Employment Impacts of a Large-Scale Deep Building Energy Retrofit Programme in Hungary

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Background

- **Climate and energy challenges in Hungary**
  - GHG emissions are below Kyoto targets, but...
  - very high energy dependency, especially from fSU gas
  - the average Hungarian household is in fuel poverty according to the UK definition

- **Thermal inefficiency** of Hungarian buildings
  - Largest energy saving potential among end-use sectors
  - Contribute 50% of energy-related emissions in Hungary

- **Hungary has the second lowest employment rates of**
  - the EU and the OECD
Background

Households’ specific energy consumption (kWh/m2a) scaled to EU average climate. Hungary vs. CEE Member States. Average 2000-2007
Source: own elaboration based on data retrieved from the ODYSSEE database
Background

Activity rate in the European Union, Q2 2009 (selected countries)

Country Activities rate (%)

- Denmark
- Germany
- Austria
- Latvia
- Estonia
- Slovenia
- EU-27
- Lithuania
- Czech Republic
- Slovakia
- Bulgaria
- Poland
- Romania
- Italy
- Hungary
- Malta

Activity rate (%)

- 90
- 85
- 80
- 75
- 70
- 65
- 60
- 55
- 50
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: investments involved, reduction in energy consumption and CO2 emissions, energy cost savings
- Net impacts on Hungarian labour market

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

**BUILDINGS RETROFITTING programme**
- Job losses to **ENERGY gen. & distr. sector**
- Job gains

**CONSTRUCTION sector**
- Job gains

**ENERGY gen. & distr. sector**
- Job losses to **SUPPLY-CHAIN related sectors**
- Job losses

**SUPPLY-CHAIN related sectors**
- Job losses to **OTHER sectors**

**OTHER sectors**
- Additional spending and job gains

**HOUSEHOLDS**
- Additional disposable income

Types of effects:
- **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>S-BASE</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>S-DEEP1</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>S-DEEP2</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>S-DEEP3</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>S-SUB</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>

### Energy efficiency gains (% of kWh/sqm/y)

- **S-BASE**: 1%
- **S-DEEP1**: 3%
- **S-DEEP2**: 6%
- **S-DEEP3**: 9%
- **S-SUB**: N/A

### Retrofit Rate (% of building stock)

- **S-BASE**: 1%
- **S-DEEP1**: 5%
- **S-DEEP2**: 10%
- **S-DEEP3**: 20%
- **S-SUB**: 25%
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
  - Best-case approach for deep (e.g., SOLANOVA)
  - 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

Renovation Case Studies

- Labour
  - Up-scaling
  - Direct (positive) impacts in construction

- Investments
  - I/O analysis
  - Indirect + induced impacts

- Energy savings
  - Labour intensity
  - Direct (negative) impacts in energy supply
Scenario results: CO2 emission reductions until 2050: 45% locked in by S-SUB scenario

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

CO2, Mtonne/year

Year

85% savings

45% lock-in

S-BASE
S-DEEP1
S-DEEP2
S-DEEP3
S-SUB
Energy security benefits

- Reduced import of natural gas (NG)
  - At the end of their implementation, the deep renovation scenarios can save up to 39% of the NG imports in Hungary (2006-2008 levels).
  - The natural gas saved in 2030 is the same order of magnitude as Hungary’s NG production (2006-2008 levels).
Energy security benefits (2)

In January - peak month for imports - the energy savings achieved by 2030 would be equivalent to between 59% (S-DEEP1 scenario), 26% (S-DEEP3 scenario) and 18% (S-SUB scenario) of the natural gas imports recorded for that month.

![Graph showing energy savings in January 2030 in different scenarios compared to January imports (average 2006-2008)]
Scenario results: annual investment needs vs. energy cost savings

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

![Graph showing total employment impacts for 2020 across different scenarios: S-BASE, S-DEEP1, S-DEEP2, S-DEEP3, and S-SUB. The impacts are measured in thousands of full-time equivalents (FTE). The graph includes categories such as 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, and direct impacts on construction sector.]

**Scenario**
- S-BASE
- S-DEEP1
- S-DEEP2
- S-DEEP3
- S-SUB

**Induced impacts from energy savings**
- S-BASE
- S-DEEP1
- S-DEEP2
- S-DEEP3
- S-SUB

**Induced impacts from lost jobs created by reduced demand for energy**
- S-BASE
- S-DEEP1
- S-DEEP2
- S-DEEP3
- S-SUB

**Indirect impacts from reduced demand for energy**
- S-BASE
- S-DEEP1
- S-DEEP2
- S-DEEP3
- S-SUB

**Direct impacts on energy supply sector**
- S-BASE
- S-DEEP1
- S-DEEP2
- S-DEEP3
- S-SUB

**Induced impacts from additional jobs created by investments in construction**
- S-BASE
- S-DEEP1
- S-DEEP2
- S-DEEP3
- S-SUB

**Indirect impacts from investments in construction**
- S-BASE
- S-DEEP1
- S-DEEP2
- S-DEEP3
- S-SUB

**Direct impacts on construction sector**
- S-BASE
- S-DEEP1
- S-DEEP2
- S-DEEP3
- S-SUB

**Total impacts**
- S-BASE
- S-DEEP1
- S-DEEP2
- S-DEEP3
- S-SUB
Direct employment impacts: comparison with other investments

- Labour intensity in renovations is higher than labour intensity in many other sectors
- E.g., many more jobs would be created with these programmes than if the money was spent in building highways or similar infrastructures

