Bottom-up analysis of fuel poverty in Ireland

DCENR

Final report

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Element Energy Ltd

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• Description of approach
• Results
• Caveats and potential refinements
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Fuel poverty definitions

We use the ‘objective’ measure in this presentation

<table>
<thead>
<tr>
<th>Fuel poverty measure</th>
<th>Method</th>
<th>Previous study in Ireland?</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Actual expenditure</td>
<td>Compare fuel expenditure to household income</td>
<td>Yes</td>
<td>Scott et al (ESRI, 2008)</td>
</tr>
<tr>
<td>3. Objective</td>
<td>Compare normative fuel expenditure** to household income</td>
<td>Not to our knowledge</td>
<td>This study</td>
</tr>
</tbody>
</table>

• In this project we use the ‘objective’ measure of fuel poverty.
• The objective definition allows measurement of:
  • the ‘extent’ of fuel poverty, i.e. how many households are in fuel poverty;
  • the ‘severity’ of fuel poverty, i.e. how much of a household’s income is required to be spent on fuel.
• In the objective definition, a threshold of percentage income required to spend on fuel is typically set; households above this threshold are said to be in fuel poverty.
• We will use three thresholds: 10%, 15% and 20%, and calculate the number of households in fuel poverty (the ‘extent’).
• We will also report on the ‘severity’ of fuel poverty.

*Reported difficulty in warming the home adequately and/or going without heating for some part of the year.
**i.e. that which would need to be spent to maintain certain standard internal conditions
Definitions

**Required energy spend fraction:**

\[
100 \times \frac{\text{modelled fuel expenditure}}{\text{income}}
\]

**At-risk group:**

Households whose *Required energy spend fraction* exceeds a defined threshold

**Prevalence of fuel poverty:**

The percentage of households in a particular category (e.g. living in detached houses) whose *Required energy spend fraction* exceeds the defined threshold
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Irish households were disaggregated into groups by six core variables

Each group represents a combination of six ‘core variables’

- Location
- Dwelling type
- Main heating fuel
- BER rating
- Tenure
- Employment type

<table>
<thead>
<tr>
<th>Core variables</th>
<th>Example group</th>
<th>Output of analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Kildare</td>
<td></td>
</tr>
<tr>
<td>Dwelling type</td>
<td>Terraced house</td>
<td></td>
</tr>
<tr>
<td>Main heating fuel</td>
<td>Oil</td>
<td></td>
</tr>
<tr>
<td>BER rating</td>
<td>D1-D2</td>
<td></td>
</tr>
<tr>
<td>Tenure</td>
<td>Private rented sector</td>
<td></td>
</tr>
<tr>
<td>Employment type</td>
<td>Self-employed</td>
<td>Required energy spend fraction</td>
</tr>
</tbody>
</table>

- The aim was to be able to identify likely segments of the population in which fuel poverty is prevalent.
- The results in this presentation are given in terms of the fuel poverty metric (% or number of households in fuel poverty) by one core variable at a time.
- The model used to derive these results could also be used to estimate prevalence of fuel poverty by two variables, for example tenure and employment.
Data analysis and stock modelling were used to predict fuel poverty prevalence for each group.

**SOURCES**
- Element Energy/SEAI residential stock model
- Household Budget Survey 2009-10
- 2011 Census (CSO)

**DATA**
- Physical building stock data
- Final energy consumption per building by fuel
- 2010 income data
- Employment type Tenure

**CALCULATIONS**
- Normative energy requirement by group
- Income data inflated to 2014/15

**RESULTS**
- Normative energy expenditure by group
- Income by group
- Required energy spend fraction
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Overall results for Ireland

Distribution of Required energy spend fraction

Number of households in Ireland

Required energy spend fraction
Overall results for Ireland: prevalence of fuel poverty using different thresholds

