Energy Efficiency Training Week
Indicators and Evaluation

Session 6: How to tell if your policy made a difference
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IEA #energyefficientworld
Introduction

• Impact evaluation needs to demonstrate cause and effect

• Policy and programmes operate in a complex environment – multiple causes contribute to an effect

• Different methods of impact evaluation are suited to different policies and programmes and different types of questions

• Aim of this session is to introduce main impact evaluation approaches and their strengths and weaknesses

• And consider where data will come from to implement each approach
What is impact?

Positive and negative, primary and secondary long-term effects **produced** by an intervention, directly or indirectly, intended or unintended.

From OECD DAC

- What does impact mean for appliance and equipment policy – energy saving:
  - Compared to what (BAU, baseline)
  - By whom (rural, urban)
  - What energy (e.g. kerosene lamps to electricity)
  - Does it translate into $$ and CO2?

- What else might we be interested in?
  - Fairness
  - Prices
  - Jobs/economic development
  - Exports
  - Energy security
Estimating energy consumption and savings – appliances/equipment

- Annual energy consumption (kWh) = kW in an hour x hours of use in a year
- Cost = kWh x cost per kWh

<table>
<thead>
<tr>
<th>Refrigerator example</th>
<th>Standard</th>
<th>Efficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>kW</td>
<td>50</td>
<td>18</td>
</tr>
<tr>
<td>Hours of use</td>
<td>8760</td>
<td>8760</td>
</tr>
<tr>
<td>Annual consumption</td>
<td>438kWh</td>
<td>158kWh</td>
</tr>
<tr>
<td>Cost @ 10c/kWh</td>
<td>USD 44/year</td>
<td>USD 16/year</td>
</tr>
</tbody>
</table>

- Multiply by the number of products in use
Measuring energy saving – baseline/business as usual

- Compare energy consumption with policy to energy consumption without policy
### What data do you need and where can you get it?

<table>
<thead>
<tr>
<th>Data</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership levels</td>
<td>Household survey/national statistics</td>
</tr>
<tr>
<td>Historic sales</td>
<td>Manufacturers</td>
</tr>
<tr>
<td>Current sales</td>
<td>Registration system/market survey</td>
</tr>
<tr>
<td>Replacement rate</td>
<td>Household survey/international experience</td>
</tr>
<tr>
<td>Annual hours of use</td>
<td>Household survey</td>
</tr>
<tr>
<td>Average energy consumption before policy</td>
<td>Market survey/manufacturers/assumption/past household surveys</td>
</tr>
<tr>
<td>Energy consumption of efficient products</td>
<td>Registration system</td>
</tr>
<tr>
<td>Compliance levels</td>
<td>Market survey/enforcement action</td>
</tr>
</tbody>
</table>
Triangulation

- Do data from different methods, sources and approaches align?
- Are the economy wide indicators consistent with the estimate of programme savings?
- Do data from manufacturers and retailers align with results of household surveys?
Did appliances and labelling policy make a difference?

- Compliance with MEPS
- Labels influence competitive strategy
- Technological change
- Other influences on competitive strategy

Manufacturers offer lower energy products

- Consumers purchase lower energy products
- Energy Saving

- Labels
  - Relative price/affordability
  - Environmental attitudes
  - Brand

- Rebound – use for longer
- Rebound – bigger products
- More products
- Non-compliant products

Unintended outcomes
Did the policy make a difference?

- Randomised control trial
- Statistical tests
- Contribution analysis
Approaches to causal attribution 1 – randomised control trial

- Population is split into 2 groups by random lot
- Outcomes for both groups are measured

INTERVENTION

CONTROL
Approaches to causal attribution 1 – randomised control trial

- Test the inclusion of costs on energy label + staff training
- UK Government + John Lewis department store
- Trial group of stores compared to control group
- Small difference for washer dryers, no difference for other products
Approaches to causal attribution 1 – randomised control trial

• **Strengths**
  - “Prove” effect of policy
  - In the circumstances of the test (when, where)
  - For the indicator being measured

• **Weaknesses**
  - Doesn’t tell you why the policy worked/doesn’t work
  - Doesn’t tell you if the policy will work in other circumstances
  - Challenging to design and implement
Approaches to causal attribution 2 - statistical

- Difference in difference

- Using meter data can compare changes in energy consumption between the group subject to the policy and a comparison group (difference in difference) before and after the policy implementation.
Approaches to causal attribution 2 – statistical

• Strengths
  - “Prove” effect of policy
  - In the circumstances of the test (when, where)
  - For the indicator being measured

• Weaknesses
  - Doesn’t tell you why the policy worked/doesn’t work
  - Doesn’t tell you if the policy will work in other circumstances
  - Depends on ability to obtain data
Approaches to causal attribution 3 – contribution analysis

- Develop theory of change
- Consider alternative explanations, develop contribution story
- Gather evidence of the results, the causal links and other influencing factors
- Refine contribution story, repeat as necessary
- Validate with stakeholders
Estimating the effect of energy labels – contribution analysis

• Contribution story, labels reduce energy consumption because:
  - Consumers have a reliable way of choosing energy efficient products
  - Manufacturers are motivated to produce more energy efficient products

• Theory based evaluation tests:
  - Whether the policy was implemented as intended
  - Whether there is evidence to support the theory
  - What else might explain what has happened
Evidence

• Vietnam Energy Efficiency Labels
  - Implemented for a range of products in 2014

• Evidence from
  - Interviews with manufacturers
  - Consumer interviews and survey
  - Registration system
  - Label compliance survey
Results

• Interviews with manufacturers found that labels had a:
  - Significant influence on manufacturers of air conditioning and refrigerators
  - Moderate influence on manufacturers of fans, rice cookers and lighting
  - No influence on manufacturers of washing machines and televisions

• Survey of consumers found that labels influenced 85% of purchases to some extent

• Alternative explanations
  - Technological change
  - Spillover from other markets
  - Brands
Example of theory based evaluation

- But in some cases policy not implemented as intended:
Example of theory based evaluation

- And there isn’t full compliance with the policy
## Effect of Vietnam Energy Efficiency Standards and Labels

<table>
<thead>
<tr>
<th>Product</th>
<th>Manufacturers</th>
<th>Consumers</th>
<th>Compliance</th>
<th>Net effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air conditioning</td>
<td>Significant</td>
<td>85%</td>
<td>71%</td>
<td>60%</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>Significant</td>
<td>85%</td>
<td>n/k</td>
<td>63%</td>
</tr>
<tr>
<td>Fans</td>
<td>Moderate</td>
<td>No</td>
<td>64%</td>
<td>32%</td>
</tr>
<tr>
<td>Rice cookers</td>
<td>Moderate</td>
<td>85%</td>
<td>78%</td>
<td>33%</td>
</tr>
<tr>
<td>Washing machines</td>
<td>None</td>
<td>No</td>
<td>88%</td>
<td>0</td>
</tr>
<tr>
<td>TVs</td>
<td>None</td>
<td>No</td>
<td>n/k</td>
<td>0</td>
</tr>
</tbody>
</table>
Approaches to causal attribution 3 – contribution analysis

- **Strengths:**
  - Reflects more of the influences on outcome
  - Explains why and how change happens
  - Utilises diverse evidence

- **Weaknesses:**
  - Approximate impact estimate
  - Doesn’t provide proof of impact
  - Complexity can be challenging to communicate
Approaches to causal attribution – further reading
Things to think about during the site visit

• What is the theory of change?
• How do they tell if they are achieving their aims?
• What indicators do they use?
• 5 minutes for each group to report tomorrow morning