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Energy
For a Low Carbon Future

Using multipliers to study rebound effects

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Structure of presentation

- Part A – Antonios Katris
  - Multipliers featured in our work
  - What is a rebound effect?
  - Can we study rebound using multipliers?

- Part B – Oluwafisayo Alabi
  - Scottish multipliers
  - What are our limitations?
  - How can multipliers be used for Scottish case studies?

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Part A

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Multipliers featured in our work

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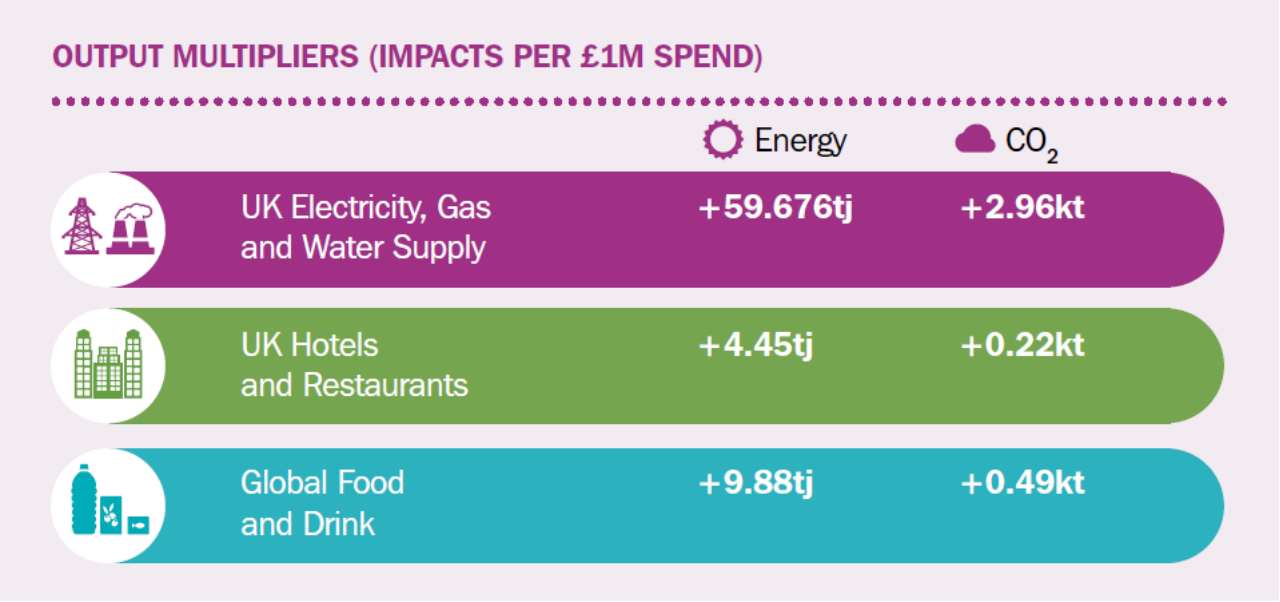
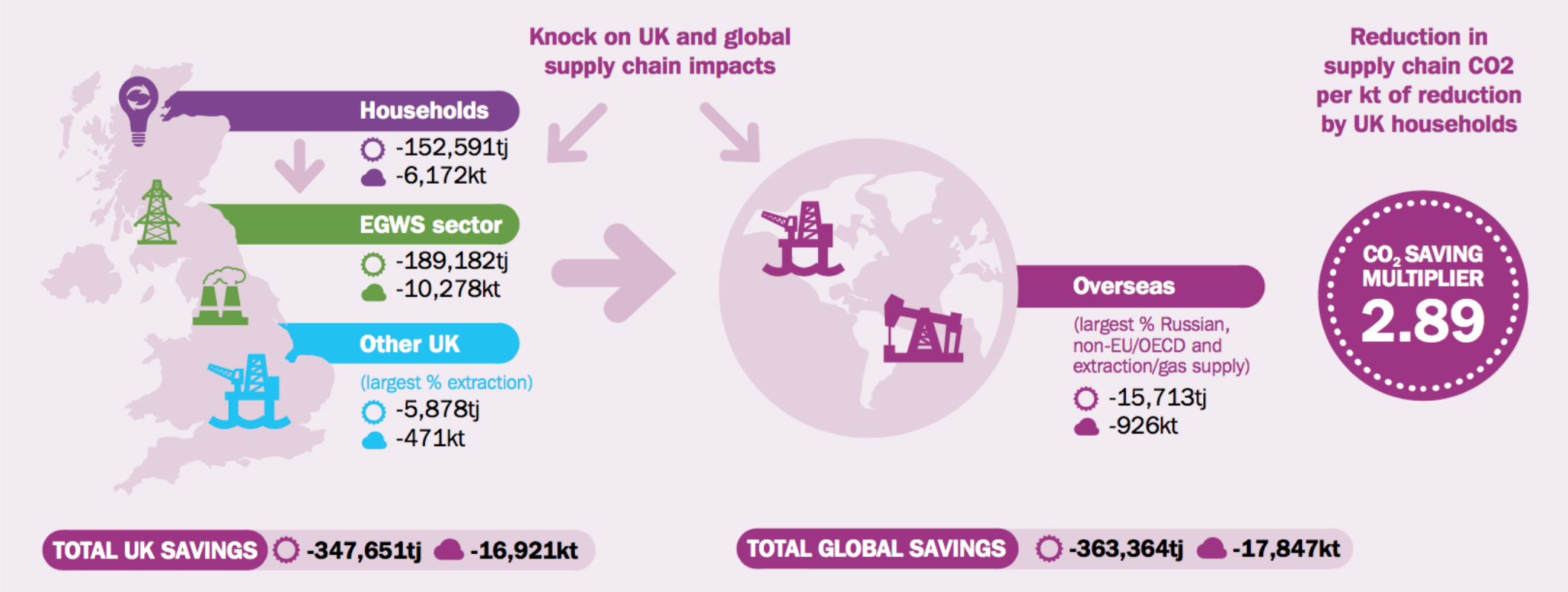
- Multiplier analysis a widely used tool in IO frameworks
- For example Employment multiplier shows the changes in employment throughout the economy following a change in employment in one sector
- We focus on embodied energy use/emissions
  - Output multipliers key for our work

