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Addressing fuel poverty: what are the relative benefits of public spending on direct bill support or energy efficiency?

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Professor Karen Turner, Dr Antonios Katris, Dr Long Zhou and Hannah Corbett

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1. Summary

Around 3.6 million UK households currently live in fuel poverty (under the English definition).[1] What can government do about this, particularly in the timeframe to 2030 where energy prices are expected to remain elevated above pre-2022 levels?[2] Two basic solutions may involve: (1) government providing direct bill support, for example extending the Warm Homes Discount while prices remain elevated, or (2) publicly funding basic energy efficiency measures, for example loft or cavity wall insulation, so that households living in fuel poverty can permanently lower their own bills.

Our research within the **Energy Demand Research Centre (EDRC)** Equity theme addresses the question of which would deliver most benefit to more households living in fuel poverty, and when, and would trigger wider economy benefits that could benefit more households, jobs and GDP?

In practice, a combination of measures will be required to tackle fuel poverty while delivering on decarbonisation. However, it is useful to isolate and consider the potential impacts of alternative actions, here with a focus on the dynamic impacts on household real incomes and spending and the wider economic landscape.

Our research finds:

1. Direct energy bill support (at a total cost of £9 billion) temporarily helps *all* households who are classed as living in fuel poverty *and* provides a transitory boost to the economy through the uplift to their non-energy spending. This boost peaks in the years 2030-31 with an additional 6,000 jobs and annual GDP gains of just over £600 million. However, all benefits quickly erode thereafter.

2. Redirecting the £9 billion pot to provide loft and cavity wall insulation for households in fuel poverty would deliver more permanent gains in terms of reduced energy bills for those receiving energy efficiency improvements. The impacts on those households' real income and spending will support modest lasting GDP and job gains (around £100 million per annum/1,100 jobs). However, the pot is only sufficient to reach 64% of the 3.6 million households helped through direct energy bill support.

3. Public spending on delivering loft and cavity wall insulation means additional demand for an already busy UK construction industry. This could trigger more

pressure on the cost of living and doing business in the period to 2030 than direct bill support does.

The key point is that new public spending constitutes additional demand in a constrained UK economy, not least because of persisting worker and skills shortages. The main implication is that some increase in the consumer price index (CPI) should be expected where the economy expands in response to either approach considered here. However, where government spends on construction activity for energy efficiency, the pressure on the CPI, and the cost of doing business during the period of public spending (to 2030) is exacerbated because the construction industry services investment demand in all sectors.

2. Analysis of broad policy options

2.1 Direct bill support scaled to close the fuel poverty gap

Our approach to undertaking this research is set out in more detail in the accompanying Technical Appendix included at the end of this report. In summary, we use an economy-wide scenario simulation model and set a £9 billion budget, based on what would be required to close the 'fuel poverty gap'[3], measured at £417 in 2023 prices. Our first set of simulations then involves considering the impacts of providing this amount in direct bill support to each of the 3.61 million households (under the English definition) living in fuel poverty in each year between 2025 and 2030.

Our findings show that providing direct bill support of £417 per annum will benefit households living in fuel poverty by enabling them to spend this amount on more energy and/or on other goods and services. Giving people more money to spend will generally trigger a limited (and constrained) consumer spending driven economic expansion. However, our results suggest that where spending is directed to non-energy spending, this will support a greater uplift due to the relatively higher labour and wage intensity of other consumer-facing sectors. We assume that if government pays part of the energy bill, the £417 support can be entirely directed to non-energy spending.

Where we assume government provides direct bill support by paying part of the energy bill, and households living in fuel poverty consequently spread the £417 uplift on non-energy goods and services, our results suggest the wider economic expansion peaks in 2030-31 with a potential GDP uplift of close to £628 million (0.03%) above what it would otherwise be in 2031, while net job gains peak at almost 6,000 in 2030 (see Figure 1 and Figure 2). Gross (full-time equivalent, FTE) jobs gains are concentrated in consumer facing sectors.

There is some displacement of employment elsewhere due to producer cost and CPI pressure (peaking at up to 0.11% in 2025, before eroding to around 0.07% in 2030 then falling away – see Figure 3) as the economy expands in the presence of a supply constrained UK labour market and consequent wage bargaining.

In the absence of any labour market constraints, and therefore wage pressures to producer cost, the 2030-31 peak of the GDP uplift associated with this direct bill support and the consumer spending response of households living in fuel poverty exceeds £1.3 billion (0.057%). This is accompanied by a peak in net job gains of over 18,150 FTE jobs and more limited CPI pressure (where a 2025 peak in the CPI of 0.1% over what it would otherwise be, steadily eroding to 0.05% by 2030, 0.02 points lower than with wage pressure, before disappearing).

The boost to total spending of households living in fuel poverty is greater if direct bill support is not directly tied to energy bills. That is, if a straight income transfer gives those households more freedom in how they spend the £417, here assuming they spread it in line with existing spending, which implies some of it goes to more relatively costly energy. However, the boost to the wider economy is smaller (and associated CPI pressure more limited) because spending on energy supports less employment and thus triggers more limited further rounds of income and spending gains in the wider household sector.

However, in either case, the direct benefits to households living in fuel poverty disappear with the end of support in 2030, while the expansionary power (which delivers employment and other income gains to other UK households) is gradually eroded beyond that point. See the grey and orange trend lines in Figure 1 and Figure 2

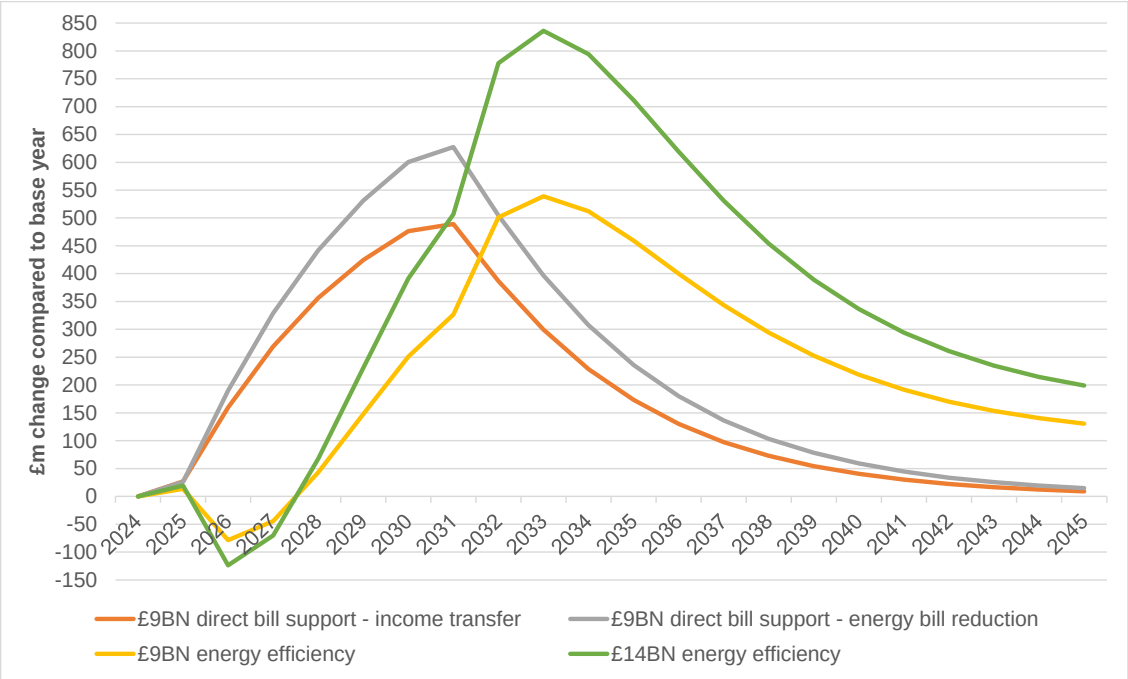

Figure 1: GDP benefits of different government interventions to support households living in fuel poverty.

2.2 Redirecting spending to retrofitting delivered by the UK construction sector

What if government instead spends the £9 billion budget on basic energy efficiency measures for households living in fuel poverty? Here we consider loft and cavity wall insulation sufficient to lower energy bills in households living in fuel poverty by 10% for a given level of energy use, at an average cost of £3,913. [4] One crucial implication is that the £9 billion pot now only reaches 2.3 million (64% of) households living in fuel poverty [5], who do not all benefit from the outset, where we assume that delivery is spread evenly over the 6 years from 2025. [6]

We find that supporting retrofitting projects of this type could trigger ultimately larger transitory net boosts to employment than found for direct bill support, due to the labour intensity of retrofitting activity. On the other hand, the GDP uplift is slower, and cost-price pressures more pervasive, with some initial crowding out as government spending competes for constrained construction industry resources and has a lower and later peak compared to what is observed for direct bill support.

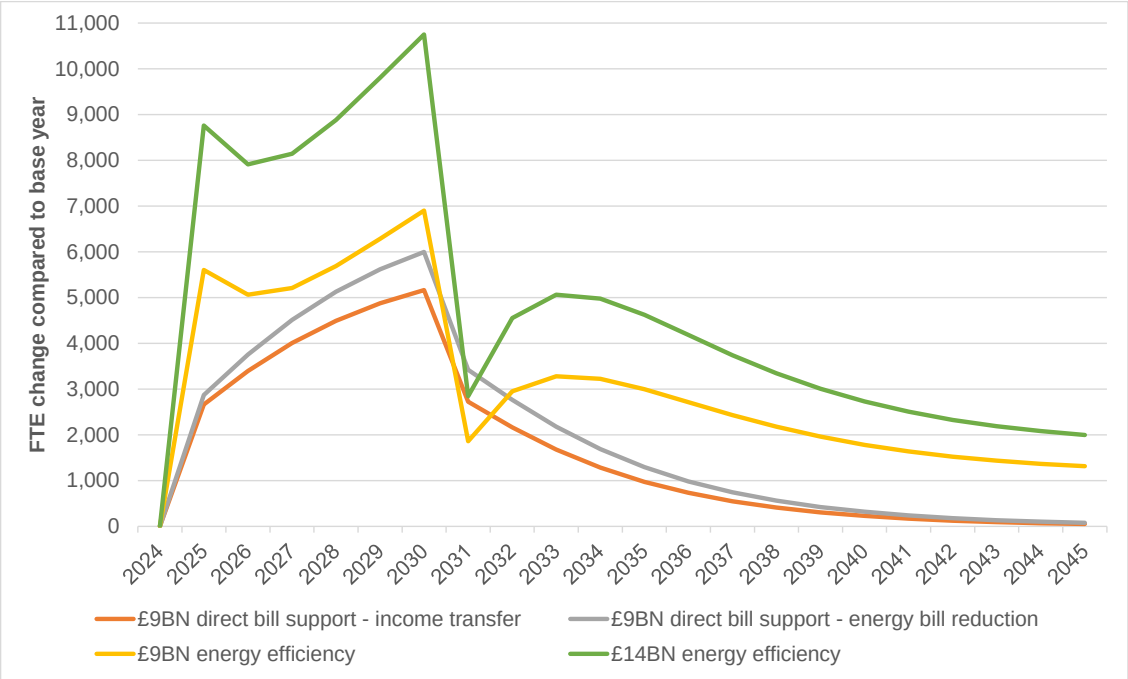

Figure 2: Employment benefits of different government interventions to support households living in fuel poverty.

However, while smaller than observed in the retrofitting stage to 2030, the realisation of energy efficiency gains by beneficiary households delivers a sustained GDP boost and employment uplift driven by lasting reductions in energy bills and, thus, the ability of those households living in fuel poverty to spend more on non-energy goods and services.

Through to 2040, we estimate GDP and jobs gains of just over £200 million per annum and 1,780 FTE respectively, reflecting an expansion that is supported entirely by the impacts of reduced energy costs to the 64% of households living in fuel poverty receiving energy efficiency improvements. See the yellow trend lines in Figure 1 and Figure 2. Beyond 2040, the expansion settles with a sustained uplift of around £100 million in GDP per annum and 1,100 FTE jobs and minimal persisting CPI pressure (see Figure 3 - the lasting impact on the CPI is only around 0.01% above what it would otherwise be, in the absence of any action on energy efficiency).

