Employment, energy security and fuel poverty implications of the large-scale, deep retrofitting of the Hungarian building stock.

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Evaluating the Benefits of Low-Income Weatherisation Programmes
Outline

- The context: Hungary’s energy, fuel poverty and employment challenges
- The project: Employment Impacts of a Large-Scale Deep Building Energy Retrofit Programme in Hungary
Mitigation targets
Short-, mid- and long-term

HUNGARY - Total GHG emissions including LULUCF/LUCF

Source: UNFCCC
Energy dependency
Net (extra-EU) imports as % of Gross Inland Energy Consumption (2007)

Source: EEA
Activity rate
Percentage of the 15-64 yo. employed (2010 Q3)

Source: EUROSTAT
Energy performance of the residential stock

Per unit energy consumption scaled to EU average climate

Source: ODYSSEE
Fuel poverty
Energy prices vs. household incomes

**Consumer Price Index** (CPI), price index of goods and services considered in CPI calculations, and increase index of wages and pensions (2000-09)
Fuel poverty
Primary indicators (1)

EXPENDITURE APPROACH:
% of energy expenses vs. net income

9.7% of a household’s net income spent on energy, as an average for the period 2000-2007.

Source: KSH
12.4% of the population declare to be unable to keep their homes adequately warm (2005-2009)

Source: EU SILC

- Expenditure-based measurements seems to be higher than self-reported fuel poverty rates
- Self-reported trends do not follow the expected pattern of development for the late 2000s.
Fuel poverty
Secondary indicators (1)

ARREARS ON UTILITY BILLS
(self-reported)

FUEL POVERTY-RELATED
HOUSING FAULTS*
(self-reported)

Source: EU SILC
*Leaking roof, damp walls, floors or foundation, or rot in window frames of floor
Fuel poverty
Secondary indicators (2)

USE OF TRADITIONAL FUELS FOR SPACE HEATING

Source: KSH
District heating and panel buildings

The thermal trap

DH providers do not easily allow to switch to other fuel or company

Prefabricated panel buildings in suburban areas

Low-income population

Inability to control indoor temperature thermal discomfort

Fixed flat rate, no individual meters

Some consumers fail to pay regularly the tariff: indebtedness

Many DH networks are now obsolete and need modernization both on the heat supplier and on the consumers’ side

European Climate Foundation

3CSEP
Who are the most affected?

- **Lower income population**
  - High energy expenses vs. income ratio, lower quality housing
- **Pensioners / Elders**
  - Most EWDs are people over 60 years old
  - **Switch off the heating** instead of delaying payments
- **Households** connected to **district heating** (DH)
  - Large fixed costs, inability to get disconnected
- **Mono-parental families**
- **Rural poor**
  - Impact of increased **firewood prices** related to biomass use in renewable power generation
  - **Roma population**: electricity theft and illegal firewood collection
Strategies to deal with energy affordability problems

- Maintaining **low indoor temperatures** is only one of the solutions adopted by households…
  - reducing the fraction of the **floor area heated**;
  - **fuel switch**, mostly from natural gas to firewood, a less convenient but cheaper fuel;
  - **payment arrears** and **increased indebtedness** with energy suppliers; and
  - **electricity theft** and **illegal firewood collection**;
  - reducing the consumption of **other basic goods and services** (e.g., education or food);
Outline

- The context: **Hungary’s energy, fuel poverty and employment challenges**
- The project: **Employment Impacts of a Large-Scale Deep Building Energy Retrofit Programme in Hungary**
The project in a nutshell

- **Objective**: to gauge the net employment impacts of a large-scale deep building energy-efficiency renovation programme in Hungary

- **Scope of the research**:
  - Type of buildings: residential and public buildings (no industrial or commercial)
  - Type of renovation: reduce demand for heating (no appliances)
  - Employment effects: direct, indirect and induced

- **Expected results**:
  - Non-employment results: annual investment costs and energy saving benefits, reduction in energy consumption and CO2 emissions.
  - Net employment impacts

- **Two phases**:
  - Preliminary results: 22 March 2010
  - Final report: June 8 2010 (revised results)
Employment effects: overview

