

Internal and external barriers to energy efficiency: made-to-measure policy interventions

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Overview

This paper has two objectives. First it provides a correlation between internal and external barriers to energy efficiency and consumer behaviour related to two domains. It evaluates behaviour related to energy curtailment, which represents routine, repetitive effort to decrease consumption on a day-to-day basis. It also considers behaviour related to investments, which are one time actions such as purchasing new energy efficiency technologies.. Second, it assesses the effectiveness of the different interventions and programs in addressing the two types of barriers (internal and external) with the aim of informing the policy debate. By assessing the value of a large number of interventions, this paper is one of the first that combines in a unified framework the main findings of different disciplines, from economics to psychology.

Methods

This contribution is a review-paper of the existing behavioural and non-behavioural programs and approaches in energy efficiency. The paper first provides a description of the different barriers to energy efficiency and maps each of them with consumer behaviour. By reviewing all the existing empirical evidence, the paper provides a correlation between the different barriers and energy efficient behaviour related to two domains (energy curtailment and investments in energy efficient technologies). Second, the paper assesses the effectiveness of the different existing interventions, their penetration and highlights areas where further analysis is needed. This paper is one of the first that combines in a unified framework the main findings of different disciplines, from economics to psychology.

Results

Various barriers to the adoption of energy efficiency technologies have been identified. Some are classified as external and other as internal barriers. External barriers capture underlying factors that limit the adoption of energy efficient technologies but can be easily changed. On the contrary, internal barriers have to do with factors cannot be changed or are difficult to change because they are related to preferences and predictable (ir)rational behavior. While some types of barriers are rather known to the literature and their implications for energy efficiency documented, barriers that pertain to the preference and individual behaviour domain are less studied. This paper presents a better understanding of the exact impacts of the latter on energy efficiency. Policy instruments have been introduced to address both types of barriers. Policy instruments are classified as regulatory instruments, economic and financial programs and information-based instruments. By assessing the effectiveness of the different types of policies against the barriers they aim to address, this paper is able to provide some solid results.

First, standards, information programs and taxes are directed to the same types of market failures. However, standards are an inferior instrument compared to the other ones because they do not influence behaviour by discouraging the use of energy-using products and generate a welfare loss by reducing the available choice. Information programs and taxes should be preferred because they represent a more direct and efficient responses to the market failures they aim to address.

Second, taxes are a good solution because they are transparent, promote behavioural changes and take into consideration the heterogeneity of consumers. However they contribute to negative distributional effects. Moreover, in case of reference dependence, subsidies and tax credits are better than taxes. This is because people strongly prefer avoiding losses to achieving gains. The limitation of subsidies is that they produce a rebound effect, encourage free-riding and need a source of financing.

Third, audits are a good instrument because they increase awareness of possible improvements but their benefits are found to be inferior to their costs imposed to the community.

Fourth, the effect of product labelling is mixed depending on the methodology used for the analysis. More research is needed to fully understand if labelling really improves energy efficiency choices.

Fifth, feedbacks are an effective way to influence behaviour related to energy use, in particular if the feedback is delivered via computer, if the feedback duration is either less than three months or more than a year and if the feedback is combined with a goal intervention. Not all types of feedbacks are effective. While real time feedback induces energy conservation, a simple feedback on individual energy usage is not enough to influence behaviour. Feedback provided by vivid information, such as thermal images of heat losses, largely motivates households to reduce energy use. Moreover, feedback that provides peer comparison on energy use are used to encourage energy conservation. However, other social influence approaches, such as interventions where the information is provided by block leaders, are more effective because they deliver the feedback less anonymously.

Sixth, motivational and persuasion strategies such as commitment and goals setting, default options that favour energy conservation, loss-framed messages, messages framed in terms of intrinsic goals and moral suasion are as well very effective in addressing the relevant bias and induce energy conservation.

Conclusions

A crucial point emerging from this review is the importance of targeting the policies. For example, policies should target investments that are less conspicuous in place of those that confer a status benefit. People in search of social approval are willing to invest in the latter without any policy intervention. Moreover, while some interventions are ineffective among those who care less about the environment, they could still deliver substantial benefits if targeted towards those who strongly care about the environment. This is because they make them more inclined to act on their values. When the policy itself cannot be targeted, one can think of targeting a marketing campaign. For example, subsidies cannot be restricted to a specific group, but a marketing campaign can target the consumers that are mostly affected by the distortion that the subsidy aims to address.

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