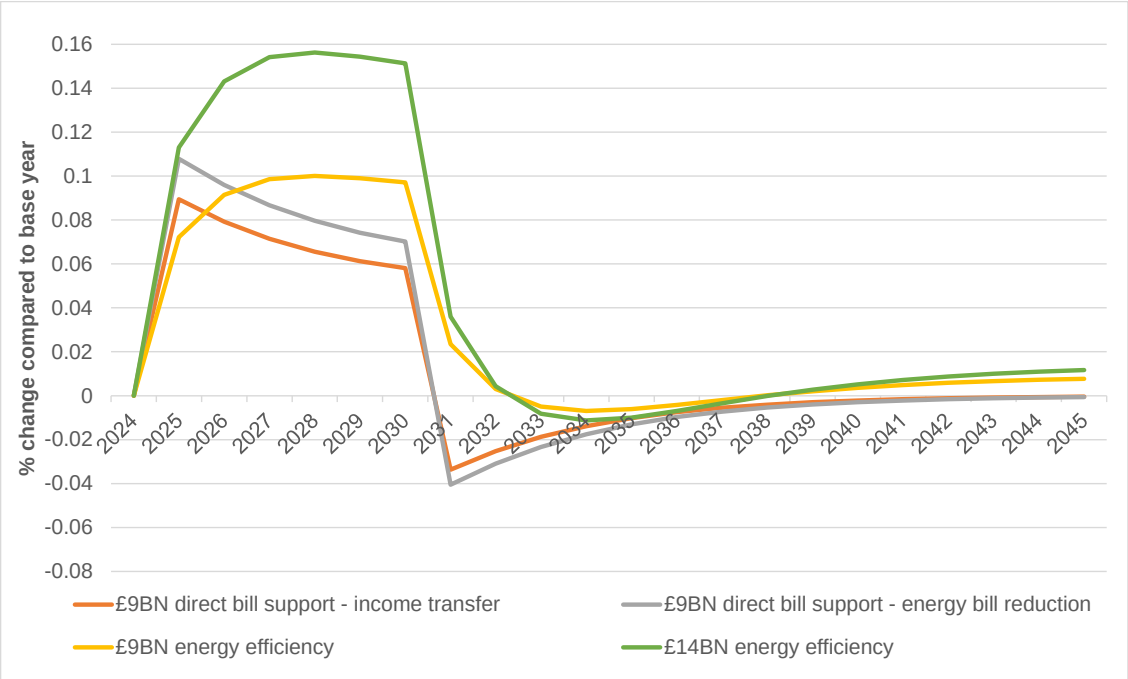

Figure 3: CPI impacts of different government interventions to support households living in fuel poverty

The retrofitting stage (to 2030) could deliver a more extensive but transitory uplift, ultimately peaking in 2033 with a GDP uplift of £539 million (0.02%), while net jobs gains peak at just under 7,000 at the end of the retrofitting programme in 2030. However, gross employment gains are concentrated in the construction sector (just over 13,000 in 2030). This is because the expansion triggers both cost-price pressures through wage responses in the supply constrained UK labour market and an increase in the price of construction, which increases the cost of investment in all sectors of the economy.

The outcome involves displacement of around 6,000 jobs across other sectors and an increase in the UK CPI of about 0.1% above what it would otherwise be throughout the retrofitting period. As in the direct bill support case, sensitivity analysis confirms that in the absence of wage-driven price pressures the potential GDP and employment gains are significantly larger and cost-price pressures lower so that the employment displacement across other sectors is held below 1,800 jobs.

Crucially, as noted above, there is a more specific central trade-off in delivering the improved wider economic picture: fewer households living in fuel poverty benefit overall and from the outset than is the case with using the £9 billion public funding pot to support direct bill support. Our results suggest that those households living in fuel poverty receiving energy efficiency improvements could ultimately gain £63-£87 a year in real disposable income, with greater gains to those households living in fuel poverty who work and, thus, gain more through the wider economic expansion. However, other

households living in fuel poverty only receive very marginal benefits entirely linked to that expansion.

However, as noted above, the broader economic expansion that is triggered by government spending on retrofitting activity is likely to lead to more sustained demand-driven price pressure across the economy than is the case with effectively boosting the consumer spending with direct bill support of households living in fuel poverty. This is reflected in the comparative CPI trajectories reported in Figure 3. Crucially, all households, not just those receiving support, will face such broader price pressures.

On the other hand, the magnitude of the CPI pressure emerging is limited (around 0.1% during the retrofitting period and a tenth of that into the long term) and not sufficient to entirely displace small real spending boosts across the household sector. However, these are very limited outside of the beneficiary households living in fuel poverty group (between £2 and £8 per annum, with higher income households benefitting most). The main (marginal) losers are exporting producers that do not benefit much from the direct household spending boost (where total UK exports fall by about 0.018% due to cost-price pressures, limiting the extent of the upward GDP and employment trajectory in the yellow trend line of Figure 1 and Figure 2).

Comparing the trajectories in Figure 3, the key point to note is that where support is provided in the form of energy efficiency improvements, government spending (on retrofitting) is directed through the construction sector, which services investment demand across all areas of the economy. This causes the impact on the CPI to build slightly more slowly to a similar peak of 0.1% observed in the direct bill support cases if government spends a £9 billion budget on retrofitting for energy efficiency. However, the increase in the cost-of-living is more sustained through to 2030, and slower to erode thereafter, when government directs funds through the UK construction industry to support energy efficiency actions.

A £5 billion increase in the pot would be required to reach all 3.61 million households living in fuel poverty.[7] This *could* trigger a more substantial sustained expansion, increasing both the transitory and permanent GDP and jobs uplift (see the green trend lines in Figure 1 and Figure 2 compared to the yellow ones for the £9 billion spend). This, however, is associated with greater wage-cost and CPI pressure (the green trajectory for the latter in Figure 3 rises to 0.16%). This triggers greater crowding out, including in investment activity due to the pressure on construction resources. Moreover, it will also increase the risk of a wider economic contraction during the retrofitting stage if producer expectations are more forward-looking than in the scenarios we focus on here (see the Technical Appendix to this brief where we

consider the impacts of different assumptions regarding producer expectations, as well as potentially rent-seeking behaviour in delivering the retrofitting programme).

3. Where, when and how government spends is important

Generally, all the outcomes reported above are sensitive to how the supply-side of the economy reacts to the relatively substantial but time-limited government spending involved. Crucially, where producers in other sectors recognise that government will be spending heavily on retrofitting, they may anticipate an increase in prices for projects delivered by the already busy UK construction industry and reconsider near term investment plans (we explore such cases in the technical appendix).

In the case of direct bill support, results of sensitivity analyses conducted around the core scenarios reported above (and presented in the technical appendix) indicate that greater supplier foresight around the time-limited nature of direct bill support is also likely to dampen the net GDP and employment gains reported in the grey and orange trend lines in Figure 1 and Figure 2. This could result in some small net employment losses in the early 2030s, after support ends. However, responses to what happens in the UK construction sector when government spends on retrofitting projects could have much more disruptive impacts, to the extent that the economy could contract rather than expand.

This is because direct bill support essentially supports consumer spending while publicly funding retrofitting projects (particularly those focussed on loft and cavity wall insulation) involves increased government spending in construction, through which much investment activity across the economy is channelled. Thus, particularly in the presence of persisting supply and skills constraints in the UK labour market, additional demand for construction can trigger pervasive cost-price pressures.

As a result, particularly in the case of the retrofitting actions simulated here, scenarios *may* emerge where government spending on energy efficiency projects could result in net contractionary rather than expansionary pressure in the economy from the outset. While initial net employment gains are likely in any scenario (due to the relatively labour-intensive nature of construction activity), our underlying results suggest that over time (and in an extreme case of perfect producer foresight) wider contractionary pressure may ultimately hit total employment.

Here, in the case of the £9 billion spending on energy efficiency, and in an extreme case of perfect producer foresight, we estimate that GDP and employment losses could peak in 2031 (after the programme ends) at around £875 million (-0.04%) and 4,000

FTE jobs respectively. The corresponding losses would be substantially larger if retrofit spending increased to £14 billion to support all households living in fuel poverty. Moreover, such a potential economic contraction would be associated with upward pressure on the CPI due to the increased demand for construction, albeit slightly less that observed for the expansionary cases for energy efficiency reported in Figures 1-3.

4. Conclusion and recommendations

In short, the challenge is how government spends money, where and when. The benefit of direct bill support is that simply giving households living in fuel poverty more money, or paying part of their energy bill, over a fixed timeframe stimulates a relatively straightforward if transitory (and constrained) economic expansion involving changes in how people spend their money.

On the other hand, while the benefits to households living in fuel poverty will be longer lasting if government redirects its funding pot to energy efficiency, the economy-wide impacts of public spending on retrofitting projects are much more difficult to predict.

Specifically, we have discussed (and explore in the technical appendix) how the latter action *could* be disruptive and contractionary, thus, potentially delivering greater upward pressure on the cost-of-living (and doing business) in the UK, and more so the greater scale and concentration of spend in short timeframes.

In summary, policymakers need to pay due attention to the potential for, and the consequences of, such trade-offs. We would therefore recommend:

- While it may be tempting to stick with DBS, which helps all households in fuel poverty from the outset while delivering time-limited wider economic gains (and associated revenues to the public purse that can help offset the direct cost), it fails to deliver long-term benefits or to make progress on the net zero agenda. This learning is not new. Ideally, policy focus needs to shift from transitory DBS to delivering the more sustained benefits of energy efficiency investment, but in such a way as to not harm those currently receiving the benefit, and to allow time (and a clear signal) for the construction sector and its supply chain to respond.
- The risk of increased congestion in the UK construction industry is clear and would exert upward pressure on the cost of living and doing business across the economy during the timeframe of public spending and energy efficiency project delivery. Urgent action is required to expand the capacity and skills of the construction sector, and to ensure policy signalling supports the necessary

expansion of industry and supply chain capacity, both of which will be heavily called upon to deliver across the net zero space.

- Consideration of how to raise funds to support such measures, while ensuring benefits are delivered to fuel poor and lower income households, is needed. Additional funding is clearly required so that all households in fuel poverty can benefit as quickly as possible from whatever measures are rolled out. It should also be recognised that this is just the start of what needs to be an ambitious retrofit agenda across the UK housing stock over the next decade and more. Here, an additional benefit of limited public spending to support those less able to pay could be signalling the need for supply chain capacity to expand in servicing a much wider need for increased energy efficiency.

References

1. As defined for England by ONS (2023). The number of households living in fuel poverty considered here is an extrapolation of the share of English households in fuel poverty to the total UK household stock. A more accurate calculation would need to take into consideration the differences in how fuel poverty is defined in other devolved nations within the UK.
2. As projected by Cornwall Insights (2023).
3. The fuel poverty gap is reduction in fuel costs needed for a household to not be in fuel poverty – as defined by ONS (2023) and charities such as National Energy Action.
4. We calculate the cost per property by taking into consideration the Census 2021 data on the types of residencies in England and Wales. We use that alongside the information provided by the Energy Saving Trust on the installation cost of cavity wall insulations and loft insulations. By combining the information of the two datasets we find that the median cavity wall insulation cost is £2,917 and the median cost for lofts is £996. Therefore, for a property where both measures are installed, as we assume here, the median cost is £3,913 to achieve energy bill reductions of 10%, as informed by NEED: Summary of Analysis, Great Britain 2023. We note that NEED reports the gas bill reductions, but we had to adjust to total energy bill reductions as necessary for our modelling approach. See the Technical Appendix for more detail.
5. This is assuming that the entire amount available is directed to retrofitting properties. However, if specialist services are required to match households to the funding or if profiteering, or other forms of economic rent, is observed then the number of beneficiary households, and the potential economy-wide benefits, will be reduced. Previous Centre for Energy Policy (CEP) work on the subject has found that in the presence of economic rent of approximately 37%, the potential GDP gains from improving the efficiency of residential properties could be almost halved.
6. This straightforward approach also matches the distribution of the available budget of DBS. However, previous CEP research shows that there can be implications if the allocation of the budget, and therefore the retrofitting activity, is front- or back-loaded. The relevant work is discussed in an Environmental Policy & Governance paper and an associated policy briefing. For readers looking to access more details on the methodology used, the work is detailed in an extensive report.
7. Noting that we assume that perfect targeting of households living in fuel poverty *can* be achieved, which is likely to be challenging in practice.

