Multiplier analysis of re-spending rebound effects

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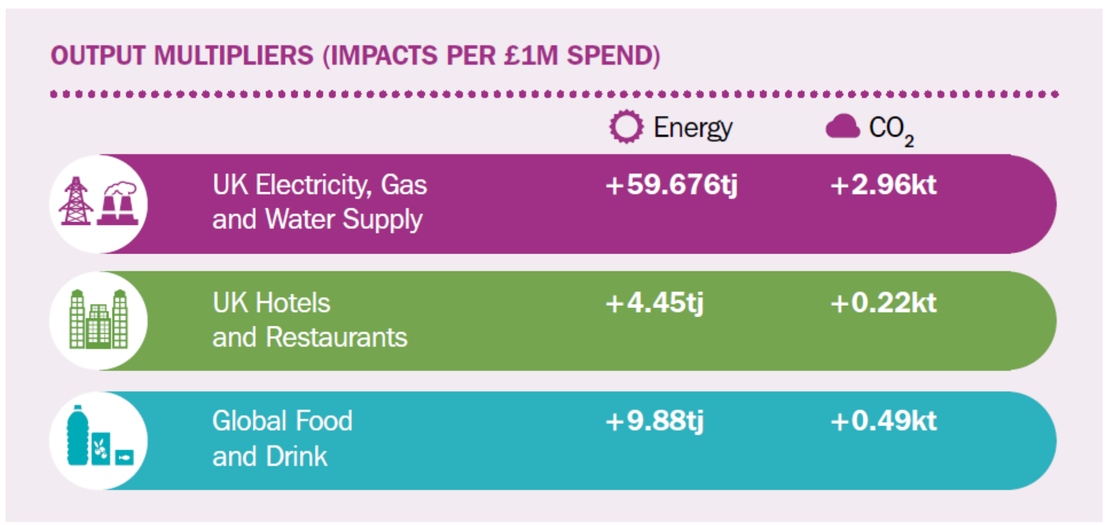
1.Introduction

Rebound effects occur when potential energy savings from an energy efficiency improvement are eroded as a result of a range of economic responses to changes in costs of energy services, incomes and prices throughout the economy. We focus on a particular type of rebound effect, which results from re-spending decisions as households realise savings due to reduced energy requirements.

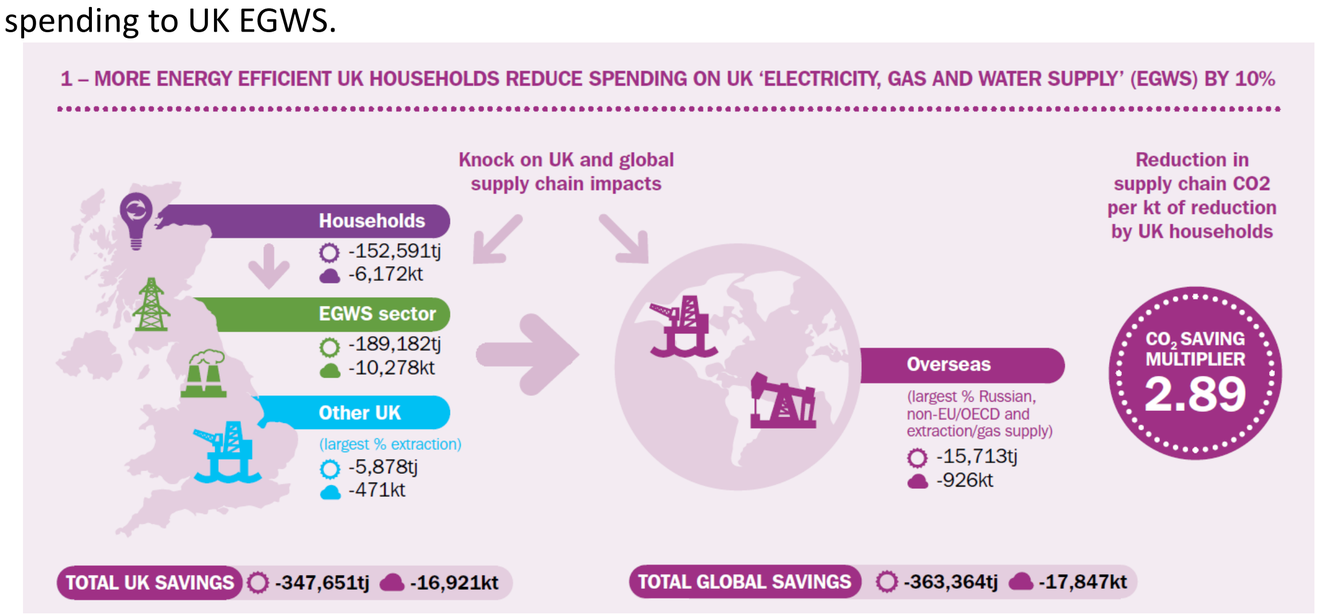
2. Multipliers in our work

By using multiplier analysis we can estimate the impact that changes in final demand have in energy use/CO_2 emissions. The graph shows the increase to energy use and CO_2 emissions in a number of sectors, resulting by an increase of their final demand by £1m.



