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Unintended outcomes of electricity smart-metering: trading off consumption and investment behaviour¹

***Daire McCoy and Seán Lyons**

EU energy and climate targets require an increase in energy efficiency and a reduction in energy demand, to contribute to a reduction in greenhouse gas emissions. Reducing residential energy consumption and increasing the adoption of energy saving measures and energy efficient appliances within the home can help to achieve these targets.

Advanced metering initiatives and feedback programmes, such as electronic in-home displays and energy usage statements, allow electricity utilities to provide consumers with better information on their energy usage and to apply time-of-use pricing. These measures have been shown to reduce electricity consumption and induce time-shifting of demand. However, less is known about how they affect the adoption of energy saving measures and energy efficient appliances.

Previous research has shown that the type of feedback provided to households can influence both the amount of energy savings achieved and the means by which households achieve these savings. For example, households may choose to curtail the usage of existing appliances, invest in energy efficiency measures such as insulation, or replace their existing appliances with more efficient ones. These can broadly be considered “curtailment” or “efficiency” behaviours. In some cases, adopting one set of behaviours might catalyse consumers to adopt other behaviours. In other cases adopting one set of behaviours may induce reduced engagement in other domains. A limit of many studies is that they capture the immediate, targeted behaviour, and ignore other behaviour that may subsequently emerge.

This study uses data from a randomised-controlled electricity smart-metering trial, based on a nationally representative sample of the Irish population, to provide empirical evidence of an environmental intervention which targets a

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reduction in, and time-shifting of, energy consumption, but also may induce a reduction in investments in energy efficiency within the home.

Households were randomly allocated to various treatment groups and a control group. The treatment groups were placed on different electricity tariffs to each other and the control, some also received in-home smart electricity metres, others received energy usage statements along with their bills.

After the trial was conducted, participants were asked whether they had invested in a range of energy efficiency measures over the previous 12 months¹. No group received any instructions related to this during the trial. In total 52 percent of participants made at least one investment in efficiency, with many adopting a number of measures together. For instance, many of the households who replaced their boilers also added thermostatic controls to their radiators, and lagging jackets to their hot-water tanks.

Relative to the control group, average overall electricity usage across various treatment groups was reduced by 2.5% and peak usage by 8%.² However, households across treatment groups were also, on average 23–28%, less likely to adopt any of the listed energy saving measures during the trial than the control group, and the expected number of energy saving features adopted was, on average 15–21%, lower for the treatment groups than for the control group. The results are largely driven by the treatment groups investing less in attic insulation, lagging jackets and double-glazing than the control group.

The data do not allow us to quantify whether or not the electricity savings observed during this trial will be offset over a longer period as a result of reduced investment in energy efficient appliances. Nor can we unpick the factors that might be driving this behaviour. However, one possible explanation is a moral-licensing effect - if someone does “something good” (reduce their energy consumption patterns), they might then feel more justified in doing “something bad” (reduce their investment in efficiency), as they feel they have a moral license to do this. Another potential explanation would be a priming effect, whereby improved feedback and information may have focused the treatment group on curtailment behaviour, but distracted them from other means of saving energy, such as investing in efficiency. One could also argue that households are being economically rational by choosing the least-cost option. Rather than investing in a more efficient central-heating boiler for example, they could achieve a similar electricity cost reduction, by time-shifting their demand to less expensive periods.

¹ These included double-glazing, attic or wall insulation, lagging jackets, boiler replacement, thermostatic controls on radiators, draught proofing doors and windows, solar panels, new lagging jacket and replacing appliances with A rated ones.

² CER (2011). Commission for Energy Regulation, 2011b. Results of electricity cost-benefit analysis, customer behaviour trials and technology trials. Smart metering information paper 4. Available: <http://www.cer.ie>.

Our results highlight the potential for behavioural interventions to have unintended consequences on behaviours other than those specifically targeted. Furthermore they underline the importance of examining a wider range of outcomes and allowing longer time-scales when evaluating this type of experiment.

References

CER (2011). Commission for Energy Regulation, 2011b. Results of electricity cost-benefit analysis, customer behaviour trials and technology trials. Smart metering information paper 4. Available: <http://www.cer.ie>.