About EDRC

The Energy Demand Research Centre (EDRC) undertakes research for an affordable and secure low energy future. Our interdisciplinary research programme identifies evidence-based energy demand reductions for a sustainable and more equitable future. We work closely with partners from policy, industry, civil society and academia.

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hello@edrc.ac.uk

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Technical Appendix

1. Introduction to the scenarios considered

Fuel poverty has been a social challenge requiring policy attention for many years, but it is one that has been exacerbated by the energy price crisis following the COVID-19 pandemic and the Russian invasion of Ukraine. In February 2024, the UK Department for Energy Strategy and Net Zero (DESNZ) estimated that in 2023 the average fuel poverty gap in England, i.e. the reduction in fuel cost required for a household to no longer be in fuel poverty, was £417. With a February 2024 House of Commons report[1] estimating 44.95% of households in the lowest income quintile and 20.4% of households in the second lowest quintile being in fuel poverty (under the definition used in England[2]), this means that at least 3.61 million households in the UK now live in fuel poverty.

One perspective may be that for the UK Government to alleviate fuel poverty, a possible course of action could be to simply transfer a sum equal to the measured average fuel poverty gap amount (£417 as last measured) to all households living in fuel poverty on an annual basis. This would introduce a new government spending requirement of £1.5 billion per year. If this was to be a time limited action, for example for the period 2025-2030, during which energy prices are certainly expected to remain elevated compared to the pre-2020 prices, this maps to a total direct government spending requirement (in 2023 prices) of £9 billion.

Such direct bill support (DBS) could be provided in the form of direct income transfers to the beneficiary households, giving them choice over how they allocate the government transfer. This could involve covering some of the elevated energy bill and/or can be used to purchase other (non-energy) goods and service. Alternatively, and similar to the current Warmer Homes Discount (and what was done with the Energy Price Guarantee), the government can directly reduce the energy (specifically the electricity) bill of beneficiary households.

An alternative to the approach of offering direct bill energy support (hereafter DBS), could involve government using the £9 billion budget to support basic retrofitting of homes of those living in fuel poverty to improve energy efficiency, thereby enabling households to reduce their own energy bills through a reduction in the physical energy requirements to deliver a given level of heat.

For basic efficiency improvement measures, such as loft and cavity wall insulations, we estimate that the cost would be around £3,913 per retrofitted property[3], and that this

could enable efficiency gains - i.e., reduction in physical energy use and associated cost in delivering a given level of heat service - of approximately 10%.

This per household cost is substantially higher than the £2,502 that each beneficiary household would receive over 6 years if the government opted for a DBS approach. This means that the £9 billion budget will deliver retrofits for fewer households living in fuel poverty: only 64% of the households living in fuel poverty would receive government-funded retrofits. For all households living in fuel poverty to retrofit their properties, an additional funding of £5 billion would need to be allocated, raising the total budget to £14 billion.

In addition to the reach/cost considerations, the retrofitting activity would need to be conducted over the 6-year period (2025-2030), meaning that some households will need to 'wait for their turn' to receive support in addressing current fuel poverty challenges. That is, unless all the retrofitting activity can be condensed in a single year (an unlikely scenario).

Moreover, directing this level of activity in particular parts of the economy – most likely the construction industry in the case of loft and cavity wall insulation - could drive further upward pressures to investment costs (given the construction sector's role in delivery of much investment activity) as well the prices of goods and services (particularly where supply constraints exist in the labour market). This will exacerbate challenges with the cost-of-living and -doing-business in the UK.

Furthermore, just like the consumer spending boost triggered by providing DBS to help mitigate budget pressures for those households living in fuel poverty, any wider economic stimulus associated with delivery of retrofitting activity will be transitory in nature. However, where the latter results in energy efficiency gains, the resulting real income uplift and ability to reallocate spending among beneficiary households will open a route to delivering longer-lasting net positive impacts at household and economy-wide levels.

In this paper, we run economy-wide scenario simulations of the intervention options outlined above and compare the differential implications for households and the wider UK economy.

In doing so, we aim to understand how the real income and spending of different household groups, and activity across different sectors of the economy is affected, and how this impacts across the economy through triggering different expansionary (and/or contractionary) drivers. We focus on key economic indicators such as the UK's Gross

Domestic Product (GDP, or Gross Value Added, GVA), employment (measured in full-time equivalents, FTE) and the consumer price index (CPI).

Crucially, we explore how the expected outcomes may change depending on the labour market conditions in the UK, including the availability of sufficient and sufficiently qualified workers, and the ability of producers in the UK economy to foresee the changes that will emerge when the national government acts to alleviate fuel poverty.

2. Our economy-wide computable general equilibrium modelling approach

In this work, we use the UKENVI multi-sector computable general equilibrium, CGE, model of the UK economy as a scenario simulation framework to capture interactions between all the UK production sectors and types of final consumers in investigating economy-wide impacts.

We have previously used UKENVI in collaborative work with (then) Department for Business, Energy & Industrial Strategy (BEIS) officials to consider the Energy Company Obligation (ECO) and other funding approaches for energy efficiency (where outcomes were reported in a 2020 Centre for Energy Policy (CEP) policy brief[4]) and to consider the role of longer-term energy efficiency programmes (with outcomes reported in a 2021 CEP report[5]). Peer reviewed journal papers[6] provide additional detail on the UKENVI framework as developed for these applications and the one presented here. These include details on the dynamics of all production and consumption behaviour and on key model closures and markets, including our treatment of the UK's supply constrained labour market. However, one key distinction in the variant of UKENVI used here is a more detailed breakdown of the two lowest income household quintiles, to identify and target households living in fuel poverty (see next section).

UKENVI is currently calibrated on a 2018 social accounting matrix (SAM) incorporating the analytical industry-by-industry input-output (IO) table published in 2022 by the Office for National Statistics (ONS)[7]. We assume that the structure of the UK economy is unchanged between 2018 and 2025 (the first year of all actions simulated). However, we report results in 2023 prices due to this being the most recent year GDP deflators are reported by ONS, where we deflate all scenario input values to 2018 prices to run simulations before inflating results back to 2023 prices.

The government actions involved - providing direct bill support to or funding retrofits for households living in fuel poverty - are introduced to UKENVI as transitory changes in government spending between 2025 and 2030. Increased energy efficiency is a consequence of the latter, involving a boost to technological progress in how

households living in fuel poverty use energy (gas and electricity) from the point at which they receive retrofits. However, the key driver of results to 2030 (end of the intervention period) is how government spending is directed. Specifically, this means (1) effectively supporting consumer spending of households living in fuel poverty with DBS (with two approaches considered – a simple income transfer or government effectively paying part of the electricity bill) or (2) providing new demand for the UK 'Construction' sector by paying for retrofit (cavity wall and loft insulation) projects. More detail on how we simulate these interventions is provided in the next section, where we set out our simulation strategy.

3. Scenario simulation strategy

As set out above, we consider two broad forms of government support to households living in fuel poverty households. The first is direct bill support (DBS) of £417 per household living in fuel poverty (sufficient to close the fuel poverty gap as reported by DESNZ for 20238), either in the form of income transfers or as electricity bill reductions. The support lasts for 6 years, between 2025 and 2030, meaning that each household receives £2,502 in total. The government spending is distributed as follows:

- 2.48 million households in the lowest income quintile (FP1) receive a total of £6.2 billion.
- 1.13 million households in the second lowest income quintile (FP2) receive a total of £2.8 billion.
- DBS reaches 3.61 million households and requires £9 billion spending by the UK Government[9]
- Beyond 2030 there are no further support provided.

The second form of potential government support is the retrofitting of the properties of households living in fuel poverty to improve their energy efficiency (EE). In consultation with DESNZ officials, we limit focus here to on cavity wall and loft insulations, which jointly improve the efficiency of a property by approximately 10%; i.e., residents of retrofitted properties need to spend 10% less on energy to achieve the same level of heat comfort and to run the appliances within their property.[10] Each retrofitting project costs £3,913 and is paid for by the government. We assume the retrofitting projects are delivered by the UK 'Construction' sector and the activity is evenly spread over the 6-year period (2025-2030); 1/6 conducted in 2025, 1/6 in 2026 and so on. We simultaneously consider the effects of the retrofitting activity and the impacts of improved efficiency in households. We initially focus on a case where the government budget for retrofitting projects matches the budget for DBS. Therefore:

- 1.59 million FP1 households and 0.72 million FP2 households receive EE support – this is 64% of the total size of the FP1 and FP2 groups.
- Both FP1 and FP2 groups become on average 6.39% more energy efficiency because of the retrofitting activity.
- If all the FP1 and FP2 households are to be supported, the budget would need to increase to £14 billion.
- Once the retrofitting activity ends in 2030, we assume the full efficiency gains are achieved and remain in place to into the long run (the terminal point of our simulations).

We analyse these scenarios through dynamic simulations in the UKENVI CGE model. In our central model setup, we assume that the UK workers have the power to bargain over their real wage, with their bargaining power increasing as unemployment falls and vice versa. We also assume that producers make their investment decisions on a year-by-year basis, while the same principle applies for the consumption decisions of consumers. However, we do consider alternative assumptions for both wages and investment decisions. We explore how a fixed real wage setup can affect the expected outcomes. We also investigate what would be the implications if producers have perfect foresight and optimise their investment decisions to maximise the value of firm activities.

4. The implications of government offering direct bill support (DBS)

Regardless of exactly how a direct bill support (DBS) scheme is implemented, the basic underlying principles are the same. The government facilitates households to better meet their needs, either but boosting their income or by relieving them from the cost of some services, here electricity. This process either increases or frees-up part of households' disposable income and, by extension, increases household consumption.

As a result of increased household consumption, and if we abstract from considering how the funds for DBS will be raised, the economy receives a consumer spending stimulus and expands (see the orange and grey trajectories in Figure 4) and there are positive outcomes in a number of areas such employment (orange and grey trajectories in Figure 5).

