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Policy Brief

The role of residential energy efficiency as a growth, welfare and system enhancing economic activity

1. Introduction

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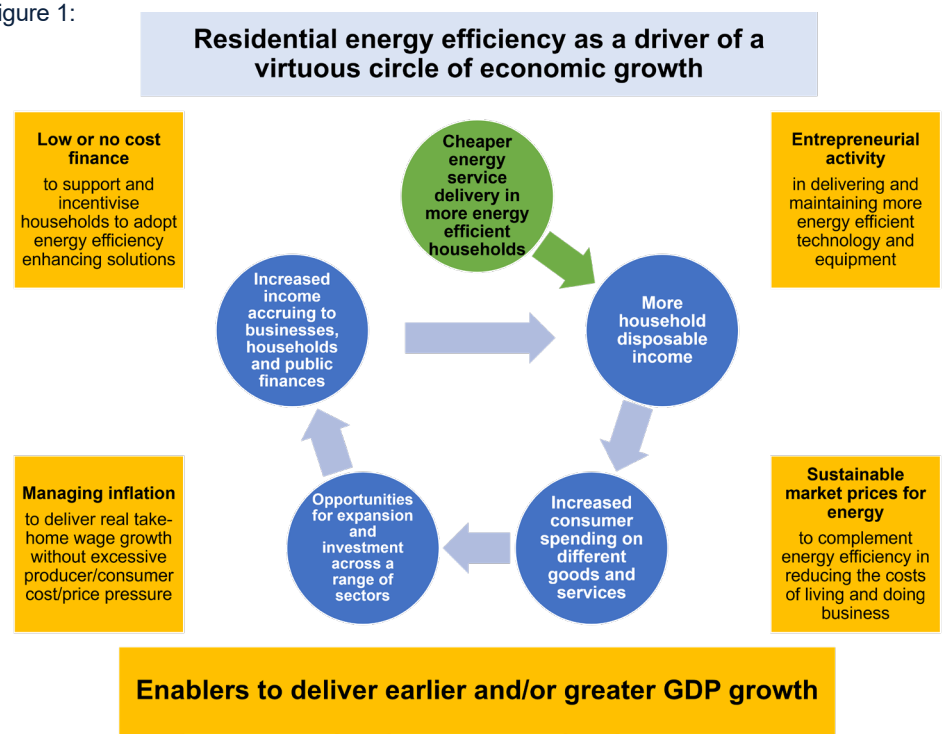
The role of energy efficiency in reducing household energy efficiency and emissions has long been recognised and promoted within in and across nations as a key demand-side measure in reducing energy use and associated emissions. However, it can also play a key role in stimulating sustained economic growth in ways that both enhance welfare - by reducing the cost-of-living and fuel poverty in more energy efficient households - and the sustainability of the wider economic and energy systems - by stimulating growth without additional pressure on constrained energy supply systems. On the other hand, increased efficiency will reduce demand for energy supply activity, though this will be partially offset by the demand of a growing economy. Any wider supply constraints may introduce price pressures to the growth process that could bring challenges for more export intensive sectors.

> “The sustained economic growth impact of residential energy efficiency improving by around 10% could equate to a sustained annual GDP boost of at least 0.07% (3% of Government’s current 2.5% growth target).”

Figure 1:



This brief reviews CEP’s portfolio of research on how residential energy efficiency actions impact the wider economy to deliver such outcomes.[1] We do so with particular focus on how the fundamentals and mechanics identified in our work could be expected to impact in the current UK economic landscape characterised by cost-of-living and energy resilience challenges combined with opportunities for new domestic supply chain development.

2. Increased energy efficiency as an economic stimulus

Our fundamental finding is that the key trigger for how increased efficiency in household use impacts across the wider economy is the fact that the cost of delivering energy services (e.g., heating a home to a given temperature for an hour or a day) is reduced. That is, the effective price of energy faced by more energy efficient consumer is reduced. This both frees up and increases real disposable income to spend on other goods and services, which in turn, stimulates activity and investment across a range of sector and supply chains across the economy, driving new income generation that funds further rounds of consumer spending, now spreading across the wider household sector (see Figure 1).[2]

The key outcome is moving the economy onto a higher GDP trajectory. Our estimates range from an additional 0.1%-0.25% GDP per annum over time for efficiency gains involving UK households using 5-10% less physical energy to heat their homes.[3] This is characterised by increased investment, reduced unemployment/higher employment and wages income. Increased efficiency will lower demand for energy supply sectors/supply chains, though this will be partly offset by the demand of the sectors that are growing.

