



What is missing in research on non-monetary incentives in the household energy sector?

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ABSTRACT

Based on current research, the impact of non-monetary incentives on energy consumption and green-energy uptake in the household sector remains unclear. Studies often only provide tests for combinations of measures and consider short time intervals. We provide a systematic review of the literature, point to several shortcomings in existing published studies and make recommendations for future research aiming to inform policy and other decision makers.

1. Introduction

Non-monetary incentives are an important tool in the transition towards a sustainable energy system. It seems to be a well-established fact that such incentives can complement monetary incentives to reduce energy consumption and to increase green energy uptake (Abrahamse and Steg, 2013; Allcott and Mullainathan, 2010; Asensio and Delmas, 2015; Ebeling and Lotz, 2015). Non-monetary incentives are often related to the concept of “nudges” (Thaler and Sunstein, 2009), defined by Sunstein as “liberty-preserving approaches that steer people in particular directions, but that also allow them to go their own way” (Sunstein, 2014, p. 583). By now, many countries in the global North and South such as the U.S., UK, India, Peru, Singapore as well as supranational institutions such as EU, UN, World Bank established so-called behavioural insight units exploring the applicability of nudges to support policy goals in various areas including health, education, and energy (World Bank, 2015). Some nudges and corresponding non-monetary incentives function well because they are built on general behavioural tendencies of humans, such as status-quo bias and loss aversion. Such non-monetary incentives seem to be low-cost, easy-to-implement and therefore an effective contribution to combating resource overuse and climate change.

How effective are non-monetary incentives in the household energy sector? We found a great variety of measures in the literature, ranging from social norms or symbolic rewards to feedback giving and information on behavioural consequences. A report by Sunstein (2014) quotes “ten important nudges,” among them default settings and social norms atop the list. But how should policy and other decision makers decide when implementing an energy reduction plan? Certainly,

relative cost-effectiveness comparing nudges and traditional policy instruments such as financial incentives is a very important criterion (Benartzi et al., 2017). But at least equally relevant is the effectiveness of a measure to reduce actual energy consumption in the first place. In this regard, not all non-monetary incentives are equally effective and some may turn out to be non-effective at all. Some incentives may be effective in other domains, mitigating e.g. food waste, calorie intake or risky driving but they may not be effective in the household energy sector. As Sunstein (2014, p. 585) claims “empirical tests, including randomized controlled trials, are indispensable.”

An ideal study carried out to answer the question of the effect of non-monetary incentives on household energy reduction would use a randomized experimental design and aim at estimating the causal effect of a particular non-monetary incentive on the specific energy-related behaviour under consideration (Shadish et al., 2001). Researchers would conduct the experiment in such a way that subjects are not aware of taking part in a research study. An ideal study would further be conducted over a long timespan, and (next to the target behaviour) it would measure behavioural changes in other energy-related domains. It would also consider different socioeconomic, regional or country contexts.

Using a covert research design does prevent experimenter demand effects (Zizzo, 2010) – in other words, potentially biased results due to the presence of a researcher. Moreover, there is the risk of a “Hawthorne effect” that attention alone, i.e. being part of a research study, may account for a decrease of household's energy consumption (Schwartz et al., 2013). Taking longer timespans into account is necessary to find out how effective incentives are over time. Further, considering different domains of behaviour allows testing of rebound

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effects or moral licensing (Gillingham et al., 2013; Greening et al., 2000; Khan and Dhar, 2006). Individuals and households might increase energy consumption in one domain due to energy-saving behaviour in another domain, where the latter was caused by a non-monetary incentive. Analysing the effects of non-monetary incentives across socioeconomic contexts, regions and countries indicates the external validity of study results. Since climate change, energy-saving behaviour and renewable energy production are global issues and there also exists remarkable heterogeneity within countries, it seems desirable to know to what extent non-monetary incentives work in different cultural, regional and socioeconomic contexts.

2. Quantitative review data

It is clear that ideal studies fulfilling all these criteria are hard to find. To shed light on the actual state of knowledge, we conducted a quantitative review of the literature about the effectiveness of non-monetary incentives in the household energy sector. We carried out a literature search based on databases (Web of Science, Google Scholar, etc.), various journals (Journal of Environmental Psychology, Energy Policy, etc.), and reference lists of papers. Search keywords included (combinations of) the terms nudge, nudging, green nudges, energy, electricity, social norm, default, feedback, and information. We only considered (quasi-)experimental studies dealing with effects of non-monetary incentives/nudges on energy consumption and choice of energy source mix. This means that all studies under consideration make use of the advantages of an experimental design. With one exception, we limited the search to papers published in English and included all papers without constraints regarding year of publication. We thus focus on crucial methodological aspects and important research needs.

