, and 0 otherwise.
Perceived comfort E-head	Indicates how the water-saving showerhead performs in terms of comfort compared to a standard head [1=Significantly worse, 2= Worse, 3 = Equal, 4 = Better, 5 = Significantly better].
Usage of showering head	Indicates what the participant will do if s/he wins a showerhead [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.]
Money savings of E-head (in EUR)	Indicates what the participant believes how much money the water-saving showerhead saves per year in comparison to the standard

	showerhead assuming a one-person household, if the person showers 5 times a week for 11 minutes at 38 degrees water temperature. [1 = '0 - 55 EUR'; 2 = '56-110EUR'; 3 = '111-165EUR'; 4 = '166-220EUR']
CO ₂ savings of E-head (in kg)	Indicates what the participant believes how many kilograms of CO ₂ the water-saving showerhead save per year in comparison to the standard showerhead assuming a one-person household, if the person showers 5 times a week for 11 minutes at 38 degrees water temperature. [1 = '0-150kg'; 2 = '151-300kg'; 3 = '301-450kg'; 4 = '451-600kg']
Water savings of E-head (in liter)	Indicates what the participant believes how many litres of water 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. [1 = '0-10.000 L'; 2 = '10.001-20.000 L'; 3 = '20.001 – 30.000 L'; 4 = '30.0001 – 40.000 L']
Desirability of E-head (society)	Indicates what the participant believes on the opinions of most other participants in terms of how socially desirable (i.e., in accordance with morally and socially right behavior) the choice of the water-saving showerhead is. [1 = Socially highly desirable, 2 = Socially desirable, 3 = Socially undesirable, 4 = Socially strongly undesirable]
Desirability of E-head (personal)	Indicates how the participant personally rates the choice of the water-saving showerhead. [1 = Personally very desirable, 2 = Personally rather desirable, 3 = Personally rather not desirable, 4 = Personally not desirable]
NEP Score	Indicates the 'pro-ecological' worldview of the participant. The score is constructed as mean of the nine NEP questions. A score above three is considered as the boundary between an anthropocentric and a pro-ecological worldview.
Time preferences (GPS)	Indicates if 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 1 to 10.
Risk preferences (GPS)	Indicates how much the participant is willing to take risks on a scale from 1 to 10.
Altruism (GPS)	Constructed based on two GPS questions on altruism: Altruism = $0.6350048 \times \text{GPS question on willingness to give to good causes on a scale from 1 to ten} + 0.3649952 \times \text{GPS question on hypothetical donation}$

Appendix Table 2: Summary Statistics

	All				Price treatment				Subsidy Treatment			
	N	Mean (std.dv.)	Md.	min,max	N	Mean (std.dv.)	Md.	min, max	N	Mean (std.dv.)	Md.	min,max
Subsidy	614	.5 (.5)	1	[0,1]								
Decision 1	614	.7 (.5)	1	[0,1]	295	.6 (.5)	1	[0,1]	319	.7 (.5)	1	[0,1]
Decision 2	614	.7 (.4)	1	[0,1]	295	.7 (.5)	1	[0,1]	319	.78 (.4)	1	[0,1]
Age	591	39.6 (14.0)	36	[19,83]	284	39.4 (13.2)	36.5	[19,8]	307	39.9 (14.7)	36	[19,83]
Female	588	.4 (.5)	0	[0,1]	281	.4 (.5)	0	[0,1]	307	.5 (.5)	0	[0,1]
Married	589	.6 (.48)	1	[0,1]	283	.6 (.5)	1	[0,1]	306	.7 (.5)	1	[0,1]
Green voter	545	.4 (.49)	0	[0,1]	270	.4 (.5)	0	[0,1]	275	.4 (.5)	0	[0,1]
Tenant	581	.7 (.5)	1	[0,1]	278	.7 (.4)	1	[0,1]	302	.7 (.5)	1	[0,1]
Employed	584	0.7 (0.4)	1	[1,8]	281	.7 (2.2)	1	[0,1]	303	.7 (.5)	1	[0,1]
Uni degree	594	.7 (.4)	1	[0,1]	285	.7 (.4)	1	[0,1]	309	.7 (.4)	1	[0,1]
Income	531	5.4 (2.2)	6	[1,8]	260	5.4 (2.2)	6	[1,8]	271	5.4 (2.2)	6	[1,8]
Knowledge about E-head	595	.62 (.5)	1	[0,1]	291	.7 (.5)	1	[0,1]	314	.7 (.5)	1	[0,1]
Knowledge about E-head benefits	595	.6 (.5)	1	[0,1]	287	.6 (.5)	1	[0,1]	308	.6 (.5)	1	[0,1]
Perceived comfort E-head	591	2.7 (.7)	3	[1,5]	285	2.6 (.7)	3	[1,5]	306	2.7 (.7)	3	[1,5]
Money savings of E-head (in EUR)	593	2.1 (.9)	2	[1,4]	285	2.1 (.9)	2	[1,4]	308	2.1 (.9)	2	[1,4]
CO ₂ savings of E-head (in kg)	578	1.9 (.9)	2	[1,4]	275	2 (.9)	2	[1,4]	303	1.9 (.9)	2	[1,4]
Water savings of E-head (in liter)	592	2.0 (.9)	2	[1,4]	284	2.1 (.9)	2	[1,4]	308	2 (.9)	2	[1,4]
Desirability E-head (society)	592	3.3 (.5)	3	[2,4]	282	3.3 (.5)	3	[2,4]	310	3.3 (.5)	3	[2,4]
Desirability E-head (personal)	583	3.5 (.6)	4	[1,4]	281	3.4 (.6)	3	[1,4]	302	3.6 (.6)	4	[1,4]
NEP score	547	3.7 (.5)	3.8	[2.1,4.9]	263	3.7 (.6)	3.7	[2.3,4.8]	284	3.7 (.5)	3.8	[2.1,4.9]
Time preferences (GPS)	565	7.4 (1.7)	8	[0,10]	269	7.4 (1.7)	8	[0,10]	296	7.4 (1.7)	8	[1,10]
Risk preferences (GPS)	566	5.4 (2.2)	5	[0,10]	270	5.3 (2.2)	5	[0,10]	296	5.4 (2.2)	5.5	[0,10]
Altruism (GPS)	559	60.8 (63.6)	41.6	[0,370.7]	266	57.6 (62.1)	40.9	[0,370.7]	293	63.7 (65)	41.6	[0,370.7]