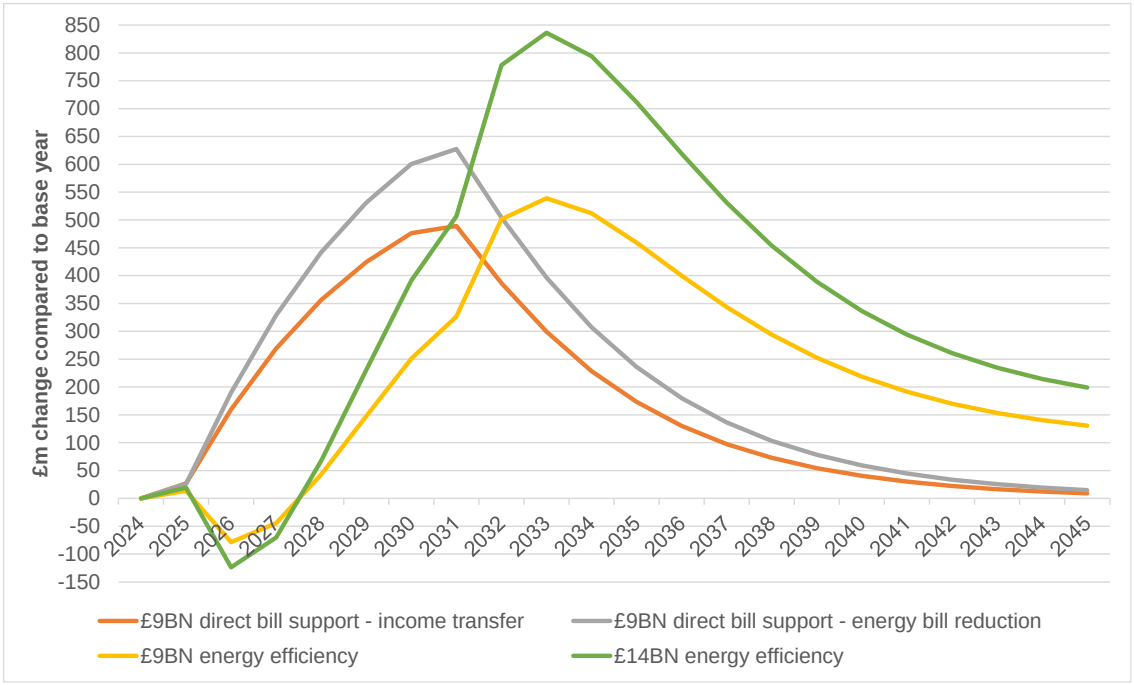

Figure 4: Changes to UK GDP due to different fuel poverty support measures

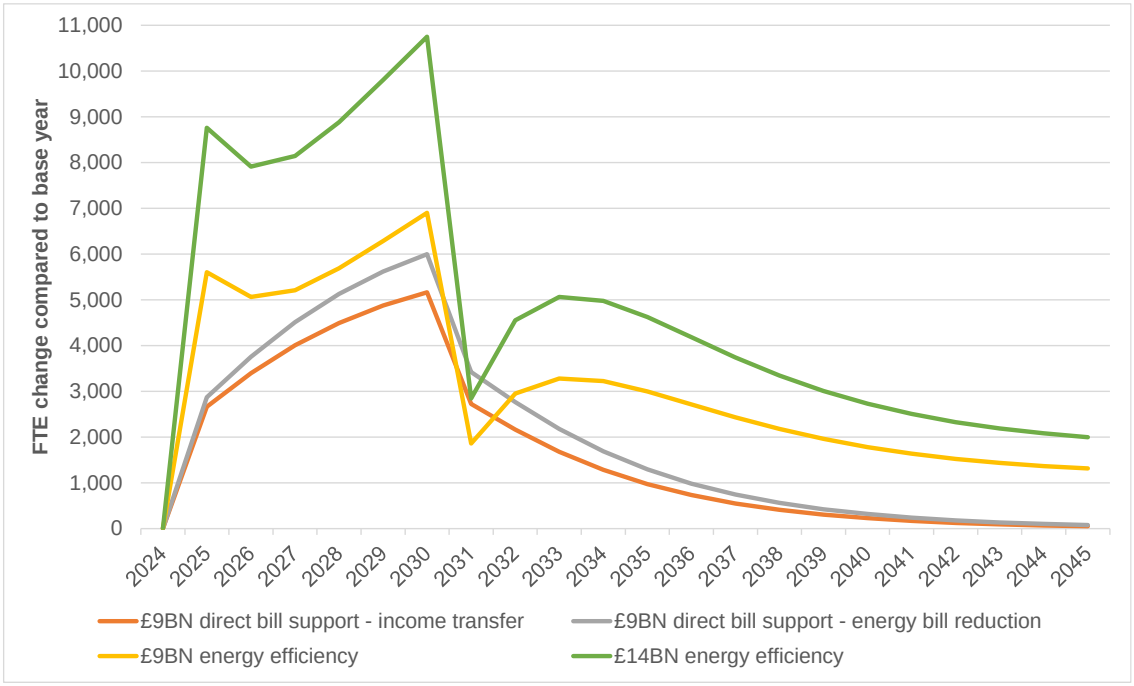

Figure 5: Changes to UK employment due to different fuel poverty support measures

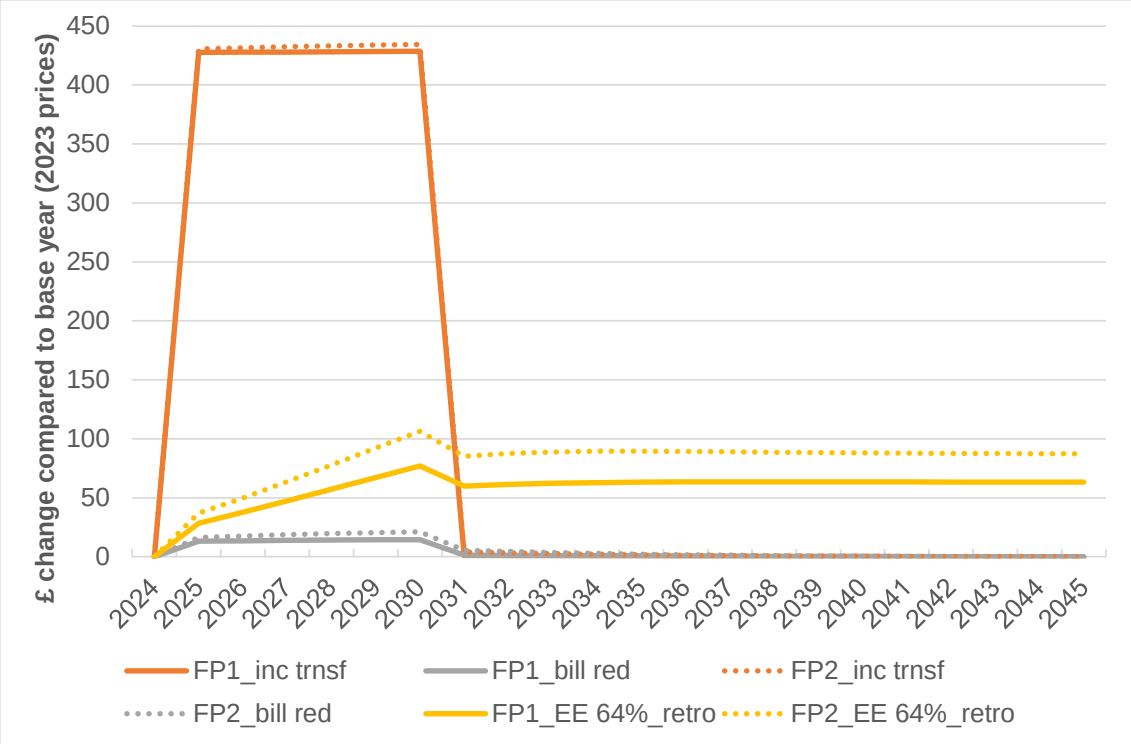

Figure 6: Evolution of FP1 & FP2 average real disposable income (£/household) due to various support measures to households living in fuel poverty

4.1 DBS as an income transfer

Offering the DBS as an income transfer is perhaps one of the more straightforward ways in which the government could support households living in fuel poverty. It does not directly affect beneficiary households' energy bills. Rather, the introduction of an additional income source allows the households to adjust their spending in line with their needs and preferences. Indeed, looking at Figure 6, the income transfer via the DBS clearly makes a significant difference to the beneficiary households' real disposable income.

The implication of this additional income, as shown in Figure 7, is that the households living in fuel poverty can purchase more goods and services and better meet their needs. The additional annual demand of those households receiving DBS is over £1,550 million across the entire duration of the DBS and is spread across most of the UK production sectors. This means that households receiving the income transfer do get to spend some of the additional income on relatively expensive electricity and gas, but this amounts to around £65 million per year across the DBS period. Overall, the total household consumption increases by over £2,100 million per year, driving an overall expansion of the UK economy, reflected in the GDP and employment gains shown in Figure 4 and Figure 5.

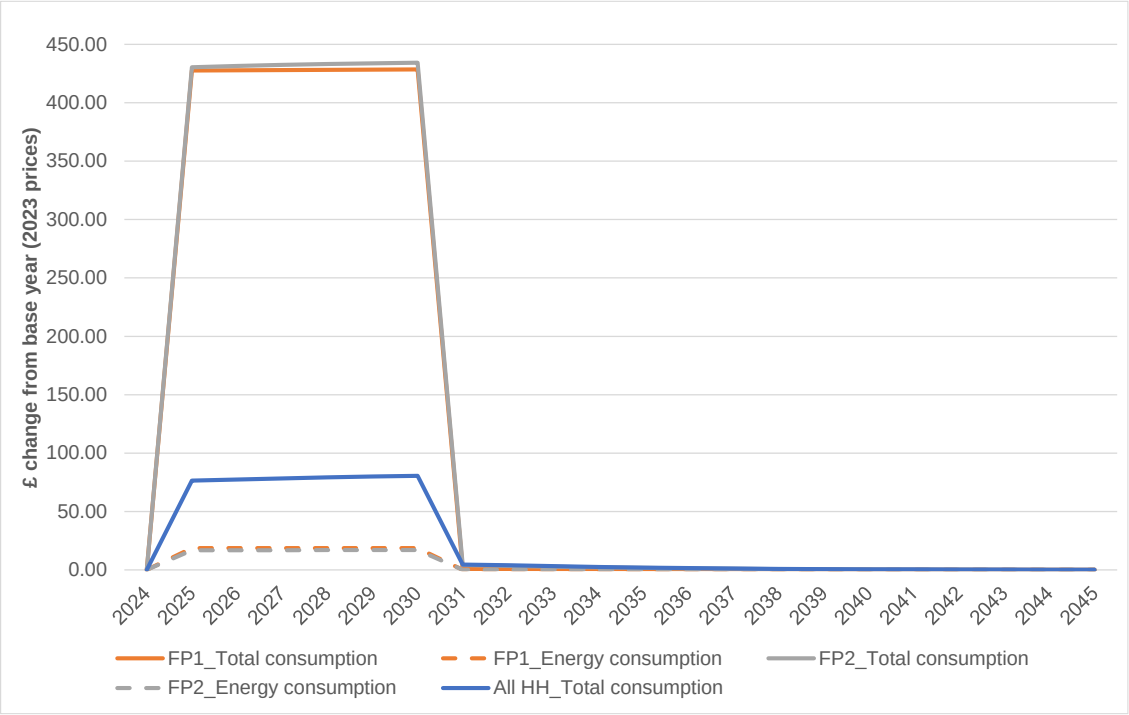

Figure 7: Changes in household consumption (£/household) due to DBS income transfer

However, as Figure 6 indicates, the households living in fuel poverty receiving the DBS income transfer do not experience any significant real income gains from the wider expansion of the UK economy. Rather, the real income boosts to these households are mainly driven by the £417 income transfer via the DBS.

In fact, higher income households benefit more from the wider economic activity. Still, the combined effect of the DBS income transfer and the limited gains feeding back to households living in fuel poverty from the wider economic expansion means that the FP1 and FP2 households can increase their consumption by more, compared to the average consumption gains across all UK households (see Figure 7).

4.2 DBS as an electricity bill reduction

It is evident from the points made above that offering DBS as an income transfer is a generic measure that does not specifically target the cost of energy for beneficiaries. In fact, it may ultimately lead households living in fuel poverty to spend some of the transferred income on more residential energy (which may, of course, be desirable, e.g., where the homes of those living in fuel poverty are currently underheated).

An alternative approach, and the one that is currently utilised via the Warmer Homes Discount, is to make direct reductions on electricity bills. The specific focus on electricity is important, as not all households will have access to natural gas for heating

and cooking purposes. Effectively via this approach, the households can continue purchasing the same levels of electricity, but now the government is paying some of the electricity bill. This frees-up some of the DBS recipients' disposable income to use on other (non-energy) goods and services.

