Energy Policies in Luxembourg

ASSESSING THEIR IMPACT ON HOUSEHOLDS' SPACE HEATING ENERGY CONSUMPTION AND CO_2 EMISSIONS

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CIRED Summer School, July 2018

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1. Goal of the paper

The Luxembourgish residential sector :

- accounts for a major part of the energy consumption	- is a cost-effective way for energy savings and carbon dioxide mitigation

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key in achieving the national energy targets

1. Goal of the paper

energy-efficiency gap = cost-effective energy efficiency measures – actually implemented measures

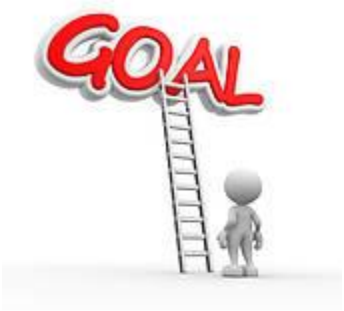
explained by marked failures and barriers to energy efficiency

minimised

1. Goal of the Paper

Find the policy, resp. policy combination, with the greatest mitigation effect on residential :

A. space heating energy consumption
B. CO_2 emissions



2. Model features

A modified version of the French dynamic simulation model Res-IRF is used.

hybrid energy-economy model

- Updated
- Refined
- Adapted to the Luxembourgish territory’s specificities and the disposable national data

2. Model features

$$E_{fin}(\tau) = S(\tau) \cdot \rho \cdot F$$

Effectively needed energy for residential space heating

Building stock

Theoretically needed energy

Adjustment factor

2. Model features

$$E_{fin}(\tau) = S(\tau) \cdot \rho \cdot F$$

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Building stock

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	1. Existing buildings	2. New constructions
Energy classes	$E = \{I, \dots, B, A\}$ $e \in E$	N= $\{B, A, ZEB, PEB\}$ $n \in N$

$$E_{fin}(\tau) = \sum_{k \in E \cup N} S_k(\tau) \cdot \rho \cdot F$$

2. Model features

The building stock $S(\tau)_{k \in E \cup N}$ is dynamic

a part of the non-destroyed existing stock is retrofitted

newly constructed stock grows

2. Model features

1. Existing buildings	2. New constructions
a) **IF** proportion of retrofits of energy class e buildings is determined	a) **IF** the number of new constructions is determined
b) Proportion of retrofits from energy class i to f : $$PR_{e,f}(\tau) = \frac{LCC_{e,f}^{-\nu}(\tau)}{\sum_{h>e} LCC_{e,h}^{-\nu}(\tau)}$$	b) Proportion of new constructions of energy class n : $$PRN_n(\tau) = \frac{LCCN_n^{-\nu}(\tau)}{\sum_k LCCN_k^{-\nu}(\tau)}$$

2. Model features

$$PR_{e,f}(\tau) = \frac{LCC_{e,f}^{-\nu}(\tau)}{\sum_{h>e} LCC_{e,h}^{-\nu}(\tau)}$$

$$PRN_n(\tau) = \frac{LCCN_n^{-\nu}(\tau)}{\sum_k LCCN_k^{-\nu}(\tau)}$$

«$-\nu$ » is a measure of market heterogeneity (barrier):

- high values of ν - describe a homogeneous market
- low values of ν - describe a more heterogeneous market

2. Model features

$$E_{fin}(\tau) = \sum_{k \in E \cup N} S_k(\tau) \cdot \rho_k \cdot F_k$$

Theoretically needed energy (in $kWh_{fs}/m^2/year$)

Adjustment factor $= \frac{effectivally\ needed\ energy}{theoretically\ needed\ energy}$

3. Extended empirical study

Adjustment factor :

$F_k \longrightarrow F_{k,c,p,D}$

k : energy class
D : socio-economic variables, e.g. households' income or occupancy status
c : energy carrier
p : energy price

4. Evaluated policies

Applied	**Estimated**
Credits at Reduced Interest Rate	Credits at Zero Interest Rate
Energy Tax	Carbon Tax
Energy Performance Requirements for New Buildings	Remediation Duty for Existing Buildings
Grants for: • insulation measures on existing dwellings, • green building, • sustainable heating systems.	

Thank you very much for your attention!