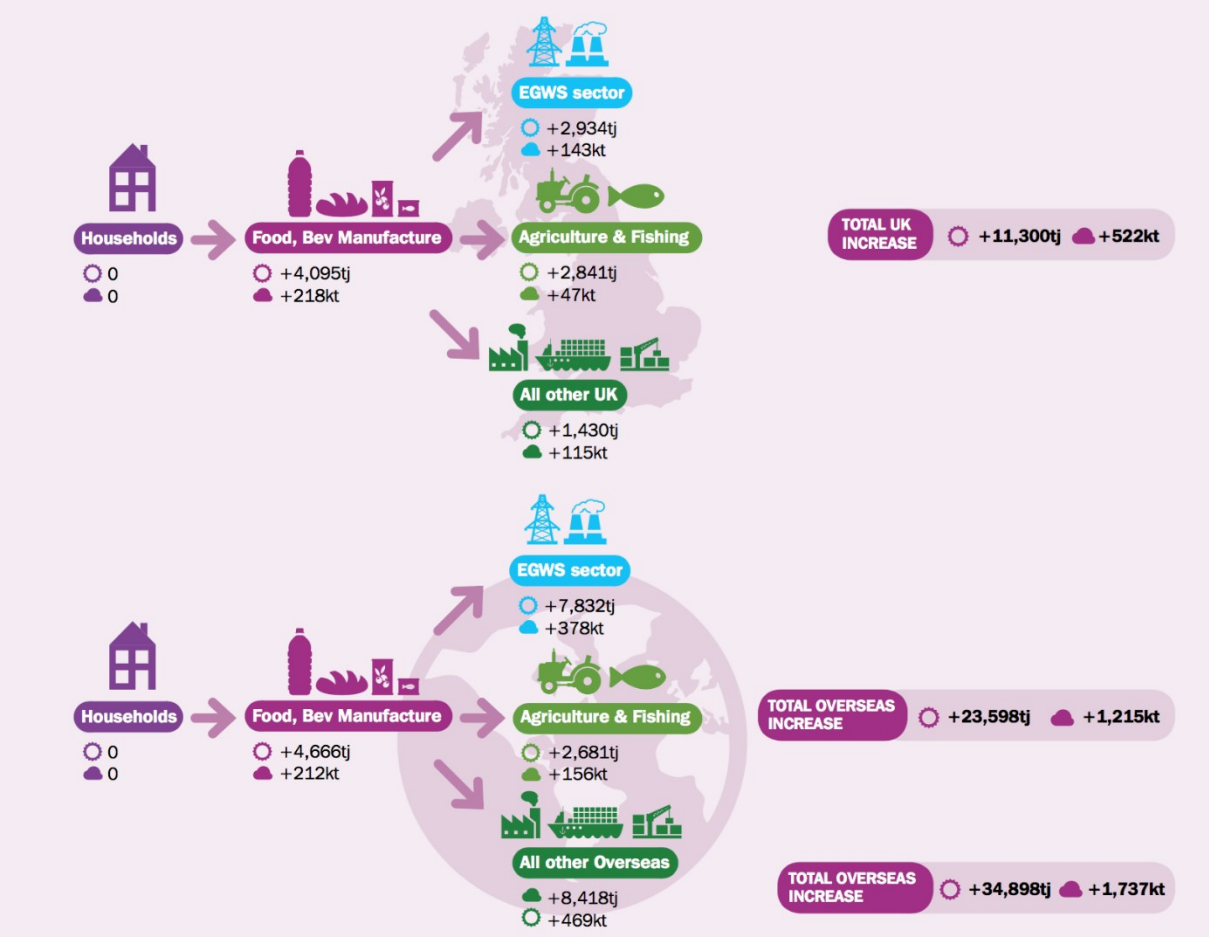


- Our output multipliers show the change in energy use and CO_2 emissions due to a change in final demand

- Simple scenario; Improved energy efficiency in UK households reduces spending to EGWS sector by 10%

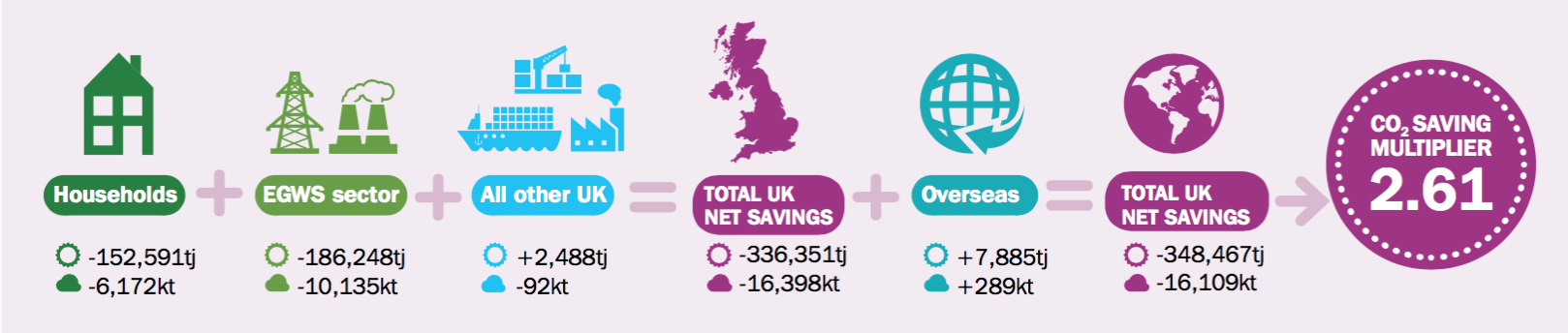


- If savings are re-spent to Global Food and Beverage Manufacture we have an increase in energy use/carbon emissions



- Main impact overseas

- Does this increase offset the original savings due to improved energy efficiency?
  - We need to examine the net change in energy use/ emissions



- The benefits from improved energy efficiency have been reduced
- Still net energy/CO_2 savings

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What is a rebound effect?

