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Policy Brief

What does increasing residential energy efficiency do for the economy?

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Summary

We know that increasing the efficiency with which households use energy, particularly in heating their homes, plays a key role in reducing energy use and bills, fuel poverty and emissions. But how does it impact across the wider economy? CEP's research[i] identifies two main routes and types of (ultimately coinciding) effects. [ii]

The first is new economic activity associated with delivering energy efficiency projects. Here, the likelihood and magnitude of a transitory net GDP impact depends crucially on how actions are funded, signalling by government on the extent and length of the programme and the extent to which resources are displaced and consequent price responses.

The second is the impacts of households facing lower energy bills and realising gains in real income available for spending on other goods and services as a result of energy efficiency projects delivered. Here, sustained net gains in GDP can be expected to evolve over time and, crucially, to increasingly coincide with and uplift gains/offset losses associated with project delivery as more households make energy efficiency improvements. Ultimately, the magnitude and composition of evolving and sustained GDP gains will be dependent on constraints and price/cost responses across the economic system.

Moreover, where increased real household spending shifts away from energy towards other goods and services, a recurring finding is an overall reduction in the energy (and emissions) intensity of the economy. Depending on the supply response in energy markets, **an important associated benefit could be a sustained, albeit potentially relatively marginal, reduction in energy prices faced by all (domestic and non-domestic) consumers.**

> "The...most sustained route to economic growth through increased energy efficiency is triggered by households being able to reduce their energy bills, not through simple conservation, but by lowering the cost of delivering heating and other energy services."

Energy efficiency projects as a source of economic growth?

The first potential route to economic growth is through the capital spending and supply chain activity involved in doing things like retrofitting homes. We estimate that **this could provide a transitory economic stimulus, with the annual GDP gain peaking at up to 0.04% above what it would otherwise be during the timeframe that projects take place.**

However, whether net GDP gains transpire, when, and to what extent (and composition), depends crucially how energy efficiency projects are funded. For example, our 0.04% finding relates to a case with grant funding spread over **a 15-year retrofitting programme scaled to raise most UK households to EPC C by 2035 (in line with Government's 2019 Clean Growth Strategy aim) at a total cost of £68.5billion (£4.6bn p/a).**[iii] Over time this results in **an average 10% increase in energy efficiency across the UK housing stock.**

This 0.04% uplift in UK GDP associated with the retrofitting alone represents a peak (from the capital spending alone) that is reached 10 years in, before resources begin to reallocate as the programme comes to an end and the transitory growth boost directly associated with project activity dissipates. One focus of our research here was **how negative reallocation impacts of energy efficiency programmes coming to an end can be smoothed where Government is able to signpost continued intent to support future programmes.**[iv]

However, returning to the point of how capital spending on energy efficiency is funded, our finding is that **GDP gains from the capital spending stage maximised where grant funding is available**. Crucially, however, our analysis of the £68.5billion programme does not hypothecate what the public funding mechanism would be. Rather, we model what the deficit implications of providing grants would be to inform fiscal analyses of how Government may fund them. We would need to re-run our simulations to consider how different public funding approaches may affect wider economy outcomes.[v]

On the other hand, if the retrofitting (and, thus, the £68.5billion) were entirely paid by beneficiary households, the outcome of the retrofitting stage in isolation could more clearly be one of a net marginal contraction in UK GDP (but with smaller public deficit implications) for some or all of the programme timeframe.[vi] This is basically because **paying upfront for energy efficiency actions or taking out (even low cost) loans will constrain household budgets so that real spending on other goods and services falls.** On the other hand, there could be some positive displacement impacts where energy efficiency projects utilise sufficient domestic supply chain activity, given the import-intensity of consumer spending.

More generally, under any funding approach, the potential for net GDP gains from the retrofitting state alone will be limited **where constraints on labour supply combine with low unemployment so that new investment activity triggers costly competition for limited resources.** Given that the UK is currently challenged by a range of labour market constraints, the timing and pace of energy efficiency programmes will be crucial. For example, our research shows that spikes in, for example, construction sector activity associated with delivering projects, can be a critical trigger for competition and wage cost pressure in the UK labour market. Thus, the headline results reported here are for a steady action case.[vii] However, whether the capital spending and new economic activity solely associated with delivering energy efficiency programmes will deliver GDP gains and/or losses, when and how, **really does need to be considered in the context of the outcomes of realising efficiency gains, which will help negate some of the negative pressures discussed above.**