<table>
<thead>
<tr>
<th>Metric</th>
<th>Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of households in fuel poverty</td>
<td>10% 15% 20%</td>
</tr>
<tr>
<td>10% threshold</td>
<td>461,000</td>
</tr>
<tr>
<td>15% threshold</td>
<td>133,000</td>
</tr>
<tr>
<td>20% threshold</td>
<td>42,000</td>
</tr>
<tr>
<td>% households in fuel poverty</td>
<td>10% 15% 20%</td>
</tr>
<tr>
<td>10% threshold</td>
<td>28%</td>
</tr>
<tr>
<td>15% threshold</td>
<td>8%</td>
</tr>
<tr>
<td>20% threshold</td>
<td>3%</td>
</tr>
</tbody>
</table>

- Using the 10% threshold, more than one-fourth of Irish households are in fuel poverty.
- The next slides show how this number varies with the six core variables introduced earlier.
Fuel poverty by location

- Ulster has the highest rate of fuel poverty, at 50% under the 10% threshold.
This graph reflects the greater number of households overall in Leinster, as opposed to necessarily showing a high occurrence of fuel poverty.
Fuel poverty by tenure

Percentage of households of each tenure in fuel poverty

- Social housing has a very high prevalence of fuel poverty according to the objective measure (almost 70%).
- Within the at-risk group in the social housing category, the average Required energy spend fraction is 17%.
Fuel poverty by tenure

Number of households in fuel poverty

- Although the highest prevalence is found in the social rented category, the highest number of households in fuel poverty is found in the Owner category.
- This indicates that if only the social rented category is targeted, the majority of households in fuel poverty would be missed.
Fuel poverty by main heating fuel

Percentage of households using each fuel type in fuel poverty

- Oil heated dwellings have the highest prevalence of fuel poverty.
- The highest average Required energy spend fraction within the at-risk group is found in oil heated dwellings, at 15%.
Fuel poverty by main heating fuel

Number of households in fuel poverty

- Oil heated dwellings also dominate under the ‘number of households in fuel poverty’ metric.

ElementEnergy
Fuel poverty by dwelling type

Using the 10% threshold, households in detached houses have about twice the prevalence of fuel poverty than other households.
Fuel poverty by dwelling type

Number of households in fuel poverty

Detached houses are also the dwelling type with the highest number of households in fuel poverty.
Fuel poverty by BER rating

Percentage of households from dwellings of each BER category in fuel poverty

- BER rating has a strong effect on prevalence of fuel poverty.
Fuel poverty by BER rating

Number of households in fuel poverty

- Number of households in fuel poverty
- 10% threshold
- 15% threshold
- 20% threshold

- D1-D2 and G are the largest categories within the dwelling stock
Fuel poverty by employment type

Percentage of households of each employment type in fuel poverty

- Unemployed and retired households have a high prevalence of fuel poverty.
- However, the largest category in percentage terms is ‘Other not in labour force’ employment type.
- This refers to the sum of households where the reference person is:
  - Looking after someone at home
  - A student/pupil
  - Unable to work due to permanent sickness/disability
  - Looking for first regular job
  - Aged 15 or under, or absent on census night
- The Household Budget Survey reports that this ‘Other’ category has the lowest average income of all the categories, which is why its extent of fuel poverty is high.
Fuel poverty by employment type

**Number of households of each employment type in fuel poverty**

- **Self Employed**
- **Employee**
- **Unemployed**
- **Retired**
- **Other not in labour force**

- **Number of households in fuel poverty**
  - 10% threshold
  - 15% threshold
  - 20% threshold

- Note that the ‘Other not in labour force’ category also has a large number of households in fuel poverty.
Highest numbers in terms of prevalence of fuel poverty (using the 10% threshold)

The social rented sector was where the highest prevalence of fuel poverty was found

Categories of variables with a high prevalence of fuel poverty under the 10% threshold:

- Social rented (68%)
- ‘Other not in labour force’ (61%), unemployed (57%) and retired (55%)
- Located in Ulster (50%)
- G-rated dwellings (47%)
- Oil heated dwellings (43%)
- Detached houses (42%)
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Higher resolution income data would improve the accuracy of the analysis

• Currently, the income data is as follows:
  ➢ Income by tenure
  ➢ Income by location
  ➢ Income by employment type

• We do not currently have data for the individual combinations of income by tenure and location and employment type. The income of these individual combinations was estimated by applying distributions for tenure, location and employment subsequently.