- BUILDINGS RETROFITTING programme
  - Job losses
  - Additional disposable income
- ENERGY gen. & distr. sector
  - Job losses
- CONSTRUCTION sector
  - Job gains
  - Job gains
- HOUSEHOLDS
  - Additional spending and job gains
- SUPPLY-CHAIN related sectors
  - Job gains
  - Job losses
- OTHER sectors
  - Job losses
  - Job losses
  - Job losses

- DIRECT effects
- INDIRECT effects
- INDUCED effects
### Scenarios considered

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
<th>Retrofit rate</th>
<th>Type of retrofits</th>
<th>Forecasted completion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S-BASE</strong></td>
<td>Baseline scenario: no intervention</td>
<td>1.3% of the total building stock (around 4.5 million square metres a year, equivalent to 55,000 dwellings)</td>
<td>“Business as usual” retrofits</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>S-DEEP1</strong></td>
<td>Deep retrofit with fast implementation rate</td>
<td>Around 20 million square meter (equivalent to 250,000 dwellings) per year</td>
<td>Deep retrofits</td>
<td>18 years</td>
</tr>
<tr>
<td><strong>S-DEEP2</strong></td>
<td>Deep retrofit with medium implementation rate</td>
<td>Around 12 million square meter (equivalent to 150,000 dwellings) per year</td>
<td>Deep retrofits</td>
<td>28 years</td>
</tr>
<tr>
<td><strong>S-DEEP3</strong></td>
<td>Deep retrofit with slow implementation rate</td>
<td>Around 8 million square meter (equivalent to 100,000 dwellings) per year</td>
<td>Deep retrofits</td>
<td>41 years</td>
</tr>
<tr>
<td><strong>S-SUB</strong></td>
<td>Suboptimal retrofit with medium implementation rate</td>
<td>Around 12 million square meter (equivalent to 150,000 dwellings) per year</td>
<td>Suboptimal retrofits</td>
<td>28 years</td>
</tr>
</tbody>
</table>

#### Retrofit depth (% of kWh/sqm/y)

- S-DEEP3
- S-DEEP2
- S-DEEP1
- S-SUB
- S-BASE
Methodology: building stock model

- **Data on the building stock**
  - # units, size, specific energy consump. for heating
  - Novikova (2008), Korytarova (forthcoming)
  - *Ramp-up* period: progressive implementation rates

- **Costs of suboptimal and deep renovations**
  - Lit. review, case studies (Hungary and Austria)
  - Decreasing cost for deep renovations: learning factors

- **Energy prices**
  - Increase in real energy prices estimated from KSH and IEA.
Methodology: employment impacts

- **Mixed**: Up-scaling + Input-Output analysis

- Labour
- Up-scaling
- Direct (positive) impacts in construction
- Indirect + induced impacts
- Investments
- I/O analysis
- Direct (negative) impacts in energy supply
- Energy savings
- Labour intensity

**Renovation Case Studies**
Carbon emission reductions

CO2 Emissions - Residential and Public Buildings
Including Buildings Built After 2010

- S-BASE
- S-DEEP1
- S-DEEP2
- S-DEEP3
- S-SUB

45% locked-in

85% savings

Year

CO2, MTonne/year

2010 2015 2020 2025 2030 2035 2040 2045 2050
Energy dependency reduction

- Reduced **annual** and **peak imports** of natural gas. Once fully implemented, **deep renovation scenarios**:
  - Save up to 39% of Hungary’s NG imports (2006-2008 levels).
  - NG savings are at the same order of magnitude as Hungary’s **domestic NG production** (2006-2008 levels).

