Toolkit

The relationship between product efficiency and prices

LAE Stream: Session number 6
Mark Ellis
Jarkarta, 17 July 2018
#energyefficientworld
Scenario

- You have been asked to prepare an impact statement for your regulations, including the effect on product prices.

- How would you go about the task of estimating future product costs?
Why are appliance costs important?

- A core aim of energy efficiency programs is to deliver cost benefits to consumers.

- In principle, any **additional costs** of more efficient equipment is offset by lifetime **savings in fuel bills**.

- Life-cycle cost = Capital cost + lifetime running costs.

- Often used to set performance thresholds, i.e. via least life-cycle costs.
## Life-cycle costs

<table>
<thead>
<tr>
<th></th>
<th>Average product</th>
<th>Energy efficient product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Cost ($)</td>
<td>$300</td>
<td>$350</td>
</tr>
<tr>
<td>Running cost per annum</td>
<td>=150kWh x 0.2$</td>
<td>=120kWh x 0.2$</td>
</tr>
<tr>
<td></td>
<td>= $30</td>
<td>= $24</td>
</tr>
<tr>
<td>Lifetime (yrs)</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Total lifetime cost (LC)</td>
<td>= 300 + (30 x 12)</td>
<td>= 350 + (24 x 12)</td>
</tr>
<tr>
<td>LC</td>
<td>$660</td>
<td>$638</td>
</tr>
</tbody>
</table>
Setting MEPS at Least Life-cycle cost

Life-cycle Cost(€)

Current efficiency level

Proposed MEPS level

Energy Efficiency

Base Case Product

Improvement A

Improvement B

Minimum Life-cycle Cost (LLCC)

Improvement C

Improvement D

Best Product

© OECD/IEA 2018
• If you are setting MEPS based on least life-cycle cost....

• what impact is there if efficient products costs are higher/lower?
Setting MEPS at Least Life-cycle cost

[Diagram showing the relationship between life-cycle cost and energy efficiency, with different improvements indicated.]
• So that is the theory

• Now lets look at what is actually happening........
Analysis: Impact of Refrigerator Standards: Energy Consumption in the USA

Analysis: Impact of Clothes Washer Standards on Annual Energy Consumption in the US

IEA 4E, Achievements of appliance energy efficiency standards and labelling programs - A Global Assessment in 2016
Examination of MEPS impacts: Cold appliances: % change

-70% -60% -50% -40% -30% -20% -10% 0% United States Australia (refrig) Australia (freezer) UK (refrig) UK (freezer) Japan

-70% -60% -50% -40% -30% -20% -10% 0% United States Australia (refrig) Australia (freezer) UK (refrig) UK (freezer) Japan

Av. Energy Consumption Av. Price
Examination of MEPS impacts: other appliances: % change

-40% -35% -30% -25% -20% -15% -10% -5% 0% -5% -10% -15% -20% -25% -30% -35% -40%

United States (clothes washers) Australia (clothes washers) Australia (clothes dryers) United States (a/c) Japan (a/c)

Av. Energy Consumption Av. Price
What does this tell us?

- No evidence that Standards and Labeling policies have increased real prices to consumers
  - Some minor movements, usually explained by other factors

- Generally average real prices for studied products have fallen faster than for other goods in these markets

- No correlation with energy/electricity prices

- Manufacturers confirm that, given notice, energy efficiency requirements can be absorbed into design process with little or no extra cost
What does this tell us?

• No correlation between price and efficiency

• However, sometimes the most efficient products are also the most expensive, because:

• High priced products differentiate through:
  - branding
  - quality of materials
  - design
  - energy efficiency is a further indicator of quality
Implications for policy

- So how does this impact on our policy settings?
### What happened?

<table>
<thead>
<tr>
<th>Appliance Type</th>
<th>DOE estimate price BEFORE</th>
<th>Census prices AFTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerators</td>
<td>56</td>
<td>37</td>
</tr>
<tr>
<td>Clothes washers</td>
<td>54</td>
<td>-35</td>
</tr>
<tr>
<td>Clothes washers</td>
<td>199</td>
<td>10</td>
</tr>
<tr>
<td>Electric water heaters</td>
<td>108</td>
<td>28</td>
</tr>
<tr>
<td>Non-electric water heaters</td>
<td>121</td>
<td>34</td>
</tr>
<tr>
<td>Central ac</td>
<td>267</td>
<td>207</td>
</tr>
<tr>
<td>Room ac</td>
<td>13</td>
<td>-162</td>
</tr>
<tr>
<td>Commercial ac</td>
<td>512</td>
<td>-224</td>
</tr>
<tr>
<td>Ballasts</td>
<td>6.73</td>
<td>-1.78</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>148</strong></td>
<td><strong>-12</strong></td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td><strong>108</strong></td>
<td><strong>10</strong></td>
</tr>
</tbody>
</table>
Why did we get it wrong?

- Predictions made prior to regulations based on engineering analysis
- Observed prices may be 5-10 years later
- In the meantime:
  - Regulations stimulate growth in the market
  - Costs have reduced as the market share has grown
  - Some shift to offshore manufacturing
  - Companies find innovative solutions
  - Technologies rarely predicted
Conclusions

- Current cost-benefit analysis tends to overstate the future costs of efficient appliances
  - Politically conservative

- Observations fit ‘learning-by-doing’ model

- Suggests that we have not been optimising policies to reduce energy and CO2

- Policies could be more stringent and still show positive benefits

- Some countries now reduce estimates for future cost impacts