• Obtaining access to the microdata from the 2009-10 Household Budget Survey would enable data to directly be used for these individual combinations.

• Secondly, it would be beneficial to obtain data on income by dwelling type, BER rating and main heating fuel (the three of the six core variables for which we do not currently have income data).

• This would allow us to observe, for example, the extent to which detached houses are occupied by either more wealthy households or poorer ones. Currently, indirect correlations are captured by variables such as employment status, which are not 100% correlated to income.

• Finally, a distribution of incomes could be used instead of the average per group. Currently, all of the households within one group are either in fuel poverty or not; in reality, their differing incomes would spread them out over both sides of the boundary.
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## Appendix 1: Variables used from each data source

<table>
<thead>
<tr>
<th>Data source</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>BER register</td>
<td>BER rating by dwelling type</td>
</tr>
<tr>
<td></td>
<td>BER rating by main heating fuel</td>
</tr>
<tr>
<td></td>
<td>BER rating by location</td>
</tr>
<tr>
<td>Household budget survey 2009-2010 (inflated to 2014/15)</td>
<td>Income by tenure</td>
</tr>
<tr>
<td></td>
<td>Income by employment type</td>
</tr>
<tr>
<td></td>
<td>Income by region</td>
</tr>
<tr>
<td>2011 Census (CSO)</td>
<td>Number of households by location</td>
</tr>
<tr>
<td></td>
<td>Number of households by dwelling type</td>
</tr>
<tr>
<td></td>
<td>Number of households by main heating fuel</td>
</tr>
<tr>
<td></td>
<td>Number of households by employment type</td>
</tr>
<tr>
<td></td>
<td>Number of households by tenure</td>
</tr>
<tr>
<td></td>
<td>Income by county</td>
</tr>
<tr>
<td>Element Energy/SEAI residential building stock model</td>
<td>Final energy demand of dwelling archetypes, by fuel type</td>
</tr>
</tbody>
</table>
Appendix 2: Fuel price data used

Note: The year 2015 was used for all of the analysis in this report; subsequent years given for info.

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Electricity (heating)</td>
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<td>0.11</td>
<td>0.11</td>
<td>0.11</td>
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</tr>
<tr>
<td>Electricity (non-heating)</td>
<td>0.28</td>
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<td>0.30</td>
<td>0.31</td>
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<td>0.36</td>
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<tr>
<td>Oil (including LPG)</td>
<td>0.12</td>
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</tr>
<tr>
<td>Natural gas</td>
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<tr>
<td>Solid fuel</td>
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</tbody>
</table>
## Appendix 3: Comparison of results to other fuel poverty definitions

<table>
<thead>
<tr>
<th>Fuel poverty measure</th>
<th>Method</th>
<th>Result</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Actual expenditure</td>
<td>Compare fuel expenditure to household income</td>
<td>19.4% of households in fuel poverty in 2008</td>
<td>Scott et al (ESRI, 2008)</td>
</tr>
<tr>
<td>2. Subjective</td>
<td>Occupant self-reported difficulty to a) keep the home adequately warm and/or b) self-reported going without heating for some part of the year</td>
<td>8.1% of households reporting a) or b) 2006 7.3% of households reporting b) in 2009 21.2% of households reporting a) or b) or arrears in 2011</td>
<td>Scott et al (ESRI, 2008) DCENR (2009) Watson &amp; Maitre (2015)</td>
</tr>
<tr>
<td>3. Objective</td>
<td>Compare normative fuel expenditure (i.e. that which would need to be spent to maintain certain standard internal conditions) to household income</td>
<td>30% of households in fuel poverty</td>
<td></td>
</tr>
</tbody>
</table>