Modelling Human Behaviour in Climate Mitigation Scenarios

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IEA Workshop on:
The role of ‘behavioural aspects’ for reaching net zero emissions by 2050

online, 16 February 2021
Social and behavioural change is critical for net-zero, and ubiquitous in the ‘real’ world.

Figure 5.6 in UK CCC (2019). *Net Zero: The UK’s contribution to stopping global warming*. London, UK, UK Committee on Climate Change.
There are different ways of representing or simulating behaviour in models.

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<tr>
<th>implicit</th>
<th>explicit</th>
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<td>(part of a more general phenomenon)</td>
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Models handle some behavioural phenomena quite well: e.g., income & price responsiveness.

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**exogenous**
(externally specified)

scenario narrative translated into general modelling approach
e.g., energy service demand is a function of GDP growth

**endogenous**
(internally generated)

behavioural phenomenon codified without resolving specific causal mechanism
e.g., price elasticity

Non-economic behavioural phenomena are *not* typically well represented in models.

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<td><em>e.g., ‘consumption options’, Low Energy Demand scenario</em></td>
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<td><strong>endogenous</strong></td>
<td>specific behavioural process represented causally in model parameters or relationships</td>
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<td><em>e.g., social influence and learning</em></td>
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Modelling ‘behaviour change’ can be reduced to changes in $A$, but $S$ and $I$ are also important.

**Activity** =
total amount ‘consumed’ e.g., less °C, less meat, fewer p-km

**Structure** =
mix of different forms of activity e.g., mixed use buildings, modal shift

**Intensity** =
efficiency of each form of activity e.g., heat pumps, line drying, EVs

Activity – Structure - Intensity decompositions are useful for translating behaviour into models.

scenario narratives to 2050 in global ‘Low Energy Demand’ scenario:

- **increase in Activity**
  - more demand for useful services (esp. Global South)

- **changes in Structure**
  - new forms of service
  - improved 'service' efficiency

- **reduction in Intensity**
  - improved conversion efficiency
  - avoided losses

As well as behavioural change, important social and behavioural processes can be modelled.

**uptake rates?**

**diffusion is a social process (Rogers 2003)**

- Early Adopters (EA)
- Innovators (IN)
- Early Majority (EM)
- Late Majority (LM)
- Laggards (LG)

**social learning** (SL) parameterised alongside technological learning (TL) in global modelling


More explicit representation of behaviour in models is possible, useful, and policy-relevant.

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- **Exogenous** (externally specified)
  - Scenario narrative translated into general modelling approach
    - *e.g., energy service demand is a function of GDP growth*
  - *Low Energy Demand scenario*

- **Endogenous** (internally generated)
  - Behavioural phenomenon codified without resolving specific causal mechanism
    - *e.g., price elasticity*
  - Specific behavioural process represented causally in model parameters or relationships
    - *e.g., social influence and learning*

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Social and behavioural change can - and should - be captured in scenario narratives for achieving net-zero, then ...

... *either* translated into modelling assumptions,

... *or* internalised as parameters and relationships within models.

‘*Behaviour is uncertain and there’s insufficient empirical evidence*’ are not strong enough reasons to avoid trying!


More explicit representation of behaviour in models is possible, useful, and policy-relevant.