3. A simple improved efficiency scenario

To explore how multipliers could be used to identify the impact throughout the economy as a result of improved energy efficiency, we use a simple illustrative scenario. We assume that improved energy efficiency in UK households leads to a 10% reduction in spending to UK EGWS.



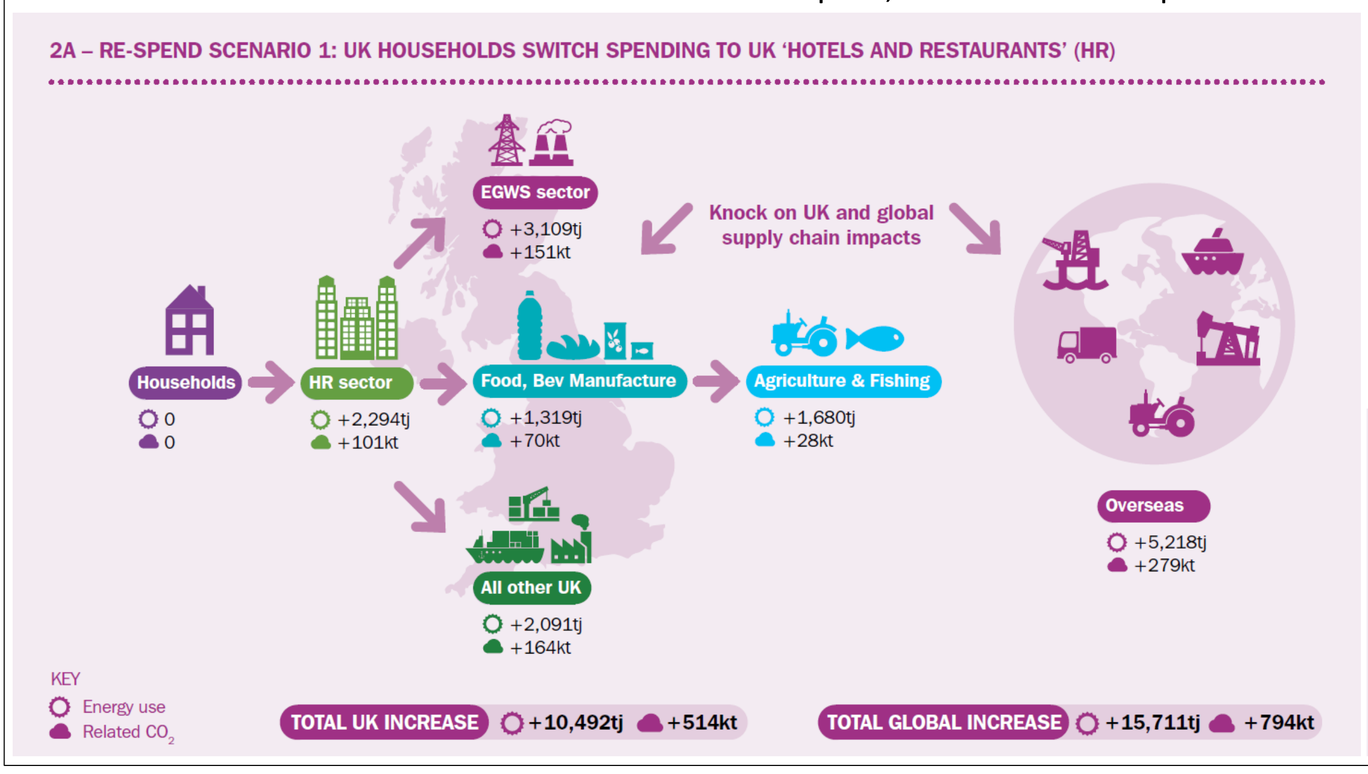
4. The Carbon Saving Multiplier

We propose the use of a carbon saving multiplier (CSM). CSM is calculated using the following formula.

