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Exploring the Links between Energy Efficiency and Resource Efficiency

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Household energy efficiency could help boost the economy

Improving the energy efficiency of homes could have positive economy-wide impacts, recent UK research suggests. It would allow householders to spend the money they save on energy on other products and services. Although this additional demand and the associated production in non-energy sectors would partly offset the energy saved in the home, this 'rebound effect' does not completely outweigh the household energy savings.

This study explored the links between increased energy efficiency of UK households and the wider UK economy using 'general equilibrium' modelling. In particular, researchers investigated a potential 5% improvement in energy efficiency, which they assumed would occur as a result of technological improvements (e.g. more efficient appliances) that allow a household to continue operating at the same capacity, but using less energy.

Financial savings from this lower energy use will probably mean that householders use their appliances more than before, creating 'direct rebound effects'. This study also considered 'indirect rebound effects'. These occur because the cost savings allow householders to spend more money on goods and services other than energy. The energy used by other sectors that provide these goods and services can reduce the overall benefits of the initial improvement in household efficiency. To understand these rebound effects, the researchers assessed the energy usage of 21 economic sectors. These included four energy sectors (1. coal; 2. refined oil (and also nuclear fuel that goes to the electricity generation sector - analysed together with oil, as these two sectors were integrated in the study's source of data); 3. gas; 4. electricity) and 17 other sectors, including food, textiles/clothing and finance.

The model's results suggest that the 5% improvement would have positive effects on the national economy, because increased real income and spending on non-energy sectors has a greater economic impact than the same amount of spending on energy. The effects would change over time; in the long-run, industry and householders adjust their behaviour and capacity in response to changes in energy consumption triggered by the efficiency savings; for example, although energy companies will drop their prices in response to reduced demand, they may increase them in the long run in order to restore company revenues.

In the long term, the national GDP could increase by 0.10% in response to the household expenditure changes. Total household consumption of goods and services would increase by 0.25% in value and national investment by 0.10%, results suggest. There could also be a corresponding 0.40% fall in unemployment rates and average wage increases of 0.07%.

Household energy consumption would fall by 1.62% and overall energy demand, from all 21 sectors, by 0.22%. Large amounts of energy are required to produce useable energy itself, for fuel extraction and processing, for example, which makes the energy sector more energy-intensive than most other sectors. The transfer of demand from energy to other sectors thus translates into an overall drop in energy use. The overall rebound effect is calculated to be 59.3%, including direct and indirect effects. In other words, 59.3% of the initial 5% household energy efficiency savings will be offset by resulting changes in the UK's total energy usage.

The study also considered another possibility: householders may feel financially better off thanks to energy savings, and consequently apply less pressure on employers for higher wages. If this occurred, the economic impacts would be even greater because suppressed wages reduce labour costs per worker, and so have an economic effect that is similar to greater industrial productivity. Thus, under this scenario, although wages could fall by 0.11% in the long run, this is in nominal terms, not real terms, i.e. average wages drop, but so does the cost of living, as judged by falling prices for a wide range of products, including energy, in the Consumer Price Index. Lower costs of living could effectively allow consumers to afford more than previously.

Unemployment rates could drop by 0.99%, GDP would increase by 0.24%, household consumption by 0.29% in value and investment by 0.24%. More energy is consumed under this scenario than under the first, but the rebound effect is only modestly higher at 63.9%. Moreover, the greater growth comes with a drop in the price level, triggered by the fall in wage levels. The resulting increased competitiveness would lead to a 0.06% rise in exports.