Realising residential energy efficiency gains: reduced energy bills and increased real incomes as a source of sustained economic growth

The second, and more sustained route to economic growth through increased energy efficiency in households is triggered by households being able to reduce their energy bills, not through simple conservation, but by **lowering the cost of delivering heating and other energy services**. This **frees up and increases real income available for spending on other goods and services, and essentially reallocates resources away from energy supply and use.** The more this increased consumer spending can be directed within the UK economy, sustained economic growth is likely.[viii] Moreover, as **efficiency gains roll out, increasing and reallocating real household spending, this adds (offsets) to any GDP gains (losses) associated with project delivery alone**. For example, the 0.04% additional GDP peak (10 years into a £68.5billion grant-funded programme) associated with the capital spending stage alone above, rises to over 0.1% when the impacts of early efficiency gains are taken into account. While the lowest income households benefit more from the direct real income and spending power effects of actually becoming more energy efficient, we find that the **growing economy is likely to deliver real wage rate and income gains across the household sector,** even where the demand-led growth is associated with some upward pressure on the CPI.[ix]

However, the magnitude of sustained GDP gains, and the composition of activity across real domestic spending, investment and net exports, again depends on prevailing economic conditions. Here, our research again highlights **the importance of labour supply constraints and wage determination on producer and consumer prices across the economy.** In the case of the £68.5billion programme that could deliver the EPC C goals of the 2019 Clean Growth Strategy, we find that the sustained annual GDP gain is ultimately dependent on wage responses in the supply constrained UK labour market.[x] We find that the **sustained per annum uplift could be anything between two extremes of 0.07% in the central scenario discussed so far (where real wages are bargained up to the extent of maximising labour cost price pressures throughout the system) and 0.25% (where we consider a case where there is no upward wage pressure due to this energy efficiency programme alone).**

The **corresponding reductions in total energy use are 1.3% when GDP rises by 0.07% p/a and 1.2% when GDP increases by 0.25%.** This **demonstrates a trade-off where greater GDP gains are associated with reduced energy savings, due to increased energy use in production to service increased consumer demand.** However, the shift in the composition of activity away from energy supply means that that range of energy use outcomes narrows.

Crucially, these **long-run sustained outcomes are not dependent on the funding model used to deliver the required 10% energy efficiency gain across the UK housing stock.**[xi] That is, while these outcomes are a result of the £68.5billion capital spending requirement discussed above, over the long term (once delivery of projects is complete) the lasting wider economy impacts no longer depend on the where the funding comes from, or the pace of action. Conditions on the supply-side of the economy ultimately determine the extent of expansion triggered by reducing household energy bills and freeing up spending power.

Could falling household energy demand play a role in reducing energy prices?

Alongside the energy intensity of the economy falling as residential energy efficiency rises, a recurring finding across our research is that **net decreases in demand for energy will drive corresponding reductions in energy prices**, which acts much like a tax reduction in stimulating demand. However, such a welfare-enhancing gain is likely to depend on the competitive behaviour prevailing throughout energy supply chains. It must also be set against any opposing pressure on the wider CPI, particularly in the context of persisting supply constraints across the economy.[xii]

End notes

i 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.
ii See a paper published in the peer reviewed journal Energy Policy in 2021 and a 2021 report (and linked 2021 policy brief) for analyses focussing on both of these.
iii See our 2021 report and linked 2021 policy brief for this most recent work by CEP (with scenarios specified in consultation with BEIS officials).
iv In our 2021 report and linked 2021 policy brief we compare the outcomes of a shorter term programme with no signposting by Government regarding an extension/continuation of support for energy efficiency programmes with case reported here, involving upfront announcement of a longer programme.
v For example, changes in income or other taxes would have different types of impacts to compared to government borrowing or reallocation of existing budgets because of the different actors and resources affected. In our peer reviewed papers published in Energy Policy in 2017 and in 2021, we do explore the implications of different approaches to publicly funding energy efficiency programmes considering scenarios involving reallocation of existing government spending and/or generating additional income tax revenues.
vi 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.
vii Our 2021 report reports the steady action case alongside early and late action scenarios.
viii 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, with an overview of the process and basic impacts in a 2022 policy brief.
ix 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.
x See our 2021 report and linked 2021 policy brief.
xi See our 2021 report and linked 2021 policy brief.
xii Our analysis generally involves assuming that actors at all stages of energy supply chains will behave in a competitive manner. However, we 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.

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