

# ENERGY STAR Appliance Market Shares: Do They Respond to Electricity Prices, and Does It Matter?

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Energy efficiency is often cited as the lowest-cost method of reducing carbon emissions. Yet its effectiveness depends upon the degree to which consumers are willing to adopt such measures. The energy efficiency gap suggests that consumers do not fully respond to energy efficiency savings for such reasons as discounting future savings at an above-market discount rate. There is also evidence that they show limited response to rebates. Our paper focuses on an apparent paradox that the market share of energy-efficient appliances, as identified by ENERGY STAR (ES) labels, do not respond to changes in electricity prices. In contrast, we find a between-state price response for ES room air conditioners, refrigerators, and dishwashers, but not clothes washers.

Using similar data as in earlier studies for the years 2000-2009, we utilize an econometric specification that allows for both within-state and between-state impacts of state electricity prices. As did the earlier study, we find no response to within-state changes in electricity prices, but we do find a response to between-state changes in electricity prices. We interpret the insignificant within-state effect as a shorter term response by consumers, while the significant between-state effect reflects a longer term response.

In addition to non-price variables included in earlier studies, such as rebates, per capita income, and natural gas prices, we evaluate a number of additional variables, of which education and the percentage of housing that is owner-occupied, prove to increase the market share of the evaluated ES appliances. We hypothesize that additional education increases the demand for energy efficiency, either due to greater awareness of the cost savings or to a greater demand for improving environmental outcomes. Households that own rather than rent can more easily internalize short-term energy savings and long-term benefits when they sell a home with energy-efficient appliances.

Having established a long-term price response, we evaluate the energy savings and reduction in carbon emissions from ES as compared to conventional appliances. Using the estimation results, we find that the four ENERGY STAR appliances reduce energy use by 1.9 million megawatt-hours per year with a corresponding reduction in carbon emissions of 1.4 million tons, equivalent to removing 0.1% of all U.S. vehicles. Adding a \$100/ton CO<sub>2</sub> tax would increase these figures to 2.1 million megawatt-hours, 1.5 million tons, and 0.11% of U.S. vehicles, equivalent to removing 275,000 vehicles from U.S. roads.

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