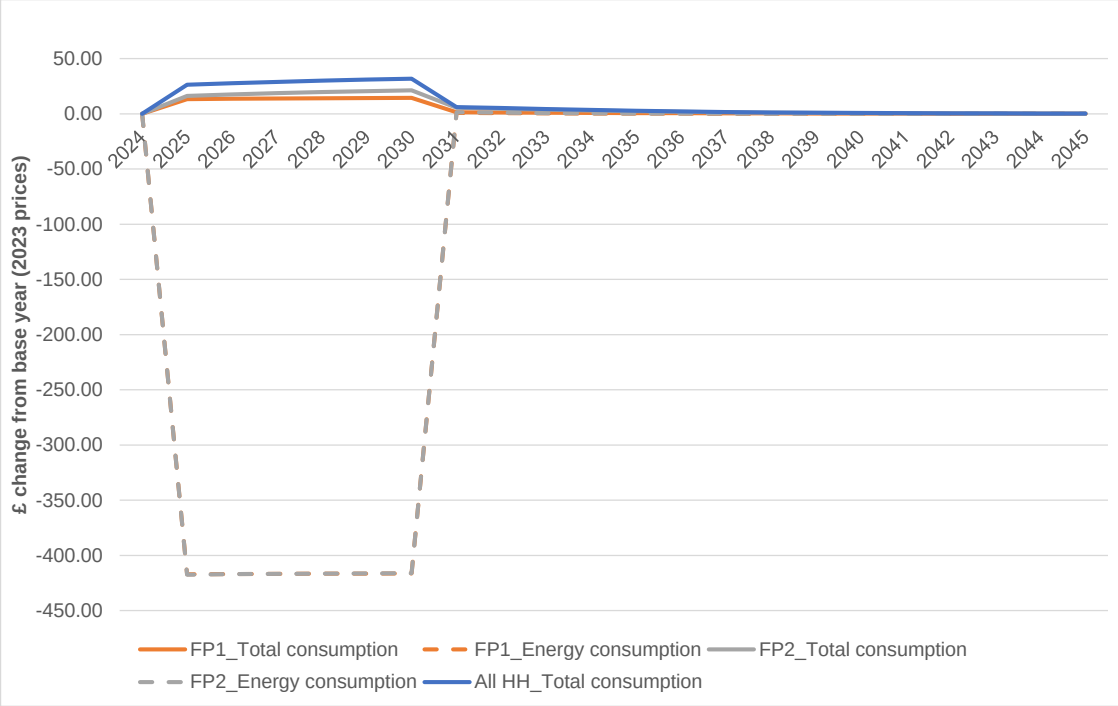

Figure 8: Changes in household consumption (£/household) due to DBS bill reduction

If DBS takes the form of an energy bill reduction, the real disposable income change is not a particularly useful indicator of impacts. Despite some of the households' disposable income being freed-up, the factors that make up the disposable income are not affected by the DBS itself; there is no additional income offered to the beneficiaries, nor is there any impact on the efficiency with which energy is used by households.

Therefore, the only income benefits emerging for the recipients of DBS, are due to the wider economic gains driven by the DBS (see Figure 6). In a similar way, the provision of DBS does not affect the total value of the consumption for the beneficiaries (see Figure 8).

What the energy bill approach does do is significantly redistribute the consumption of households living in fuel poverty away from energy sectors, in this case specifically electricity, and towards other, more labour and generally value-added intensive sectors.

It is this shift, and the fact that the demand for electricity is not falling, but with government taking over some of the paying of part of the bills of households living in

fuel poverty, that drives the overall economy wide gains demonstrated in Figure 4. The outcome is that the implementation of DBS as an electricity bill reduction (grey-coloured trajectories in Figure 4 and Figure 5) leads to slightly better economy-wide outcomes (as represented by GDP and employment uplifts) compared to delivering DBS as an income transfer (orange trajectories in Figure 4 and Figure 5).

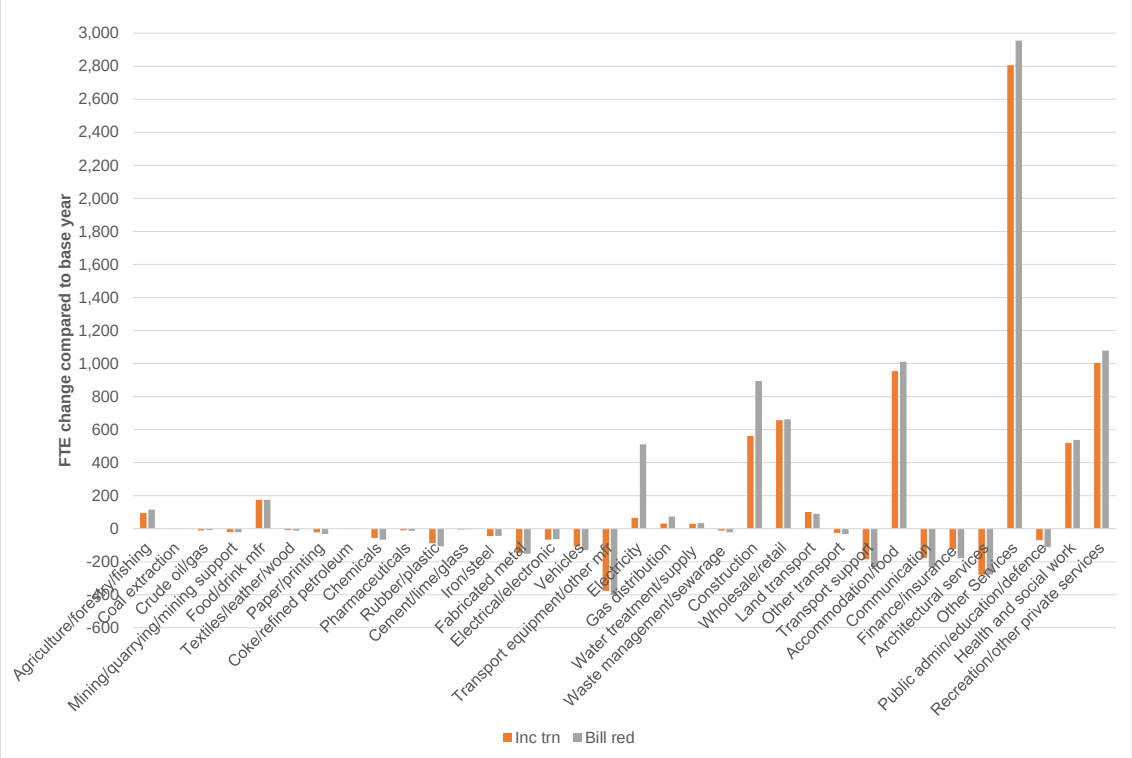

Figure 9: Sectoral employment changes due to DBS

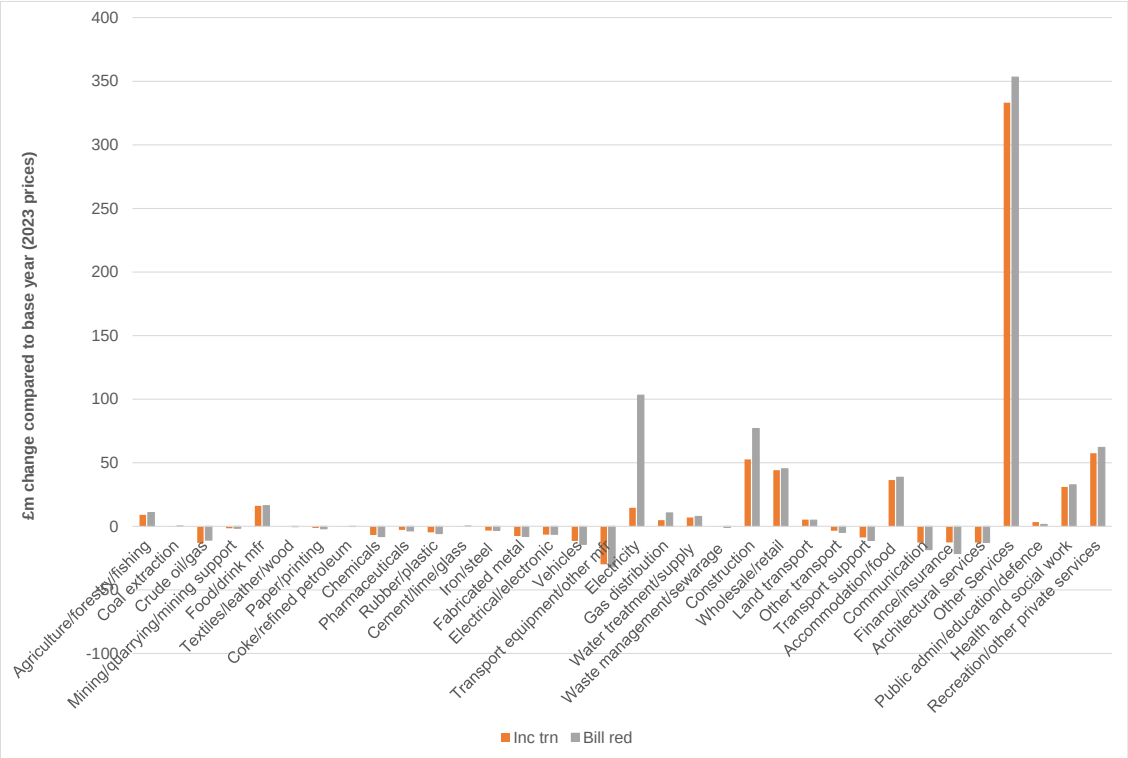

Figure 10: Sectoral gross value-added changes due to DBS

Figure 9 and Figure 10 provide a breakdown of how the employment and the value-added impacts are spread across different sectors of the economy. It is clear under both DBS approaches that reallocating the consumption of households living in fuel poverty to the tertiary sectors, where the bulk of non-energy spending occurs, is the driver of wider economic gains. Both Figure 9 and Figure 10 also demonstrate how the shift in the consumption pattern of the DBS recipients helps deliver additional GVA and employment gains.

Note that the most significant difference in terms of the overall economy-wide outcomes of the alternative DBS approaches is what happens to the electricity sector. This is due to several things happening when the bill reduction approach is used. First, the larger economic expansion means that there is a greater demand for electricity from other sectors to support their production. Second, the electricity sector itself heavily relies on self-purchases[11], which further increases the demand for output from the electricity sector. Third, the greater economic expansion means that households, including the DBS beneficiaries, can purchase more electricity compared to the income transfer case. The combined effect of all the aforementioned factors is what drives the differences observed in Figure 9 and Figure 10.

4.3 How DBS affects economy-wide prices

We have established in the previous sections that the economic expansion triggered by DBS (see Figure 4) is entirely demand-driven, triggering supply-side responses in the presence of constraints. Further demand responses are in turn triggered through a range of income and price effects, particularly in terms of responses in those sectors where most of the additional demand is directed, which tend to be consumer-facing and relatively labour-intensive sectors. Crucially, Figure 11 shows that the demand fuelled by the DBS can trigger economy-wide price pressures, reflected in the CPI increase of 0.11% under the bill reduction approach. The difference in CPI pressures between the two DBS approaches can be expected, given the difference in economic expansion driven by each of the approaches. As the economy adjusts to the (fairly stable) additional household demand, the price impacts are gradually reduced, reflected in the gradual reduction of the CPI pressures.

What is also demonstrated in Figure 11 and Figure 12 is that labour costs have a limited role to play in relation to the economy-wide pressures, at least in the early years of DBS. Comparing the grey and orange trend lines for these cases between Figure 11 and Figure 12 under, respectively, our core assumption of a bargained real wage and the sensitivity scenario changing only this assumption to one of a fixed real wage, it can be seen that, for example, in 2025 (year 1) the CPI difference between the two wage setting assumptions is less than 0.01%. In subsequent years, the difference in CPI pressures expands to over 0.02%, indicating a shift in the forces that drive the price pressures. In the early years, it is the demand for goods and services that leads to the observed price pressures and over time the price impacts are fuelled cumulatively by demand and wage costs.

