



# ESRI Research Bulletin

## *The Residential Sector's Demand for Energy*

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This Bulletin summarises the findings from:

John Curtis and Brian Stanley (2016). Analysing residential energy demand: An error correction demand system approach for Ireland. *The Economic and Social Review*, 47(2):185–211. Available online: <http://www.esr.ie/article/download/568/137>

# The Residential Sector's Demand for Energy<sup>1</sup>

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**\*John Curtis and Brian Stanley**

## **INTRODUCTION**

Ireland and other EU member states face onerous climate and energy efficiency policy targets. As the residential sector represents 25% of final energy consumption in Ireland, what happens within the residential sector will play an important part in determining whether Ireland's policy targets are achieved. Improvements in energy efficiency performance, reduced fossil energy use, and switching to less carbon intensive fuels will contribute to achieving policy targets. Price mechanisms, such as carbon taxes, are one policy option available to policymakers to encourage households to change their energy consumption patterns. This research paper examines historical data on the residential sector's energy consumption to gauge how responsive households are to changes in energy prices, which should inform the development of future policy initiatives.

The paper estimated an energy demand system for the residential sector for four fuel categories: electricity, gas, oil (incl. kerosene, diesel, LPG and petroleum coke) and solid fuels (incl. sod peat, peat briquettes and coal) and uses data from the period 1970 to 2013.

## **Results**

The primary focus of the research was estimating the responsiveness of households' energy demand to (i) changes in fuel prices and (ii) to changes in total household expenditure (which can be taken as a proxy for household income), which economists refer to as price and expenditure elasticities. The research also investigated whether the households' responses occurred instantaneously or happened over a longer period of time.

## **SPEED OF ADJUSTMENT TO CHANGES IN FUEL PRICES**

After a change in fuel prices the speed of adjustment to a new long run equilibrium level of fuel demand differs between fuel types. In the case of solid fuels and electricity about one-third of the adjustment occurs within one year. In the case of oil and gas the adjustment in demand occurs much faster, with

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roughly three-quarters of the adjustment occurring within one year of the price change.

#### **OIL AND GAS**

Households' responses to price shocks in either oil or gas are similar. In the short-run the response is likely to be quite small (possibly reflecting the fact that households can't quickly change their heating and cooking appliances) but over time a much greater demand response occurs (e.g. as households switch fuels or up-grade their appliances). As household expenditure (and incomes) increase households spend proportionally more on oil and gas. This may reflect their ability to afford to heat their homes for longer at higher temperatures.

#### **ELECTRICITY**

Electricity is similar to oil and gas in the short-run response to price changes with relatively small reductions in demand as prices increase. However, unlike oil and gas, the long-run demand response for electricity is effectively zero with demand returning to original levels. Such a finding may be reconciled with the fact that electricity is such a critical part of everyday life that households find it difficult to maintain short-run changes in behaviours associated with price changes.

#### **SOLID FUELS**

What distinguishes solid from the other fuels in this research is that solid fuels have negative expenditure elasticities, which means that demand for solid fuels will decline with rising incomes. In the long term, as incomes increase we should see a switch away from the most carbon intensive fuels (i.e. peat and coal) to cleaner fuels, such as gas. However, the ambition of climate policy is for households to switch away from carbon intensive solid fuels as soon as possible. A grant scheme supporting low income, solid fuel using households to switch to low carbon alternatives might be one way of achieving such an outcome in the shorter term.

#### **IMPLICATIONS FOR CLIMATE AND ENERGY POLICY**

Climate and energy policy ambitions are for lower but more efficient fossil energy use with the objective of reducing greenhouse gas emissions. Carbon or energy taxes are potential policy instruments to achieve such a goal but on the basis of this research it is likely that achieving substantial reductions in energy demand (or ultimately emissions) would require quite large additional taxes on energy or carbon. Furthermore, the full effect of such a policy mechanism would take several years to be realised. The implication is that any new policy measures focusing on the residential sector should not rely solely on a price effect.