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- The energy (carbon) savings are not limited to the reduced energy use (carbon emissions) of the households
- Further savings on the EGWS supply chain; Rebound effect
  - We focus on indirect rebound effect
- Rebound indicator
  - $R = \left(1 - \frac{AES}{PES}\right) \times 100$
- Ratio of Actual Energy Savings (AES) achieved over Potential Energy Savings (PES) anticipated
- We want negative R
  - Actual savings larger than Potential
  - If AES positive then we have net energy (carbon) savings
- No standard definition for PES

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Can we use multipliers to study rebound?

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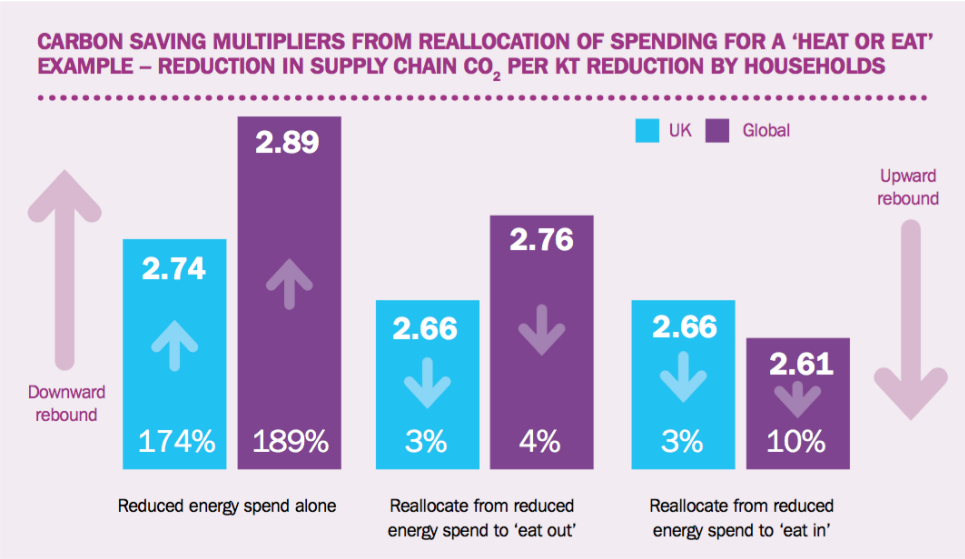
- We propose the use of a Carbon Saving Multiplier (CSM) instead of R
- CSM is calculated using the following formula
- $$CSM = \frac{Change\ in\ embodied\ emissions}{Direct\ household\ emissions\ savings}$$
- CSM tells the same story as R
- In example CSM=2.89
  - For every kt of CO_2 saved by UK households further 1.89 kt are saved globally



- Thank you for your attention
- Further information can be found on the policy briefing