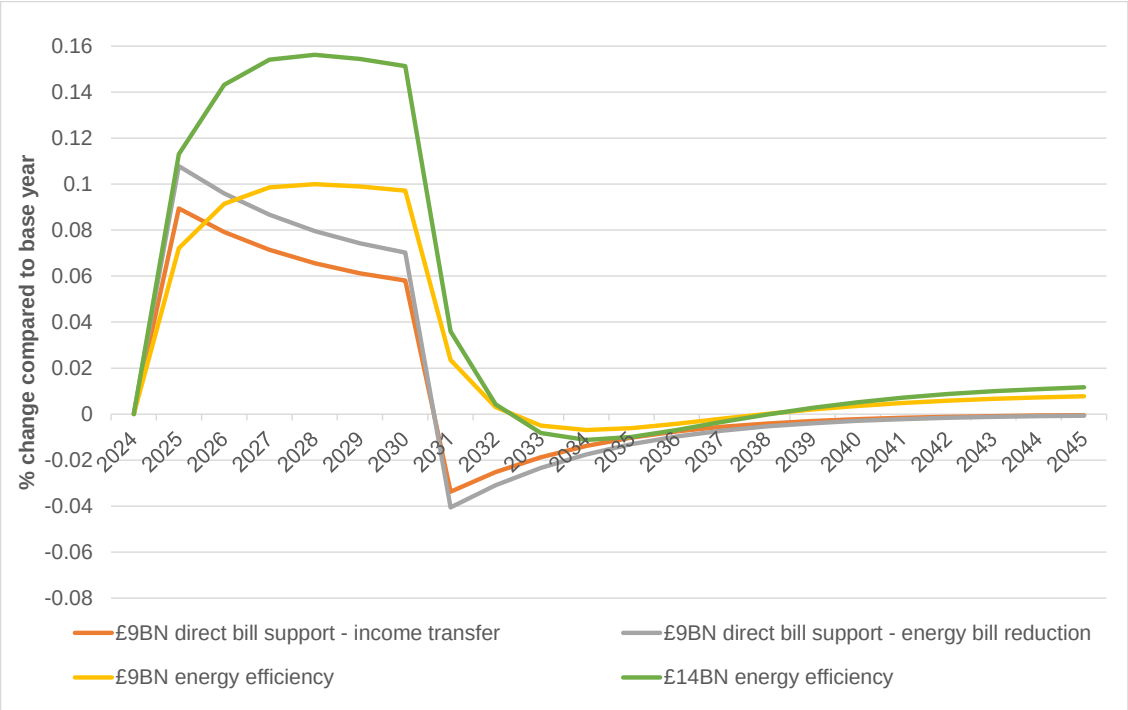

Figure 11: Changes in UK CPI due to government fuel poverty support measures (bargained real wage)

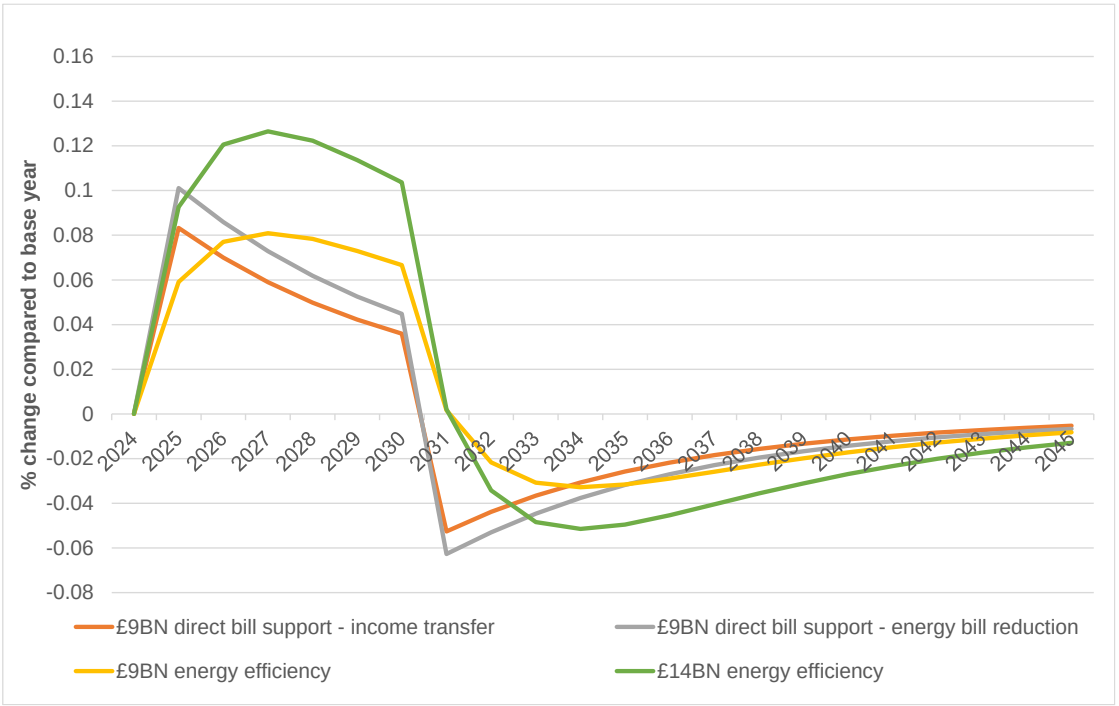

Figure 12: Changes in UK CPI due to government fuel poverty support measures (fixed real wage)

Understanding the potential price pressures of DBS is important in anticipating the wider economic implications of such an intervention, particularly given the persisting labour supply constraints that characterise the UK economy. Figure 6 clearly shows that the price pressures are not sufficient to completely offset the net real household spending gains of the DBS beneficiaries (see Figure 7 and Figure 8). However, those

households not living in fuel poverty only receive real income and spending gains through the wider economic expansion, mainly in the form of additional employment opportunities. While the aggregation of other groups in Figure 7 and Figure 8 reports net gains for those households not living in fuel poverty, these are not uniform across all households and some may not enjoy any net increase at all, while all households face increased prices of goods and services.

Underlying this latter finding lies the result that the provision of DBS triggers different price impacts across UK production sectors. This is demonstrated in Figure 13 and Figure 14, where we can see that there are differences in price pressures both across the sectors and across the years. Focusing on the bars for the DBS (grey bars), we see in Figure 13 that in the first year of DBS, 2025, the sectors where households tend to spend more of their income, such as 'Recreation/other private services', 'Other services' and 'Accommodation/food', experience higher price increases compared to 'Chemicals' or 'Iron/steel'. The price pressures are eased as we move towards the end of the DBS period, 2030, but some of the price differences remain (see Figure 14), highlighting the role of household consumption in driving prices upwards.

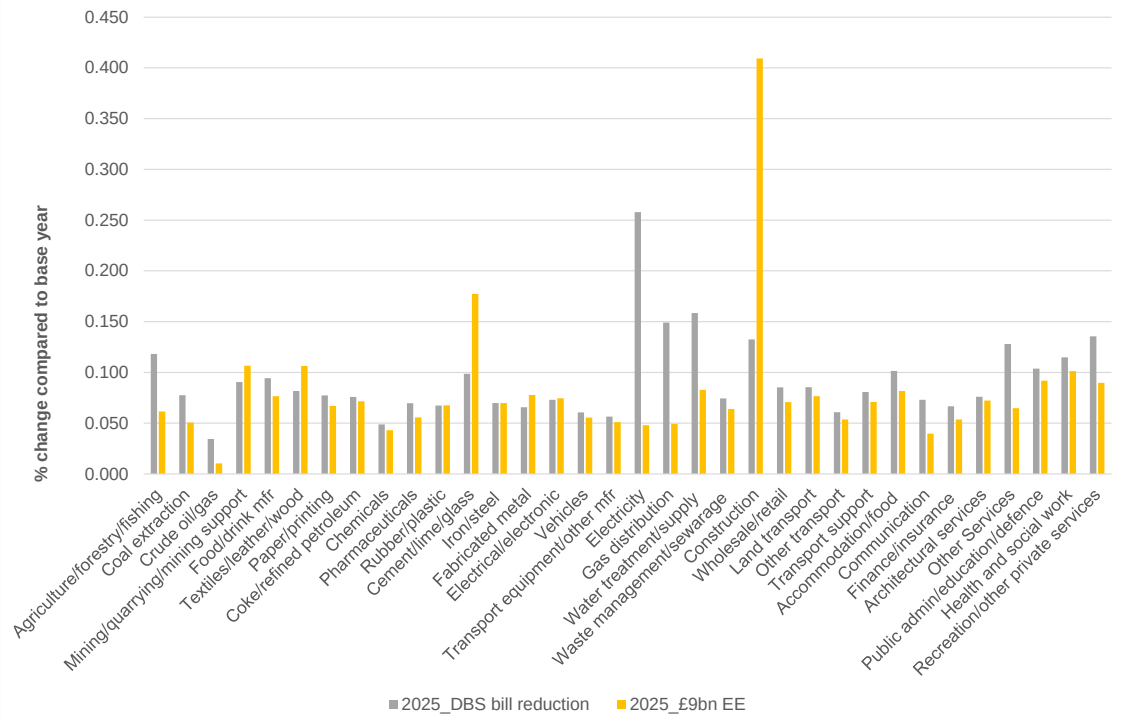

Figure 13: Output price changes in 2025 due to government fuel poverty support measures

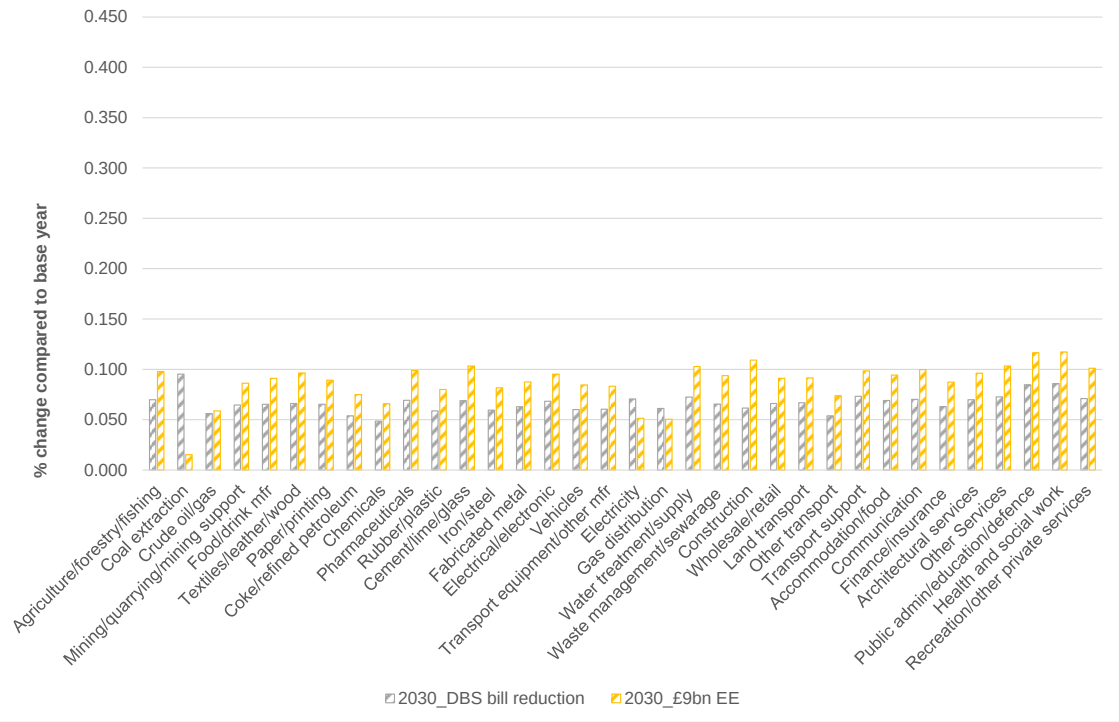

Figure 14: Output price changes in 2030 due to government fuel poverty support measures

5. How could the economy be affected if energy efficiency (EE) improvements were supported?

The key challenge regarding DBS is that once the support from the government ends, the benefits to the beneficiary households are significantly eroded and the same applies for the economy-wide gains (see the grey and orange trend lines in Figure 4 and Figure 6). A further limitation of DBS is that it does not reduce, and in fact is likely to deliver a net increase in household and overall demand for electricity, which has implications for areas of policy interest such as energy security.

