

# Killing the bill: The interplay of social comparisons and financial information on preferences for electricity-saving behaviors

Fabien Giauque\*    Mehdi Farsi\*    Sylvain Weber<sup>†</sup>    Michael Puntiroli<sup>‡</sup>

February 7, 2025

## Abstract

Using a discrete choice experiment (DCE), we analyze the effect of information treatments on households' preferences and trade offs for three sustainable behaviors in electricity demand: conservation actions, efficiency investments, and purchasing a green power mix. Our focus is on social comparisons and financial information and their interplay. The results suggest that a strong majority of respondents favor a sustainable behavior to inaction. However, the estimated average treatment effects suggest that both interventions significantly increase the probability of preference for inaction. Heterogeneity analyses reveals that these negative effects are specific for households with above-average consumption. Furthermore, our results address conflicting dimensions of motivation and suggest a possible motivational crowding out, in which financial information included in normative messages undermines intrinsic motivation.

**Keywords** Electricity-saving behaviors; households' preferences; social comparisons; financial information; discrete choice experiment; mixed logit (MXL) model; crowding out effects.

**JEL Codes** D12, D91, Q48.

This research was carried out with the support of the Swiss Federal Office of Energy (SFOE) as part of the SWEET consortium CoSi. The authors bear sole responsibility for the conclusions and the results.

---

\*University of Neuchâtel, Institute of Economic Research, Switzerland.

<sup>†</sup>University of Applied Sciences Western Switzerland (HES-SO/HEG-Genève), Switzerland.

<sup>‡</sup>University of Neuchâtel, Institute of Management, Switzerland.

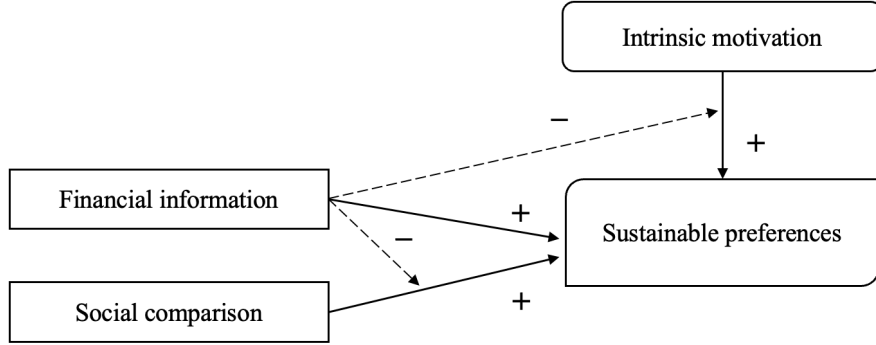
# 1 Introduction

There is growing interest in non-financial approaches to reduce electricity demand, with social comparisons emerging as particularly effective (Andor and Fels, 2018). People tend to benchmark their actions by looking at the behaviors of others, so that social norms may exert powerful influence on individual behavior (Allcott, 2011). This influence is further reinforced by a desire for social approval, as individuals value the esteem of their peers (Cialdini and Goldstein, 2004). When saving electricity aligns with social norms, individuals are motivated to conform, upholding a positive self-image and social standing (Laibson and List, 2015). Alongside these social influences, highlighting financial aspects remains a popular tool to influence behavior. Given the delay between electricity consumption and billing, households may not fully account for the cost at the time of use (Kempton and Layne, 1994). Bringing financial consequences to the forefront of household awareness may therefore drive behavioral changes (Bordalo et al., 2013).

However, psychologists have long theorized that external rewards, such as financial incentives, can undermine intrinsic motivation, which was labeled the hidden costs of rewards (Deci, 1971) or the over-justification hypothesis (Frey and Jegen, 2001). These theories suggest that when individuals accept an external reward, they may come to view it as the primary driver of their motivation, thus reducing the value they place on their intrinsic interest (Ryan and Deci, 2000). Financial information may not improve motivation as expected; rather, it may reduce it, a phenomenon later termed motivational crowding out. Financial information provides an egoistic motive to conserve electricity. Therefore, on the one hand, intrinsic motivations, such as environmental concerns, could be undermined as individuals no longer perceive themselves to act for these reasons. On the other hand, social comparisons can be undermined as the desire for social approval drives individuals to adjust their behavior to avoid being perceived as motivated by financial gain (Steinhorst et al., 2015). In other words, financial information can threaten self-image and social standing (Delmas et al., 2013). This study aims at shedding light on these opposing effects on sustainable preferences in the context of residential electricity consumption (Schwartz, 2019).