In an economy like the UK, labour supply conditions constitute the main constraint on expansion, where – as with any demand-led expansion – there is a risk of inflationary pressures acting to offset the welfare-enhancing properties of economic adjustment. In particular, rising wage and other costs does risk 'crowding out' particularly of industries that are more export intensive compared to those servicing growing household demand. This motivates the identification of inflation management, already a pressing issue in the UK and other nations, as one of the key enablers of economic growth associated with residential energy efficiency.

Overall, despite the stimulus to a range of UK sectors - crucially involving a shift in growing real household spend from energy to other goods and services - a key outcome is likely to be an overall reduction in the energy intensity of the economy. Thus, the economy grows without additional – and, indeed likely reduced – pressure on the energy supply system. Here another key controlling factor on the extent of the growth, and the easing of cost of living and energy system pressures, will be what is otherwise happening to the market price for energy. This includes whether energy suppliers respond to falling demand by reducing wholesale and retail prices, another issue of current public, policy and regulatory concern.[4]

3. Different households benefit in different ways

Households that directly benefit from energy efficiency actions enjoy the obvious benefits of reducing their energy bills and, thus, their cost of living, while becoming more resilient to the type of energy price shocks that we are currently experiencing. However, even household not taking action on energy efficiency will gain as a result of increased income generation across the economy, depending on where they are employed and/or invest, and the extent to which additional consumer spending power is freed up.

Here, we find that most of the gains accruing to the lowest income households will be associated with the positive cost-of-living impacts when they can become more energy efficient. On the other hand, mid- to higher-income households are likely to gain more from real wage and other income gains associated with economic growth.

Moreover, we find that the greatest expansionary power is released across the economy when higher income (and higher energy using) households become more energy efficient, basically because of the greater consumer spending power freed up at the initial stage of the process in Figure 1.[5] Of course, energy conservation in the face of currently high energy prices could redirect consumer spending: the key point is that energy efficiency gains are required to deliver real income gains and alleviate cost of living pressures in any type of household.

4. Opportunities for quicker and further gains from residential energy efficiency

How long it takes to fully realise positive growth, welfare and system enhancing outcomes from energy efficiency actions depends on a range of factors. One central issue is around how residential energy efficiency actions are funded.[6] For example, when households incur the costs of purchasing a new boiler or install better insulation, this will introduce a budgetary constraint on the household spending injection to the economy at the start of the cycle in Figure 1.

Where the household spending requirement can be smoothed through low-cost finance spread over a number of years, or some 'no cost' (directly to the household) option (i.e., a government grant) is available, this will relax the budget constraint. Here, we find that, for example, 10 years into a 15 year large scale energy efficiency programme, the provision of grant finance could enable GDP gains anything up to twice as large as they would be under any private spending approach.[7]

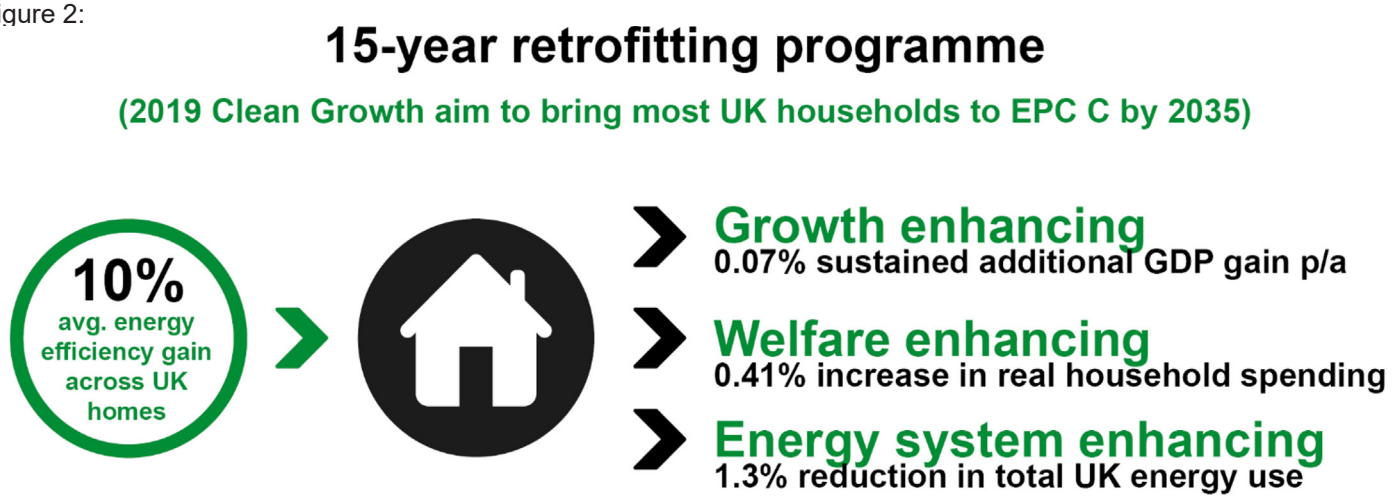
Whatever the approach to private and/or public finance, the near term wider economic expansionary power of making households more energy efficient is enhanced by the delivery of retrofitting projects. Here, the UK construction sector and its supply chain are the main channel for further 'circular' gains feeding back through investment activity and household income gains. This may, however, bring two broad challenges of particular current relevance.