3. Results

3.1. Almost half of the treatments fail to single out the effect of a particular incentive

We found 40 papers, mainly published after 2012 ($n = 30$, 75%). These papers reported on 45 studies, of which 42% used fully randomized experimental designs, and 45% used quasi-experimental designs where random assignment of subjects or households was not possible. Fewer studies relied on survey experiments such as stated choice experiments (11%) and other methods, such as an online tool (2%). While fully randomized experimental designs might be preferable, quasi-experimental studies are also able to separate effects of different incentives on energy-related behaviour.

The scale of the studies varied remarkably. Sample sizes ranged between $n = 37$ and $n = 2516,089$ individuals or households; the median sample size amounted to $n = 431$ individuals/households.

The 45 studies we reviewed included 67 treatment groups, not counting control groups (see Table 1, and [suppl. material](#) for more information on studies and incentives). It turns out that information treatments, feedback mechanisms and descriptive as well as injunctive social norm treatments have been tested considerably more often than incentives such as social competition, default rules, framing, and symbolic rewards. Looking at studies that tested one incentive per treatment, we found that the feedback mechanism and descriptive social norms were tested most often, followed by default rules and information.

Of 67 treatments, 37 tested one non-monetary incentive as a stimulus, and 30 combined at least two incentives (with a total of 72 non-monetary incentives as part of multiple incentives treatments). Therefore, in almost half of the treatments it was not possible to separate the effects of non-monetary incentives because they combined different incentives in the treatment condition. For example, providing subjects at the same time with feedback and descriptive norm information may result in a decrease in electricity consumption. While

Table 1

Overview of type of non-monetary incentive and the number of studies testing one or more incentives.

Incentive/nudging type	n, combined incentives	n, one incentive only	Share sign. pos. effect
Information	19	4	2/4
Descriptive social norm	14	9	6/9
Feedback	13	9	3/7 [#]
Injunctive norm	13	–	–
Social competition	6	–	–
Goal setting	4	–	–
Moral suasion	2	2	1/2
Default rules	1	5	5/5
Framing	–	2	1/2
Priming	–	1	0/1
Mental accounting	–	1	0/1
Off-setting	–	1	0/1
Decoy choice	–	1	0/1
Symbolic rewards	–	1	1/1
Indirect information	–	1	1/1
TOTAL n	72	37	

Note: Share sign. pos. effect refers to treatments testing one incentive for which the studies' authors report a statistically significant difference at least at the 5%-level. [#] We count seven studies because two out of nine studies had no control group for the feedback treatment. In these two studies, the feedback treatment was designed as control group.

such integrated approaches – programs combining multiple incentives – can provide very valuable insights (Banerjee et al., 2015), it is not clear in a strict sense whether this effect is due to the feedback, the descriptive norm or the combination of both incentives.

Regarding treatments testing one incentive, i.e. no combination of incentives in a single treatment, Table 1 shows in the last column the proportion of treatments that (according to the studies' authors) showed a statistically significant effect on the outcome at hand. A striking insight is that all studies testing default rules revealed a significant effect. Descriptive norms worked out in two thirds of the treatments, and other non-monetary incentives seemed to work in half of the treatments. While it is difficult to conclude which non-monetary incentive is especially effective for specific behavioural domains (see also Nielsen et al., 2017), it is noteworthy that the studies testing default rules mainly investigate green electricity uptake and that descriptive norm studies with significant positive effects mainly refer to electricity saving. However, when interpreting the values in Table 1, the low absolute number of treatments has to be borne in mind.

Furthermore, 60% of the studies employed an overt research approach, in which subjects were aware of being part of a research study or experiment; the remaining 40% used a covert approach. Overt studies are prone to experimenter-demand effects (Zizzo, 2010) and the possibility that a respondent's awareness of taking part in a research studies affected the results cannot be ruled out. A noteworthy, randomized controlled study by Schwartz et al. (2013) found an energy reduction "effect" of 2.7% simply by informing customers that they take part in a study on energy use. After the "intervention" households adjusted to the pretreatment consumption level. It therefore seems important to investigate a potential bias in this regard.

3.2. Reported effects might be prone to a cultural bias

Of the studies reported in the 40 papers, 45% were conducted in the U.S. Considerably fewer studies were carried out in Germany ($n = 4$), the UK ($n = 4$) and the Netherlands ($n = 2$). Compared to the U.S. ($n = 18$) and Western European countries ($n = 17$), overall fewer studies were found for Asia ($n = 5$), and none for Africa and South America. Thus, the overwhelming majority of studies were bound to Western culture.

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