Although these conflicting effects have been experimentally studied on electricity consumption (Dolan and Metcalfe, 2015; Ito et al., 2018; Holladay et al., 2019), little research has focused on their impact on the various strategies to achieve sustainable electricity consumption. In fact, households can adopt various approaches to achieve more efficient electricity usage. However, such behaviors are not easily observable. To address this, we designed a discrete choice experiment (DCE) that captures different as-

Figure 1: Conceptual framework



pects of sustainable electricity use. Specifically, the experimental design considers the trade-off between engaging in conservation actions, investing in efficient appliances, and contracting a green electricity supply. Subsequently, by systematically varying the information provided to participants — one group receives a social comparison framed in electricity consumed (kWh), another group receives a social comparison using its monetary value (CHF<sup>1</sup>), and a control group receives no normative information — we estimate the causal effect of combining social comparisons and financial information on household sustainable preferences. We model these preferences with an indirect utility function and use Mixed Logit (MXL) models to measure the effects of treatment on the probability of selecting an alternative.

This paper investigates the direct effect and interactions of two interventions (social comparisons and financial information) on individual preferences. As illustrated in Figure 1, we hypothesize that financial information and social comparisons positively impact sustainable preferences. In addition, intrinsic motivation, such as concerns about the environment or energy security, also enhances sustainable preferences. Concurrently, financial information can undermine intrinsic motivation as well as social comparisons. Therefore, the overall effects on household preferences remain uncertain, which is the central focus of this study. Shedding lights on these hypothetical paths requires testing different effects. First, we estimate the impact of electricity comparisons (kWh) and financial comparisons (CHF) on household preferences. Next, we identify key components of intrinsic motivation and assess their influence. Finally, we compute the difference between both treatment and, therefore, evaluating the inclusion of financial information into a normative message.

Households' electricity consumption is a crucial factor, defining whether the social comparisons

<sup>1</sup> The Swiss franc is the currency and legal tender of Switzerland. CHF/USD: 1,0967 USD (17<sup>th</sup> of January 2025).

indicate that their electricity consumption is below or above the comparison group. Adapting to the norm means opposing effects for the two groups as the former would increase their consumption while the latter would decrease it. Therefore, we conduct subsample analyses to estimate the effects of social comparisons and financial information separately for these two groups. Households with above-average consumption are the priority target of such policy intervention since they have the largest potential for reduction. However, it is crucial to assess that households with below-average consumption maintain their preferences for conserving electricity.

Our first results provide unexpected evidence on the effect of social comparisons. Quantitatively, our analysis shows that participants exposed to electricity comparisons (kWh) show a decrease in their preferences for *efficiency investment* by 2.6% and an increase in their preferences for *no action* by 4%, which means that social comparisons do not improve sustainable preferences. We do not observe significant effects on the other alternatives. For participants treated with financial comparison (CHF), we note an increase for *no action* by 5.7%. In general, both treatments cause adverse effects on preferences.

Therefore, we continue our analysis by separately estimating households with below- and above-baseline electricity consumption. Starting with low-consumers, we observe no statistically significant effect. This result suggests that both social comparisons (kWh and CHF) do not backfire. Interestingly, the effects differ for high-consumers, who have the greatest potential for energy savings. However, we find a significant adverse effect from both treatments, as participants show increased preferences for *no action*, rising by 13.1% among those who receive electricity comparisons (kWh) and by 7.0% among those who receive financial comparisons (CHF). This segment of consumers may not like to be compared with other households or consider high consumption desirable. We also note that financial information reduces the adverse effect by 46.6%. This is consistent with the hypothesis that households with above-average consumption should not manifest intrinsic motivation to save electricity and therefore financial information positively affect them.