First, whether the right skills and supply chain capacity are available to deliver energy efficiency programmes within UK regions. Second, where there are industry-specific challenges and/or the national labour supply constraint bites, this brings a further risk of inflationary pressure. Here, maximising wider economy gains while managing the cost of living and doing business requires careful consideration of the pacing and likely smoothing of the costs and delivery of energy efficiency actions.

5. In conclusion – residential energy efficiency can be growth, welfare and system enhancing

In summary, if UK households can increase the efficiency with which they use energy, direct cost-of-living benefits will be delivered, but the consequent freeing up of increased real income and spending on other goods and services can trigger expansionary process across the economy without putting additional burdens on the energy system. For example, see Figure 2. Here, our most recent scenario simulations[8] show that the sustained economic growth impact of residential energy efficiency improving by around 10% (in line with Government's 2019 Clean Growth aim of getting most UK households to EPC C by 2035) could equate to a sustained annual GDP boost of at least 0.07% (3% of Government's current 2.5% growth target).

Figure 2:



We estimate that the GDP gain could be considerably greater (up to 0.25%) if the price and cost impacts of labour supply constraints do not constrain the expansion by introducing cost and price pressures across the system. On the other hand, while our scenario simulation results for the constrained +0.07% GDP per annum case suggest the expansion would result in 0.16% increase in the CPI, real wage rates would still increase, by 0.17%, while the expansion may be expected to deliver a 0.08% increase in total employment (through falling unemployment). This helps total real household spending to rise by 0.4% as the economy grows, but with a net decrease in total energy use.

On the other hand, our findings show that some sectors of the economy may not enjoy net gains and may suffer some extent of marginal net losses where labour and other cost pressures lead to a loss in competitiveness in international markets. Thus, more export-orientated industries may join energy suppliers in being the main, albeit marginal 'losers' from energy efficiency-powered economic growth.

Generally, our scenario simulations suggest outcomes of energy efficiency actions that deliver net benefits in terms of growth, the economic welfare of households while reducing the energy-intensity of the economy, albeit qualified by the risk of some over-heating of the economy where demand drives economic expansion.

References

1. Our work on energy efficiency (mainly in the applied setting of the UK economy) is part of a wider portfolio of work involving computable general equilibrium (CGE) modelling and other applied economic and energy system approaches led by the CEP Director, Professor Karen Turner.

2. The economic 'mechanics' of this process were initially set out in a paper published in Ecological Economics in 2014 where our general equilibrium approach in investigating wider economy impacts was initially peer reviewed. The work is also summarised in a 2015 policy brief.

3. These estimates are drawn from across the peer reviewed papers cited here and listed in the profile of Professor Karen Turner in the second endnote above. Please contact her at karen.turner@strath.ac.uk if any direction to particular evidence points is required.

4. We generally assume that energy suppliers will behave in a competitive manner, but have investigated the impacts of inflexibility in energy prices on the impacts of increased energy efficiency (focussing on the case of industrial energy efficiency) in a peer reviewed paper published in Energy Economics in 2020.

5. We investigate the mechanics driving the overall macroeconomic and distributional impacts of energy efficiency actions in different types of households in a peer-reviewed paper published in Energy Policy in 2017. Key insights are summarised in a 2017 policy brief.

6. In a peer reviewed paper published in Energy Policy in 2021, we explore how different broad types of funding approaches – ranging from upfront payment by households through different timeframes of low cost loans to government grants, and comparing to the centralised UK Energy Company Obligation, ECO, model – impact the adjustment of the economy in response to a large scale energy efficiency programme. This work involved extensive consultation with officials at BEIS and is summarised in a 2020 policy brief. It also informed subsequent more focussed work, involving further collaboration with BEIS, reported in a 2021 policy brief, with a full paper currently under peer review.

7. See our 2021 policy brief.

8. See our 2021 policy brief.

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