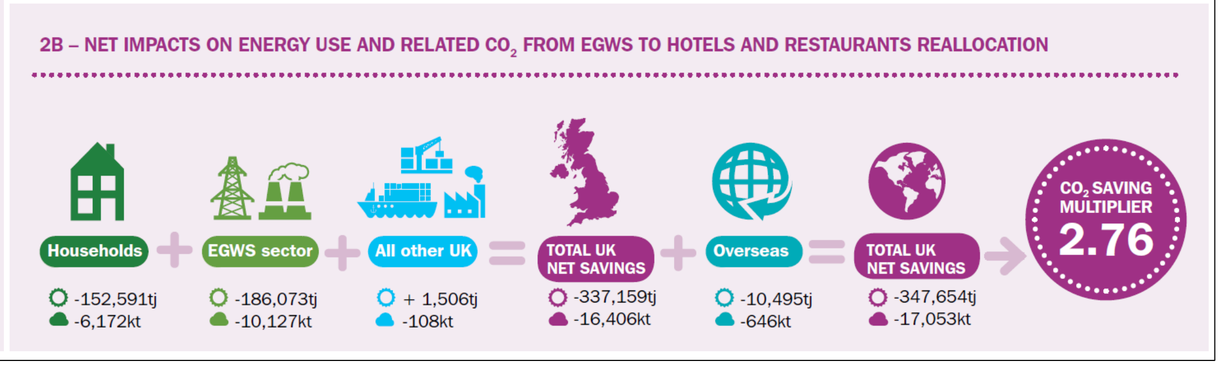
$$CSM = \frac{Change\ in\ embodied\ emissions}{Direct\ household\ emissions\ savings}$$

In the examined scenario this corresponds to the ratio of total global savings (-17,847 kt) over the direct savings of UK households (-6,172 kt) giving a CSM of 2.89. This is interpreted that for each kilo-tonne (kt) of CO_2 saved by UK households a further 1.89 kt are saved globally.

However, when the savings from improved energy efficiency are re-spent then we a subsequent increase in energy use/CO_2 emissions of the sectors where the savings are re-spent, due to increased production to meet increased final demand.

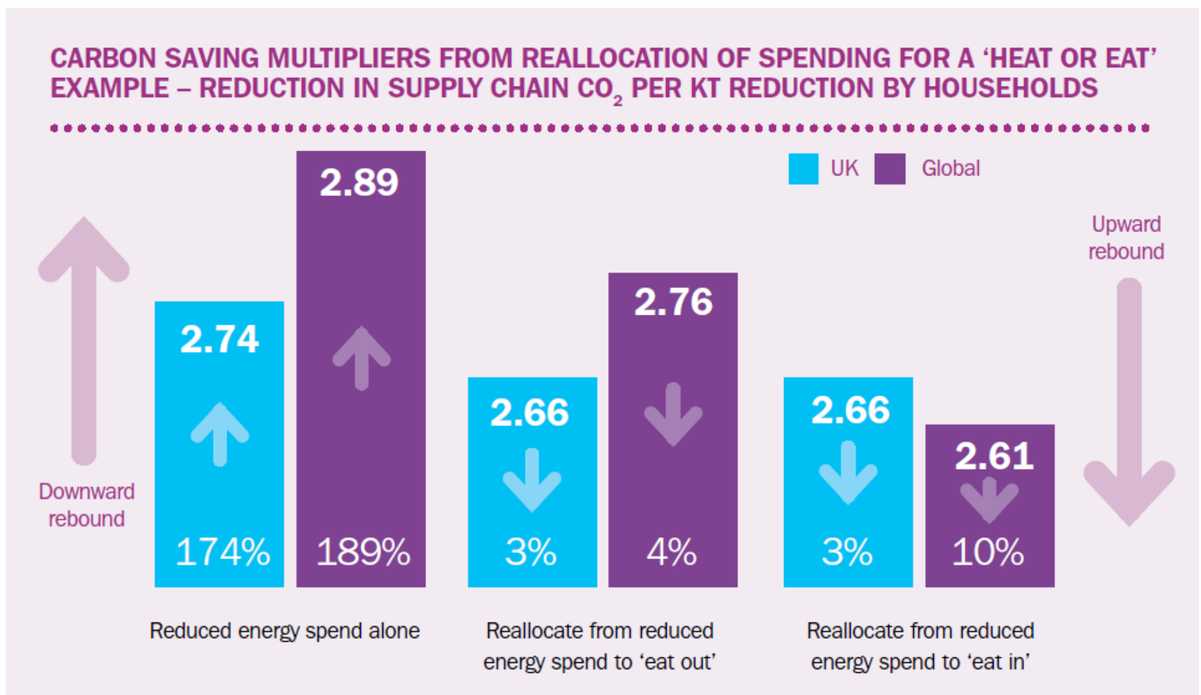


As can be seen in Figure 2B, the increased energy use/CO_2 do not offset the savings achieved before any re-spending taking place. However, the CSM is eroded as a result of the decrease in total net savings.



5. Erosion of the CSM

The CSM is eroded as a result of different re-spending decisions. The degree of erosion depends on the energy/CO_2 emissions intensity of the sector where re-spending is directed. The bar-chart shows the different levels of erosion under different re-spending scenarios compared to the original level of CSM.



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Policy briefing: http://www.strath.ac.uk/media/cross-functional/ippi/3507_CIED_policy_briefing_02_WEB.pdf
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