Individuals can be intrinsically motivated to save electricity based on moral or ethical considerations and supported by prior personal beliefs. The literature identifies key antecedents of intrinsic motivation to conserve electricity, namely attitude toward the environment and awareness of the relationship between natural resources and energy consumption. Subsequently, to assess the potential motivational crowding out, we conduct moderation analyses by adding interaction terms to the main specification. We show that financial comparisons (CHF) significantly reduces the preferences of intrinsically motivated for two of the sustainable alternatives, while electricity comparison (kWh) have no effect on them. However,

the difference between both treatments is not significant, providing only limited evidence that financial information undermines intrinsic motivation.

This paper represents a novel application of choice models to evaluate the effects of social comparisons and financial information. Our study resonates with two field studies conducted by Dolan and Metcalfe (2015), which demonstrate that incentivizing households with large financial rewards yields significant reductions in electricity usage, averaging 8%. This is consistent with standard economic theory, in which households respond to changes in relative prices. In particular, the observed reduction in consumption persists even after the withdrawal of financial incentives, suggesting that there is no crowding out of intrinsic motivation. However, introducing social comparisons annihilates this effect, indicating that the two instruments do not work together. Based on our framework, we interpret this finding as revealing that information on social norms increases the salience of socially desirable behavior. Consequently, financial incentives threaten household social standing by signaling a egoistic motivation for electricity conservation (Steinhorst et al., 2015).

Ito et al. (2018) provide similar evidence that focuses on peak-hour electricity consumption using a random control trial (RCT). They find that financial incentives do not crowd out intrinsic motivation as households show no sign of habituation, indicating no unintended long-term effect. Moreover, our analysis is closely related to the work of Pellerano et al. (2017), which has the specificity to study low-consumers in a developing country. Their analysis aligns with our findings as an opposing effect is detected between intrinsic motivation and financial incentives. Lastly, the policy treatment studied by Holladay et al. (2019) is the closest to our experiment, as the social comparisons emphasize different aspects (financial or environmental). They show no crowding out of intrinsic motivation to register for an audit program, although adding financial incentives does not strengthen the normative intervention and may reduce it. When assessing the effect on the purchase of durable goods, they find no effect for both treatments.

Our study also builds on existing research on the impact of social comparisons on different energy-saving strategies or between different consumer segments. Komatsu and Nishio (2015) demonstrate that social comparisons encourage conservation efforts, a conclusion that our research fails to support. Similarly, Holladay et al. (2019) show a positive impact on investment, suggesting that social comparisons can drive immediate behavioral changes and also translate into long-term investment in energy efficiency. We find no evidence supporting this finding. In contrast, Schultz et al. (2007) show that norm-based interventions can adversely affect households with below-average consumption, resulting in a boomerang

## References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2):179–211.
- Allcott, H. (2011). Social norms and energy conservation. *Journal of Public Economics*, 95(9-10):1082–1095.
- Allcott, H. (2016). Paternalism and Energy Efficiency: An Overview. *Annual Review of Economics*, 8:145–176.
- Allcott, H. and Mullainathan, S. (2010). Behavior and Energy Policy. *Science*, 327(5970):1204–1205.
- Andor, M. A. and Fels, K. M. (2018). Behavioral Economics and Energy Conservation – A Systematic Review of Non-price Interventions and Their Causal Effects. *Ecological Economics*, 148:178–210.
- Babutsidze, Z. and Chai, A. (2018). Look at me saving the planet! the imitation of visible green behavior and its impact on the climate value-action gap. *Ecological Economics*, 146:290–303.
- Blasch, J., Boogen, N., Daminato, C., and Filippini, M. (2021). Empower the Consumer! Energy-related Financial Literacy and its Implications for Economic Decision Making. *Economics of Energy & Environmental Policy*, 10(2).
- Bordalo, P., Gennaioli, N., and Shleifer, A. (2013). Salience and Consumer Choice. *Journal of Political Economy*, 121(5):803–843.
- Buchanan, K., Russo, R., and Anderson, B. (2015). The question of energy reduction: The problem(s) with feedback. *Energy Policy*, 77:89–96.
- Cialdini, R. B. and Goldstein, N. J. (2004). Social Influence: Compliance and Conformity. *Annual Review of Psychology*, 55(1):591–621.
- Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology*, 18(1):105–115.
- Delmas, M. A., Fischlein, M., and Asensio, O. I. (2013). Information strategies and energy conservation behavior: A meta-analysis of experimental studies from 1975 to 2012. *Energy Policy*, 61:729–739.