- Oluwafisayo will continue with the second part of the presentation

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Part B

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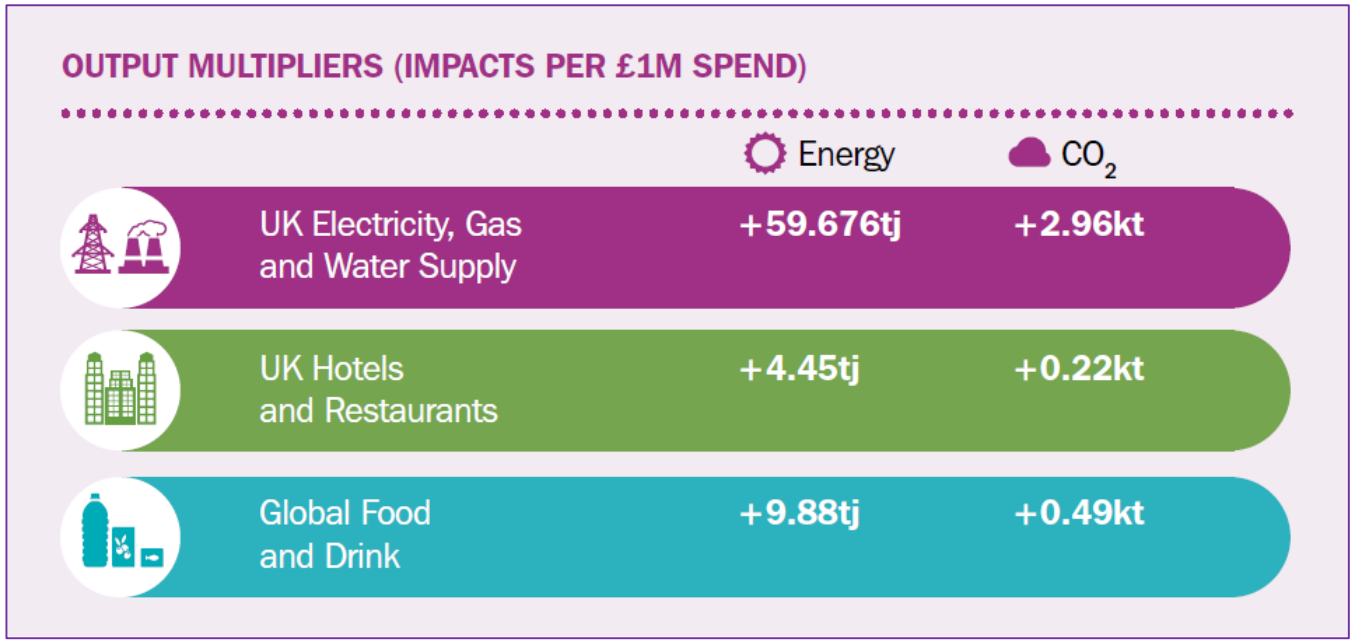
✓ Inter-country and Global case



➢ Scottish Case

- What are the Carbon Savings Multipliers for Scotland?
- What are the GHG multiplier impacts in Scotland for different ‘Eat’, ‘light’, ‘Heat’ and ‘Travel’ domestic spending options?
- Data: Scottish Input-Output (IO) Tables (2012) and UK Average Sectoral GHG Intensities.

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GHG Multiplier impacts in Scotland (CO2(e) per £1m) for different 'eat', 'light', 'heat' and 'travel' domestic spending options

More GHG Intensive

ss GHG Intensive

GHG Multiplier Impact in Scotland (CO2(e) per £1m)

4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00

Meat	Fish/fruit	Dairy	Bakery	Electricity	Gas etc.	Rail transport	Other land transport	Water transport	Air transport
0.96	0.43	1.37	0.27	3.34	0.67	0.36	0.58	1.02	2.56

Direct Emissions from household not accounted for

Scottish Input-Output Tables 2012 & UK Average Sectoral GHG Intensities

Eat
Light
Heat
Travel

Working towards Carbon Saving Multipliers (CSM) for Scotland

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*Scotland is in an excellent position with regard to economic input-output accounting data**, however a key challenge/problem is a lack of region-specific data on sectoral GHG***

Data

Further Applications:

- How GHG is distributed within Scotland's supply chain.
- Use Scottish Data to replace the electricity GHG intensities to see how the multipliers change.
- Replicate similar scenarios as in the inter-country case.

Conclusions

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Advantages of Input-Output Multiplier Analysis

- Useful tool for examining the interdependences within an economy and the interactions between the economy and the environment.
- Flexibility framework or tool (e.g. Inter-country or Regional and can be used to consider other pollutants, waste and resource uses)
- Alternatives tool/method to Rebound measures.
- Support existing economic and environmental policies or inform new policy decisions. (Key questions and 'What if' scenarios)

Still on the Scottish case…….

Gioele will give a fuller economy wide perspective on 'can rebound effects reduce fuel poverty' linked to WP4.