One alternative is to support the improvement of energy efficiency (EE) of properties where households living in fuel poverty reside. A key benefit of EE actions is that benefits extend well beyond the timeframe of DBS. This is because households in fuel poverty can achieve effectively permanent reductions in physical energy requirements which enables sustained reductions energy bills without further funding requirements on government.[12] Crucially, because of the reduced household demand for electricity and gas the price of these energy goods is kept relatively unchanged, apart from any impacts of production costs (here linked to wage pressure in the UK labour market). Given that electricity and gas are inputs to most production sectors, this helps constrain lasting price pressure across the UK economy (see Figure 11) and allows a greater economic expansion compared to what would be enabled by the energy bill savings in isolation. The result of this broader process is that, in terms of the beneficiary

households' real income gains, EE enables outcomes that are somewhat in-between what the two DBS approaches enable, but longer lasting. Thus, beneficiary households living in fuel poverty can achieve an increase in value of their total consumption, while also reducing how much they spend on electricity and gas (see Figure 15).

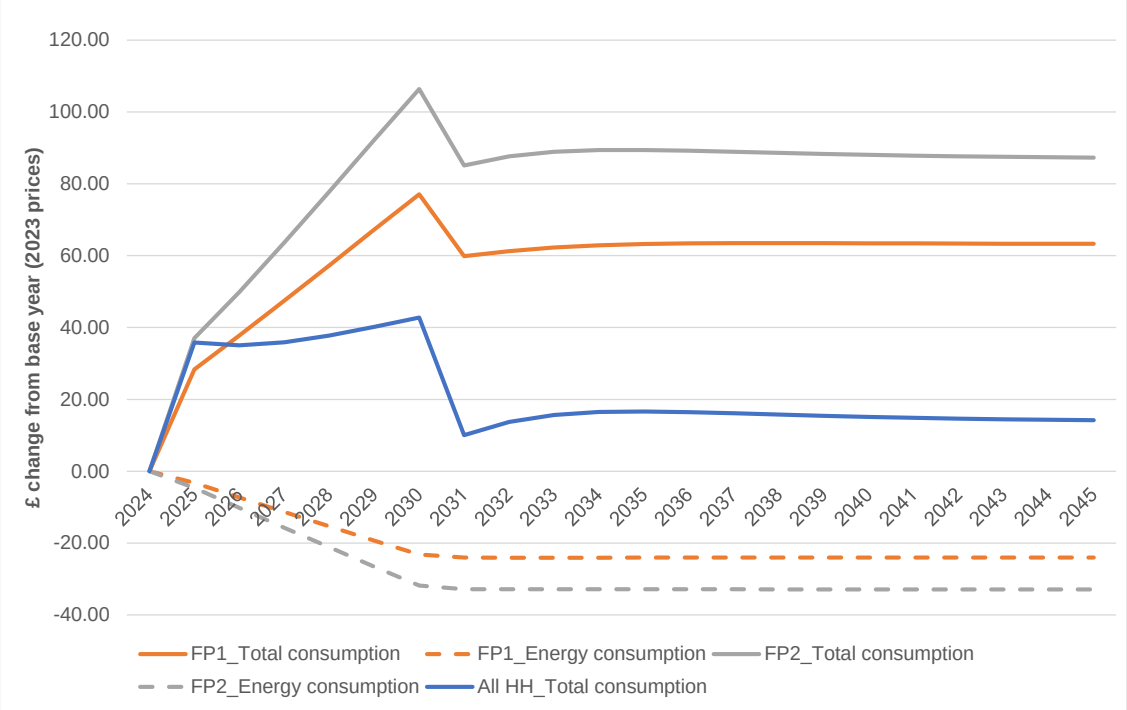

Figure 15: Changes to household consumption due to improved energy efficiency in 64% of FP households

On the other hand, cost and price pressures are a challenge during the retrofitting phase. One fundamental issue (before we turn back to those pressures triggered when the economy responds to retrofitting activity, is that retrofitting a property, even via basic cavity wall and loft insulations, is costly. In the case considered here, we estimate that 56% more funds need to be allocated per household to retrofit their property, compared to the corresponding amount allocated via DBS. Thus, it is to be expected that a fixed budget of £9 billion is only sufficient for 64% of the households identified as being in fuel poverty. This is an important limitation of the EE programmes, which may leave many households identified as needing help with their energy bills unsupported. For all households in fuel poverty to receive retrofitting support, a larger budget of £14 billion would be necessary. The additional budget will need to be sourced and, although we do not consider here how the government raises the funds for DBS and EE, whichever approach the government used to increase the available budget will have implications for the wider economy.

In either case, it is crucial to note that here we assume that all the funding available will be used to retrofit properties. In practice, it is challenging to match households with the

appropriate funding. Moreover, public funding of EE is generally susceptible to the risk that some specific projects may cost more than the market price of the retrofit. Such collateral spending, often referred to as economic rent, has the potential to reduce the amount of the total budget available to direct to retrofitting activity and, by extension, limit the number of beneficiary households. As a result of rent, the potential economy-wide gains are also eroded. In relevant CEP work focusing on the Energy Company Obligation (ECO)[13], we have found that a rent of approximately 37% can almost halve the expected economy-wide gains.

Finally, but by no means of lesser importance, the yellow trend lines in Figure 6 show that the beneficiary households' income gains build over time with EE. This is to be expected as a limited number of properties can be retrofitted in any given year. The implication here is that all but the first 1/6 of households living in fuel poverty who receive retrofits in the first year (2025) will have to 'wait for their' turn for between 1 and 5 years to receive the necessary support, which is problematic in terms of the needs of and consequences for those who have to wait.

5.1 What are the economy-wide implications of the retrofitting activity?

Besides the sustained impacts driven by the efficiency gains, the delivery of EE programmes also impacts the wider economy on a transitory basis through the necessary retrofitting activity. However, the driver is quite different to that observed in the case of DBS, where the trigger for expansion is shifts in the real consumer spending of households living in fuel poverty. If government instead spends on retrofitting for those households, public spending is instead directed to activity on the production side of the economy. Moreover, where focus is on cavity wall and loft insulations, as in the cases considered here, direct public spending will be directed to the UK 'Construction' sector. This destination of spending is likely to have quite specific impacts, given that the construction industry is a largely domestic-facing sector that plays a key role in servicing the investment demands of virtually every other sector in the economy. Thus, any pressure on the price of its output due to increased demand (here by government) will have pervasive impacts on investment costs and decisions across the economy.

The yellow trend line in Figure 5 shows that the retrofitting activity, complemented by the increasing efficiency of retrofitted properties, can ultimately deliver transitory GDP gains of comparable scale to the income transfer DBS; even if only 64% of the households in fuel poverty receive support. For GDP gains comparable to bill reduction DBS, it is essential to increase the available funding to, therefore, expand the reach of the EE programmes (as reflected in the green trend line in Figure 5). On the other

hand, comparing across DBS and EE cases in Figure 3 shows that the latter drives greater employment gains, with these dominated by construction industry jobs, due to the labour intensity of the activity involved.

However, greater labour demand in the context of persisting labour supply constraints puts more upward pressure on UK wage rates and, thus, the prices of all goods and services, as reflected in the yellow and green trend lines in Figure 11 and Figure 12. The fact that the EE-driven CPI pressures are mostly linked to the increased labour cost is highlighted by the difference between the two EE programmes reported in Figure 11 and Figure 12. The £14 billion programme (green trend line) involves greater retrofitting activity, and thus greater labour demand, compared to the £9 billion programme (yellow trend line), leading to an uplift of almost 60% in CPI pressure. Moreover, a comparison between the EE trend lines in Figure 11 and Figure 12 is indicative of the role of wages in determining the economy-wide price pressures.

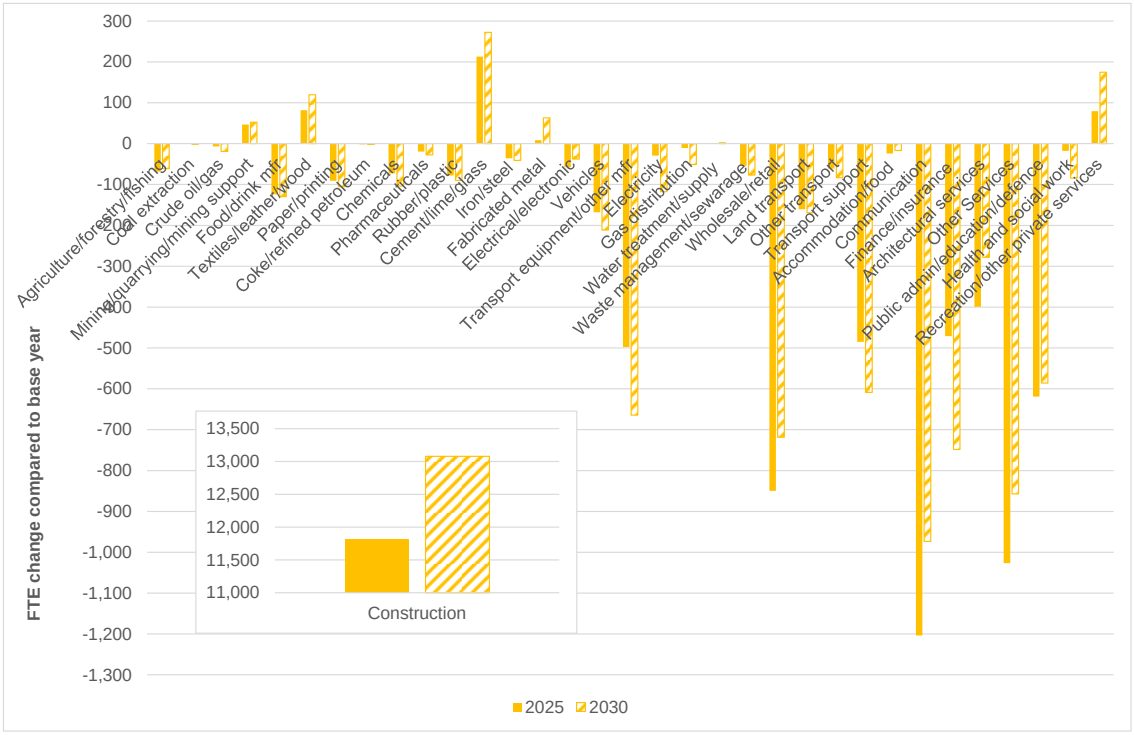

Figure 16: Sectoral employment impacts due to EE support for 64% of households in fuel poverty

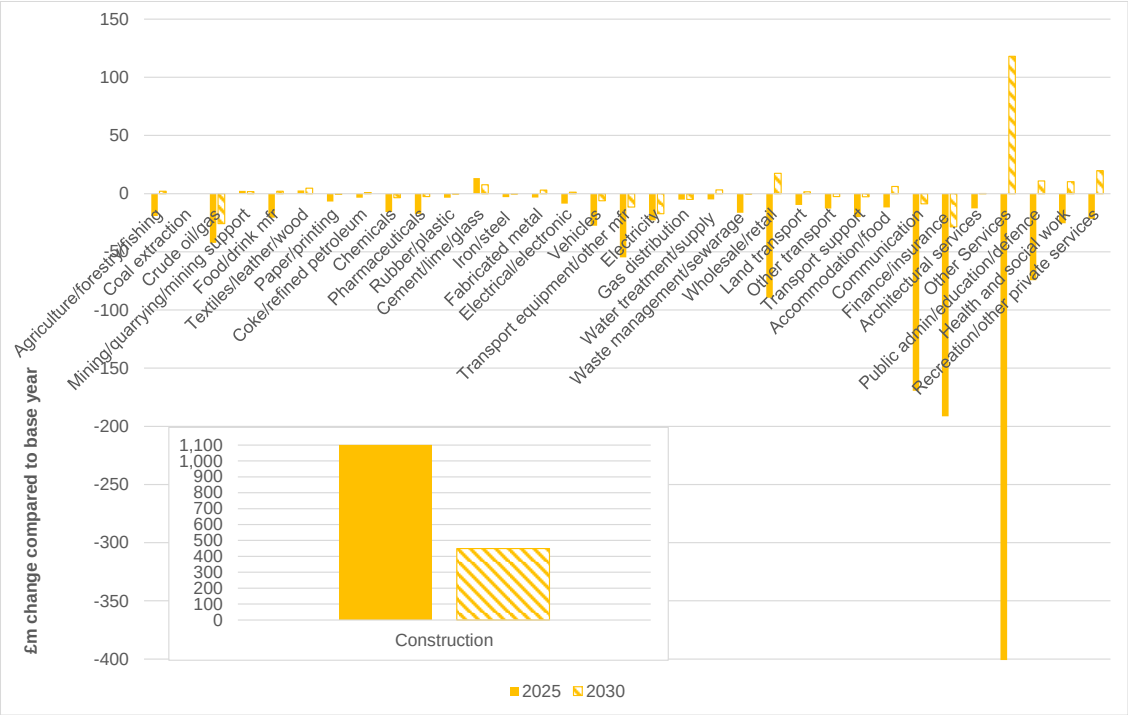

Figure 17: Sectoral investment changes due to EE support for 64% of households in fuel poverty

The increased labour cost and the associated price pressures have some very tangible implications for the wider UK economy. As shown in Figure 16, despite the significant employment gains in the 'Construction' sector and its supply chain, such as 'Cement/lime/glass', many other sectors are negatively affected. That is, there widespread displacement, or crowding out of employment, fuelled by the increased labour cost. The biggest impacts are observed in labour- and/or wage-intensive sectors, where labour cost driven price increases reduce competitiveness in domestic and international markets.

