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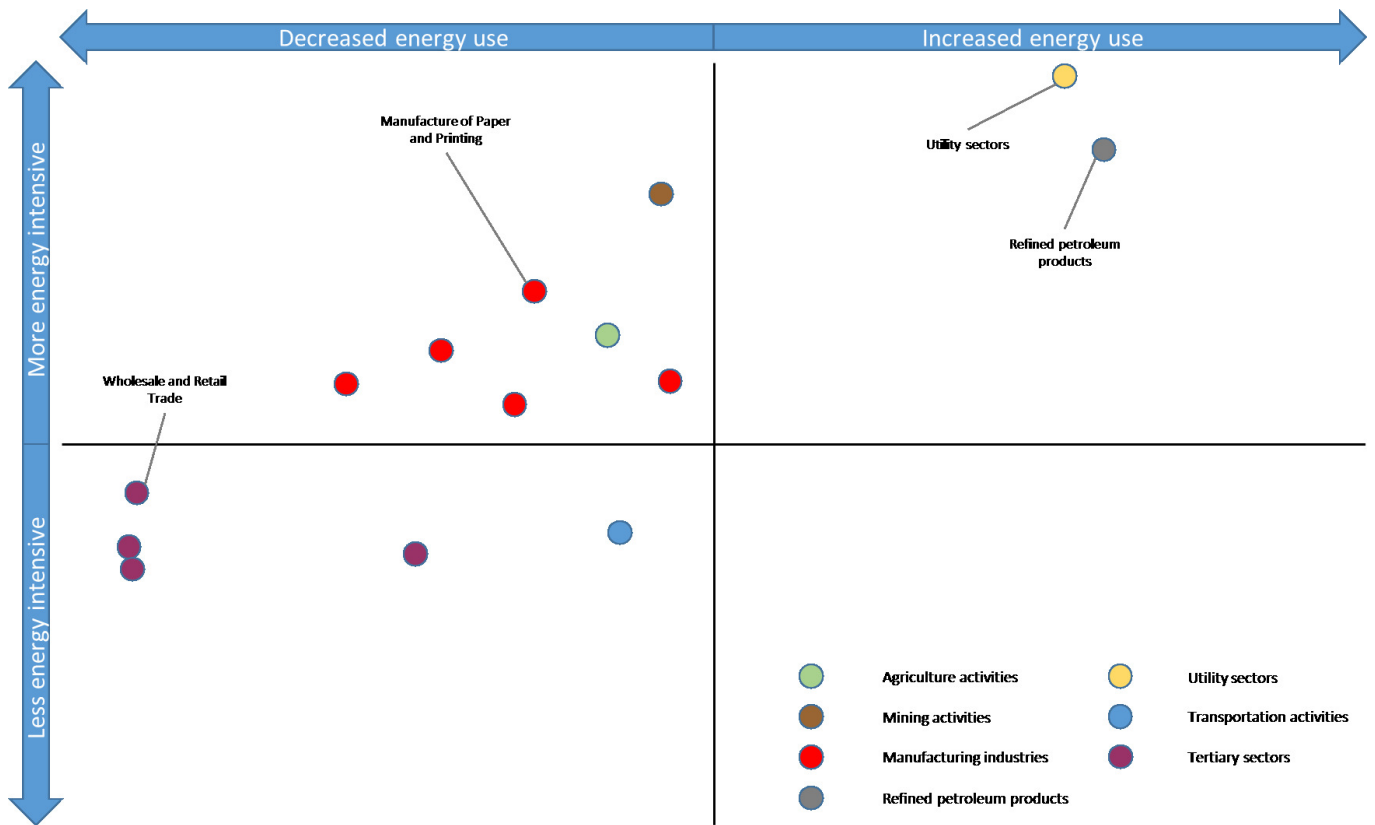
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To what extent will industrial energy efficiency reduce energy use across the economy?

What type of sectors deliver greatest energy savings?