![Graph showing direct employment impacts for a specific year (2020) compared with transport infrastructural developments]
Net employment impacts in construction: medium-term view

- The initial increase shows the ramp-up period
- The subsequent decrease is due to the learning factor
  - Productivity increases
  - Therefore costs and labour intensities decrease
  - There is practically no learning factor in S-BASE and S-SUB: the technologies are mature
Further issues

- **Distributed geographic effects**
  - The buildings are renovated throughout the country
  - Work is mainly done by SMEs
  - Induced consumption is also distributed

- **Durability of effects**
  - Such a programme lasts **20-30 years**, effectively a worker’s lifetime

- **Employment effects** in the energy sector
  - Large fixed costs in the energy sector: Job losses are probably in “lumps” – e.g. power stations still need people to maintain them, even if the demand is lowered
  - Some increase in energy demand is expected from other sectors (e.g. commercial, manufacturing) which will compensate the losses from residential sector: **rebound effect**
Further issues (2)

- **Supply of labour**
  - There is availability of labour in Hungary for all skill levels
    - Entrepreneurs, professionals
    - Skilled, unskilled – among unemployed and inactive
  - However, these workers need to be attracted to the construction industry
    - Training
    - “Promotion” of the sector
    - Possibly higher wages (at least in the beginning)
  - Population aging
  - What if there is no sufficient labour supply?
    - Guest workers might be brought in

- **Such a large-scale program** is likely to raise the **wage level** in the country
  - Increases the costs of the project
  - Increases the costs of other investments (because opportunity costs are higher)
  - But also increases consumption (hence more induced effects)

- **Supply of materials**
  - Manufacturing must keep up with the increased demand from construction sector
Further issues (3)

- **Grey labour**
  - Opportunity for the State to *increase the control* on grey labour in construction

- **Fuel poverty**
  - Such a programme has the potential of *eradicating* fuel poverty
  - Great attention has to be put in financing, especially for the lower income households

- **Real estate markets**
  - The value of buildings increases
  - The lifetime of buildings is extended
Financing

- Such programme will need a vast amount of **financing**
  - E.g. in 2020:
    - S-DEEP1 – 3.5 B€\textsubscript{2005} (13% of 2009 HU budget)
    - S-DEEP2 – 2.1 B€\textsubscript{2005} (8% of 2009 HU budget)
    - S-DEEP3 – 1.4 B€\textsubscript{2005} (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:
  - **EU funds** (up to 400M€ per year)
  - Redirecting the **current energy subsidies** (about 800M€ per year)
  - An **ESCO-type scheme of financing** in which part of the savings go into repaying the investment costs
Energy subsidies in Hungary

**Biofuel**: relatively little CO2 emission mitigation at a high cost

**District heating VAT discount**: further decreases energy efficiency

**Coal subsidy**: artificially increases the competitiveness of high carbon intensity energy

**Gas subsidy**: decreases energy efficiency and competitiveness of renewable heat

**Feed-in tariff for co-generation**: predominantly subsidy of gas based co-generation, decreases competitiveness of renewable heat

- 300 Bn HUF state investment to a new lignite plant.
- 1 Mt additional CO2 emission compared to a BAT gas turbine

Source: slides from Mr. Laszlo Varro, Strategy Director at MOL
Summary of results: conclusions

- **Deep renovation** scenarios deliver **higher climate and energy benefits** as compared to suboptimal renovation scenarios
  - Deep retrofit scenarios can save 85% of energy use and relative carbon emissions
  - A suboptimal scenario locks in 45% of 2010 heating-related emissions
  - Deep retrofit scenarios can reduce up to 39% of annual natural gas needs in 2030, 59% in the critical month of January (compared to average 2006-2008 values)
  - A suboptimal scenario will reduce imports of 10% only (18% in January)
  - The construction sector has the opportunity of learning new techniques which will inevitably be state-of-the-art in a few years

- **Employment impacts** are **highly positive in the short to medium term**, especially for **deep renovation** scenarios
  - 131,000 jobs created in S-DEEP1, 78,000 in S-DEEP2, 52,000 in S-DEEP3, 43,000 in S-SUB
    - Around 38% are indirect and induced effects in other sectors
  - Labour intensity in deep retrofit is higher than if the money was invested in other initiatives (e.g., 5 times higher than road construction)

- **The major issue is financing**
  - The renovation programmes would have a high impact on the state’s budget (up to 13% for S-DEEP1, 8% for S-DEEP2, 5% for S-DEEP3)
  - However, a large amount of money (up to 1 billion Euros) can come from the EU or from redirecting current energy subsidies (e.g. to gas and district heating)
  - Part of the initial investment costs can be financed by a pay-as-you-save financing scheme
Summary of results: recommendations

- To promote a **deep renovation** program with a **less ambitious rate of renovation**
  - e.g. *S-DEEP3* – (2.3% of the floor area, 100,000 dwellings-equivalent)
  - 52,000 jobs created by 2020
  - Less than 2 Billion Euros of peak annual investment, 1 bln in later program phases

- The **employment impacts** are **slightly lower** but **sustained**: no shock in the economy and in the industry
  - The slower rate of renovation allows for a “smooth” transition period
  - Time is allowed for the firms to learn, train employees and increase production of materials
  - The learning factor ensures that the costs become lower throughout the years
    - The investment shock is reduced
    - Less money is “locked in” on renovations which could have been less expensive in following years
  - Labour supply issues and wage effects are reduced

- The **public administration** should be **involved** in planning and financing
  - To assure that deep renovations and thus savings are achieved
  - To reduce potential supply bottlenecks
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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