Furthermore, as noted above, the fact that all the retrofitting activity is directed to the Construction industry pushes the cost of construction services upwards. This is clearly shown in Figure 13 and Figure 14, where the price pressures in 'Construction' are consistently amongst the largest in the economy, and in the early stages of the retrofitting the price increase in construction services greatly exceeds any other price pressure (see Figure 13). The implication here is that this makes investment more expensive, which in turn makes it more expensive for industries to maintain their current capital[14]; 'Construction' has a key role in introducing new and maintaining existing capital for many purposes across teh economy. This drives investment down for most of the UK sectors (see Figure 17). Furthermore, for any (and all) production sector(s) to cover this cost increase in maintaining their production capacity, it will be necessary to increase its output price, thereby compounding the direct pressure of increased labour costs. The outcome here is the picture presented in the yellow and green trend lines in Figure 11. This is what underlies the different dynamic picture

relative to what is observed for DBS in Figure 4. In fact, in the early stages of the retrofitting activity, where among other things there are limited energy efficiency associated gains, the price pressures to the UK economy under EE lead to temporary GDP losses. This is not the case under DBS.

There are some qualifications to make around all the results for our two EE cases in particular that are particularly relevant in considering the latter point. Our default assumption in all the scenario simulations conducted so far is that the UK sectors make their investment decisions on a year-by-year basis, trying to cover the difference between their production capacity and the demand for their output. This can be referred to as myopic behaviour.[15] However, in practice the producing sectors in the UK economy will have some level of foresight, and, therefore, develop investment plans over a number of years.

Here, if we rerun our simulations under an (albeit extreme) assumption of perfect foresight, all net economic gains reported above for the myopic case are likely to be smaller in the context of the short timeframe of government intervention. However, in the case of DBS, sensitivity analyses show that outcomes are likely to remain positive. On the other hand, the effect of perfect foresight on the transition path of the economy is significantly affected. This is particularly given the impacts on investment decision-making across all sectors of government spending on construction to support the EE interventions considered here,

Figure 18 presents the differences in GDP impacts, when we rerun our simulations assuming UK producers act with perfect foresight rather than behaving myopically as in our central case.[16] The differences in underlying activity are not located in the 'Construction' sector, which is subject to the (exogenously determined) public spending boost that we simulate. Rather, the differences observed reflect the response of the sectors less (or not at all) involved in the retrofitting supply chains to the knowledge that, for a number of years, they will need to endure high investment *and* labour costs, which will, in turn, affect their own prices and demand for their output.

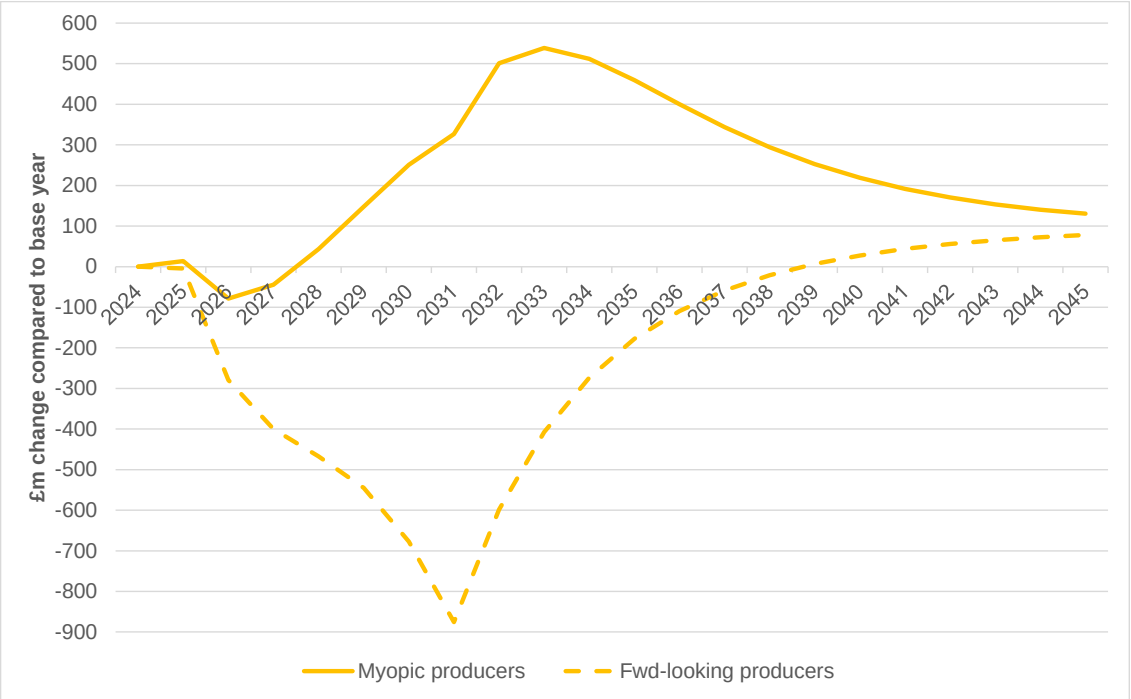

Figure 18: UK GDP impacts of EE support for 64% of households living in fuel poverty under different foresight

6. Limitations and further analysis required

In this work, we consider two broad ways in which the government could support households in fuel poverty, with a further distinction in how direct bill support may be provided. We consider each approach in isolation (and in the extreme, rather than considering a mixed approach) so that we can isolate and understand the impacts of one approach at a time. This facilitates the comparison between different types of intervention, while also allowing us to highlight the strengths and weaknesses of each.

However, in practice a mix of support measures is likely to be necessary; some households may be in need for immediate aid with their energy bills while their property is retrofitted, while others may be in a slightly less challenging position and therefore able to 'wait their turn'. The exact mix and timing of support could have its own implications so once more detailed information are released it will be important to conduct appropriate analyses.

A further limitation of our approach is that our model currently assumes perfect mobility of workers between sectors and that the wage responses are affecting all workers regardless of their skills. Our assumptions in this regard are due to a paucity of appropriate data on the skills mix and underlying sectoral and occupational labour markets to inform the economy-wide model.

Additionally, in relation to the outcomes of EE, our assumption that all retrofitting is delivered by the UK 'Construction' sector, with indirect contributions from other sectors only via the construction supply chain. This may be quite an appropriate approximation in considering cavity wall and loft insulation. However, where retrofitting is more involved – e.g. involving inclusion of additional improvement measures such as the replacement of old and malfunctioning heating systems – it would be appropriate to reset our assumptions about how spending is directed.

Moreover, in broadening the cases to ones where more types of households and funding mechanisms are involved, it becomes important to consider the impacts thereof. Here, previous CEP work on energy efficiency[17] clearly shows that 'who pays' the retrofitting can have important implications for the wider economic outcomes. We have also considered the implications of spreading retrofitting projects unequally over different timeframes, which again impacts outcomes.

Finally, as already pointed out, we consider the different scenarios in isolation, not only in terms of which support mechanisms are used in any given point in time but also in isolation from other net zero actions. However, other CEP work, for example on the planned rollout of CCUS in the UK[18], highlights that the deployment of multiple projects over similar timeframes is likely to exacerbate competition for resources and congestion in the labour market. Given the importance of the labour cost pressures described in Figure 12, it is important to consider the rollout of DBS and, particularly, EE alongside net zero and broader infrastructure development projects.

Technical Appendix endnotes

[1] See https://researchbriefings.files.parliament.uk/documents/CBP-8730/CBP-8730.pdf
[2] The definition can be found at: https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/howfuelpovertyismeasuredintheuk/march2023
[3] We calculate the cost per property by taking into consideration the Census 2021 data on the types of residency in England and Wales. We use that alongside the information provided by the Energy Saving Trust on the installation cost of cavity wall insulations and loft insulations. By combining the information of the two datasets we find that the weighted average cavity wall insulation cost is £2,917 and the weighted average cost for lofts is £996. Therefore, for a property that installs both measures, as we assume here, the median cost is £3,913 to achieve energy bill reductions of 10%, as informed by NEED: Summary of Analysis, Great Britain 2023.
[4] See https://doi.org/10.17868/71454
[5] See https://doi.org/10.17868/76997
[6] The 2021 Energy Policy paper can be found at https://doi.org/10.1016/j.enpol.2021.112375 while the 2024 Environmental Governance and Policy paper is available at https://doi.org/10.1002/eet.2124

[7] There is always a lag in the publication of input output tables, be it at national or regional level, due to the data collection and treatment required. Furthermore, the decision to move to a more up-to-date baseline is influenced by the structural changes in the economy between two different time points. In the absence of significant differences then slightly older SAMs can be used.
[8] The DESNZ published 'Annual Fuel Poverty Statistics in England, 2024' use 2023 data to estimate, among other things, the fuel poverty gap in different years up to 2023.
[9] Depending on how the funds are raised there may be implications for the wider economy. Here we abstract from considering how the government funds DBS as we want to focus only on the impacts driven by the DBS.
[10] We note that NEED reports the gas bill reductions but we had to adjust to total energy bill reductions as necessary for our modelling approach. However, the efficiency with which households in our model consume energy includes all types of residential fuels. Hence, the need to convert the information from NEED to a suitable scale for our model. The scale used here has been sense checked through engagement with appropriate stakeholders.
[11] In input output tables, which are also the basis on which our model is built, electricity is aggregated into a larger sector that includes generation, transmission, distribution and trade. Therefore, for example, purchases of wholesale electricity from retail traders are recorded as being self-purchases.
[12] We understand that insulations and other energy efficiency actions in practice have their own lifespan and need to be updated over time. However, this is outwith the scope of this work as the current policy focus is mainly on conducting the essential initial retrofittings.
[13] See our Energy Policy paper at: https://doi.org/10.1016/j.enpol.2021.112375
[14] In a CGE modelling framework, investment includes covering the depreciation of existing capital as well as the introduction of new capital. Every sector needs to pay for investment each year. If this investment only matches the depreciation of a sector's current capital, then the size of the capital does not change. When investment exceeds the depreciation, a sector's capital is increasing, with the opposite being true when investment is less than the depreciation.
[15] The differences between myopic and forward-looking producers are explained in detail in a 2013 Economic Modelling paper by Lecca et al.
[16] This is an extreme case where producers have knowledge of all the demand and price levels across all time periods. The consumers in the model are still considered myopic so they make their decisions on an annual base, depending on their disposable income.
[17] See our Environmental Policy and Governance paper at: https://doi.org/10.1002/eet.2124
[18] The report summarising the insights from our Scotland's Net Zero Infrastructure (SNZI) project can be found at: https://doi.org/10.17868/strath.00088173