Appendix Figure 1: First Purchase Decision (both treatments)

Your first purchase decision

*Please decide now, which showering head you would like to buy. The standard showering head costs 19 EUR. The water-saving showering head costs 34 EUR? The costs will be extracted from your 35 EUR budget.

Standard showering head for 19 EUR

Water-saving showering head for 34 EUR

Appendix Figure 2: Second purchase decision (price treatment)

Your second purchase decision

*Please decide now, which showering head you would like to buy. The standard showering head costs 19 EUR. The water-saving showering head costs 29EUR? The costs will be extracted from your 35 EUR budget.

Standard showering head for 19 EUR

Water-saving showering head for 29 EUR

Appendix Figure 3: Second purchase decision (subsidy treatment)

Your second purchase decision

*Please decide now, which showering head you would like to buy. The standard showering head costs 19 EUR. The water-saving showering head costs 29EUR? The costs will be extracted from your 35 EUR budget.

The water-saving shower head contributes to the energy and climate protection goals of the German government. The water-saving shower head is therefore subsidized and costs EUR 29 instead of the actual EUR 34.

Standard showering head for 19 EUR

Water-saving showering head for 29 EUR

Appendix Figure 4: The standard and water-saving showerheads

hansgrohe

Standard Showerhead

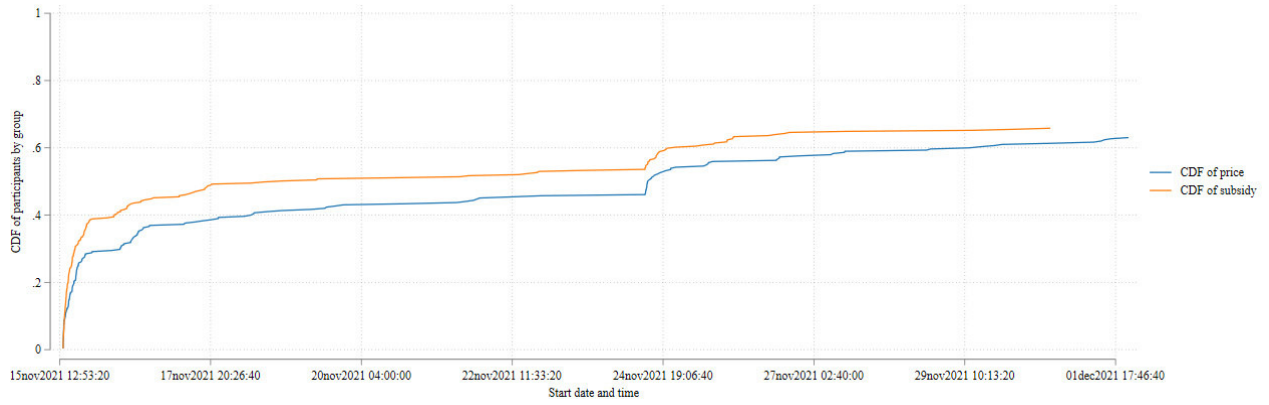


hansgrohe

Water-Saving Showerhead



Appendix Figure 5: Cumulative density functions of participants by treatment group



Online Supplementary Appendix B - 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 [blinded]. The [blinded] is [blinded]. The research project is financed by [blinded].

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: [blinded]

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 adress 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 03.12.2021 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 adresses 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 adequately 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. They 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 paid 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 / 301-450kg / 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 / 30.001 – 40.000 L //No answer

- 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.

Your bonus 4: 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 rather 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: Agree / Rather agree / Rather disagree / Disagree / 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 conform 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/a Fachhochschule / No answer

- What is your marital status?
Answering options: single / registered patnership / 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 adress 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 adress 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 [blinded]

- Screen 18 –

Today you participated in a scientific study of the [blinded] 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?
 - Yes, I would like to be added to your data base and be notified at this email adress: _____
 - 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: [blinded] 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 [blinded] 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 -

- 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 answers
- 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 answers

- 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 stranger 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?
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?
 - How 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: _____