Energy Efficiency Policies and the Rebound Effect:

Policies to Overcome the Rebound Effect

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Over the years, there have been many papers attempting to support or refute the impact of the rebound effect on energy efficiency policies. By definition, the rebound effect results in a higher consumption of energy compared to the intended impact of the energy efficiency improvement. Rebound effects can happen on several levels — either directly as a result of lower cost to the end user, indirectly through spending on other goods and services or on a macroeconomic level by driving consumption through increased productivity.

Studies have found that rebound effect at the end-user level are small and decrease over time while effects at the economy-wide level are negligible. This does not mean that rebound effects should not be taken into consideration in designing energy efficiency policies. In order to design effective interventions, policymakers need to understand (1) the estimated degree of rebound by sector and (2) whether the rebound also leads to desirable socio-economic or macroeconomic co-benefits.

Estimating the degree of rebound effect

Rebound effect is taken into account in those venues that have had a lot of experience designing energy efficiency programs, such as in the US and in the UK. In the US, the Department of Energy (DOE) incorporates rebound effects into its energy forecasting models, such as the National Energy Modeling System (NEMS). Program designers, administrators and regulators have developed ways to include rebound effects when calculating the level of achievement that energy efficiency programs should deliver, such as from utility obligations or energy efficiency resource standards.

Finding the right level can be challenging as it requires good statistical sampling and follow-on analysis to estimate the scale of the rebound. For example, the US DOE estimates a rebound effect of 0% for residential appliances, 0-2% for commercial lighting, 5-12% for residential lighting, 0-20% for industrial processes, 10-30% for residential space heating, < 10%-40% for residential water heating, 0-50% for residential space cooling.[1] This wide variation depends on the specific product or service, socio-economic situation of the target group, and other variables related to consumer behaviour. The UK estimates a 15% “comfort taking” for home insulation because the level of indoor heating and comfort is particularly poor among low-income households prior to retrofit measures. Energy-intensive sectors (eg, utilities, chemicals,

[1] The Experience With Energy Efficiency Policies And Programmes in IEA Countries, International Energy Agency, 2005.

agriculture) often have higher rebound effects than the household sector because lower energy costs incentivises greater overall production.

Recognizing the socio-economic and macroeconomic impacts

It is also important to know how to treat rebounds because an important fraction of rebound reflects a real increase in social welfare, especially for low-income households (in both developed and developing countries) where energy bills represent a relative large share of household expenditures. While the rebound effect reduces the net energy savings, it can result in other program benefits and help meet economic development goals. Consumers are receiving increased energy services at a lower cost, which contribute to a better quality of life (eg, being able to heat a home to a comfortable level, having access to hot water) and a higher standard of living.

These types of rebounds in low-income communities should diminish over time, for example, as heating needs flatten out after a comfortable indoor temperature is reached. In addition as incomes rise or the price of energy decrease, energy costs as a share of household expenditures decreases, which reduces sensitivity to energy prices.

Economy-wide rebound effect can also be an encouraged policy impact. For example, greater productivity and competitiveness, consumer demand for other goods and services and job growth can all be considered positive in light of the current economic crisis.

What kind of policies could be designed to address rebound effects?

As mentioned above, the full effect of the rebound may not necessarily need to be reduced depending on the policy priorities beyond energy consumption levels. However, policymakers will require access to detailed modelling that estimates the savings potential in each sector, including the degree of rebound. Efficiency targets can then be adjusted to take into account rebound effects.

Program designers and administrators need to understand the sectors targeted, such as the production technologies, sensitivity to energy prices and household behaviours, so that they can design approaches based on the different influencing factors and consumer responses. Studies have been carried out in the US and for selected sectors in a few EU countries (eg, space heating in Austria and the UK), but more comprehensive data and analysis on the influencing factors and estimated rebound for each policy target group, including sector and geography, is needed. There is also a need to promote the adoption of evaluation methodologies and better understand consumer behaviour, which can be used to adjust and improve policy and program impact over time.

Finally, supporting the adoption of increasingly stringent appliance and equipment standards and building codes that keeps up with best available technology is key. In addition, dynamic energy pricing schemes based on smart meter and grid technology, information management and automated technology equipment can help mitigate the impacts, especially for large energy-users.