- Dolan, P. and Metcalfe, R. D. (2015). Neighbors, Knowledge, and Nuggets: Two Natural Field Experiments on the Role of Incentives on Energy Conservation. *SSRN Electronic Journal*.
- Farrow, K., Grolleau, G., and Ibanez, L. (2017). Social Norms and Pro-environmental Behavior: A Review of the Evidence. *Ecological Economics*, 140:1–13.
- Farsi, M. and Weber, S. (2024). Swiss Household Energy Demand Survey: Past experiences and new perspectives. *IRENE Working Papers*.
- Frey, B. S. and Jegen, R. (2001). Motivation Crowding Theory. *Journal of Economic Surveys*, 15(5):589–611.
- Gatersleben, B., Murtagh, N., and Abrahamse, W. (2014). Values, identity and pro-environmental behaviour. *Contemporary Social Science*, 9(4):374–392.
- Hensher, D. A. and Greene, W. H. (2003). The mixed logit model: the state of practice. *Transportation*, 30:133–176.
- Holladay, S., LaRiviere, J., Novgorodsky, D., and Price, M. (2019). Prices versus nudges: What matters for search versus purchase of energy investments? *Journal of Public Economics*, 172:151–173.
- Ito, K., Ida, T., and Tanaka, M. (2018). Moral Suasion and Economic Incentives: Field Experimental Evidence from Energy Demand. *American Economic Journal: Economic Policy*, 10(1):240–267.
- Johnston, R. J., Boyle, K. J., Adamowicz, W., Bennett, J., Brouwer, R., Cameron, T. A., Hanemann, W. M., Hanley, N., Ryan, M., Scarpa, R., et al. (2017). Contemporary guidance for stated preference studies. *Journal of the Association of Environmental and Resource Economists*, 4(2):319–405.
- Kempton, W. and Layne, L. L. (1994). The consumer's energy analysis environment. *Energy Policy*, 22(10):857–866.
- Komatsu, H. and Nishio, K.-i. (2015). An experimental study on motivational change for electricity conservation by normative messages. *Applied Energy*, 158:35–43.
- Laibson, D. and List, J. A. (2015). Principles of (Behavioral) Economics. *American Economic Review*, 105(5):385–390.

- Lavrakas, P. (2008). Respondent Fatigue. In *Encyclopedia of Survey Research Methods*. Sage Publications, Inc., 2455 Teller Road, Thousand Oaks California 91320 United States of America.
- Pellerano, J. A., Price, M. K., Puller, S. L., and Sánchez, G. E. (2017). Do Extrinsic Incentives Undermine Social Norms? Evidence from a Field Experiment in Energy Conservation. *Environmental and Resource Economics*, 67(3):413–428.
- Ryan, R. M. and Deci, E. L. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology*, 25(1):54–67.
- Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J., and Griskevicius, V. (2007). The Constructive, Destructive, and Reconstructive Power of Social Norms. *Psychological Science*, 18(5):429–434.
- Schwartz, D. (2019). The interplay between intrinsic motivation, financial incentives and nudges in sustainable consumption. In *A Research Agenda for Economic Psychology*, pages 87–103. Edward Elgar Publishing.
- Steg, L., Dreijerink, L., and Abrahamse, W. (2005). Factors influencing the acceptability of energy policies: A test of VBN theory. *Journal of Environmental Psychology*, 25(4):415–425.
- Steindl, C., Jonas, E., Sittenthaler, S., Traut-Mattausch, E., and Greenberg, J. (2015). Understanding Psychological Reactance: New Developments and Findings. *Zeitschrift für Psychologie*, 223(4):205–214.
- Steinhorst, J., Klöckner, C. A., and Matthies, E. (2015). Saving electricity – For the money or the environment? Risks of limiting pro-environmental spillover when using monetary framing. *Journal of Environmental Psychology*, 43:125–135.