- Reduced peak imports in **January** equivalent to 59% the natural gas imports recorded for that month in 2006-2008.
Annual investment costs vs. energy saving benefits

- Annual savings become higher than the investment needs in 20 years
Financing

- Such programme will need a vast amount of **financing**
  - E.g. in 2020:
    - S-DEEP1 – 3.5 B€ (13% of 2009 HU budget)
    - S-DEEP2 – 2.1 B€ (8% of 2009 HU budget)
    - S-DEEP3 – 1.4 B€ (5% of 2009 HU budget)
- The energy savings are **higher** than the investments, but they **accrue later**
- However, at least part of the initial funds can come from:
  - An **ESCO-type scheme of financing** in which part of the savings go into repaying the investment costs.
  - **EU funds** (e.g., 15% of the funds allocated 2007-13 would provide 400M€ per year)
  - Partially redirecting the **current energy subsidies** (about 800M€ per year)
Net employment impacts
Snapshot in 2020

- Direct effects
  - Calculated with bottom-up method
- Indirect + induced effects
  - Application of I/O tables
  - Indirect + induced impacts have the same order of magnitude as the direct impacts

Total employment impacts for 2020

- Induced impacts from energy savings
- Induced impacts from lost jobs created by reduced demand for energy
- Indirect impacts from reduced demand for energy
- Direct impacts on energy supply sector
- Induced impacts from additional jobs created by investments in construction
- Indirect impacts from investments in construction
- Direct impacts on construction sector
- Total impacts
The initial increase shows the ramp-up period

- The subsequent decrease is due to the learning factor
  - Productivity increases: costs and labour intensities decrease
  - There is practically no learning factor in S-BASE and S-SUB: the technologies are mature
Fuel poverty alleviation

- **S-SUB** renovations (50% energy use reduction)
  - Partial reduction of fuel poverty rates

- **S-DEEP** renovation (85% energy use reduction)
  - Potential eradication of fuel poverty

“The most sustainable way to eradicate fuel poverty is to **fuel poverty-proof** the housing stock, which means that a dwelling will be sufficiently energy efficient that regardless of who occupies the property, there is a low probability that they will be in fuel poverty”

Source: UK DTI 2006, p. 31
Further issues

- **Distributed geographic effects**
  - Buildings renovated *throughout the country*; work mainly done by SMEs
  - Induced consumption also very distributed

- **Durability of effects**
  - The programme lasts *20 to 40 years*, effectively a *worker’s lifetime*

- **Employment effects in the energy sector overestimated**
  - Large fixed costs; job losses probably in “lumps”
  - Rebound effect: increased energy demand due to enhanced consumption

- **Constraints in the supply of labour and materials**
  - Unemployed and inactive population to provide the required labour
  - Possible increase in labour and material costs

- **Real estate**
  - Increased *financial value* and *lifetime* of renovated buildings
Conclusions and recommendations

- **Deep renovation** scenarios deliver **higher climate and energy benefits** as compared to suboptimal renovation scenarios
  - They save **85% of previous energy use** and **carbon emissions** and avoid **locking-in 45%** of 2010 emissions
  - Substantial **reduction** in **annual and peak** (January) gas imports
  - Potential eradication of **fuel poverty** if implemented to a full extent
- **Employment impacts** are **highly positive in the short to medium term**, especially for **deep renovation** scenarios
  - Up to **70,000-180,000 FTE** in the peak year (2015)
    - Around **38%** are **indirect and induced effects** in other sectors
  - **Labour intensity** of retrofits higher than the construction sector’s
  - **Induced effects** stay once renovations have finished
- The major issue is **financing**
  - Current **energy subsidies**, **EU funds** and **pay-as-you-save scheme**.
- A less **ambitious rate of renovation is recommended**
  - Avoid **shortages** in the **labour supply**: less jobs but sustained
  - Avoid **investment shock**: from 2 bln. to 1 bln. € per year
From research to policy-making…

- **Timeframe** of the project
  - March-June 2010 (commissioned by ECF Feb. 2010)
  - General elections in Hungary: April 11-25, 2010
  - Presentation of results: June 8, 2010

- **Policy impact**
  - Late June 2010: the new Hungarian government announces a **new, more ambitious renovation programme** for the residential sector:
    - **100,000** units per year, increasing up to 150-200,000 units per year
    - *Complex* renovations: **70-80%** target energy savings (previously up to 50%)
    - **Hungary** taking **leadership** in advanced EE solutions for the buildings sector
Employment Impacts of a Large-Scale Deep Building Energy Retrofit Programme in Hungary

Thank you for your attention

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