Industrial energy efficiency policy is typically targeted at the most energy intensive sectors in the economy. Less energy intensive sectors that use a relatively high level of energy due to the scale of their activity may also be targeted. Either of these types of sectors may be targeted on the basis that large energy savings could be realised at industry-level. However, particularly where national energy use and emissions are a policy concern, there is a need to consider how changes in energy efficiency in one industry may impact throughout the wider economy.



Unanticipated impacts on energy use?

In EPSRC-funded research at the University of Strathclyde, we are modelling the impacts of energy efficiency in different UK industries on energy use across the economy. On first glance, our results may appear counter-intuitive. The greatest reductions in total energy use across the economy are achieved when the energy efficiency improvements are targeted towards some of the **least energy-intensive**, but larger scale, sectors. For example, improved energy efficiency in the 'Wholesale and Retail Trade' sector achieves a **significantly greater proportionate reduction in total energy use across the economy** compared to what happens when efficiency improves in a more energy-intensive sector, like 'Manufacture of Paper and Printing'. See the figure above. If energy efficiency improves in some of the most energy-intensive industries, which tend to be fuel/utility suppliers, energy use across the economy may increase.

What explains the potentially unanticipated results we get?

There are three fundamental factors that could cause erosion of the energy savings we may anticipate in our economy as a result of energy efficiency improvements in different industrial sectors. First, improving the efficiency of energy use in production **will lower the price of the service provided by physical energy inputs**. This will encourage a **switch towards the use of energy goods** in production. This is an industry level “substitution effect”. Second, **energy intensive producers will enjoy larger decreases in total input costs**. Where this translates to lower output prices this will trigger positive “competitiveness” effects that will **spill forward through downstream supply chains**. As a result there may be a “composition effect”, **changing the industrial structure of the economy in favour of more energy efficient but (still) more energy-intensive producers**. While this type of ‘economy-wide rebound effect’ has implications for how energy efficiency may affect total energy use in the economy, it is important to recognise that it is a result of positive economic effects. The underlying **productivity-led expansion** is one of the ‘**multiple benefits of energy efficiency**’ highlighted by the International Energy Agency (2014)*.

What does all this mean for policymakers?

Our research develops methodological tools and generate results that could aid policymakers in making more informed decisions. It involves an energy variant of the type of multi-sector CGE model used by policy bodies such as HM Treasury to analyse wider economic impacts of a range of policy and other economic scenarios. Our findings regarding industrial energy efficiency indicate that **policymakers should carefully consider the wider impacts of energy efficiency initiatives focused in the most energy intensive sectors of the economy**. Economic benefits must be assessed in the context of the impact on total energy savings and emissions at a national level. However, it is also important to note that where energy-intensive UK industries are or become relatively more energy efficient relative to competitors elsewhere, there could **important positive impacts on carbon emissions at the global level if energy use is drawn to a more efficient location**. However, where national energy use and emissions levels are of concern, **greater proportionate energy savings could be realised by targeting energy efficiency improvements in sectors with lower energy intensity but possibly large overall energy uses** (due to scale of production).

Our analysis is part of the project ‘Energy saving innovations and economy-wide rebound effects’, an EPSRC End-Use Energy Demand project (Grant Ref: EP/M00760X/1).

The project is led by Professor Karen Turner, Director of the Centre for Energy Policy (CEP) at the University of Strathclyde International Public Policy Institute. The project involves researchers from the Centre of Energy Policy and Fraser of Allander Institute at the University of Strathclyde and a number of external collaborators.

Our project work on industrial energy efficiency is currently in progress and a working paper will be available soon. However, we have already published a number of papers in this area. For more information, please the contact details below and visit our project website.

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Project website: www.cied.ac.uk/research/impacts/energysavinginnovations

CEP website:

<http://www.strath.ac.uk/research/internationalpublicpolicyinstitute/centreforeenergypolicy/>

* The IEA (2014) report ‘Capturing the Multiple Benefits of Energy Efficiency’ is available at <http://www.iea.org/publications/freepublications/>.