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A macro-micro outlook on fuel poverty in 2035 France

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Research content

- Applied focus
 - Outlook on **fuel poverty** in 4 influential French macro scenarios
 - Aggregate evolution + **distribution** over income groups
 - **Policy** levers to counter phenomenon (not in 1st paper)
- Methodological contribution
 - **Hybrid energy/economy modelling** extended to households consumptions
 - Combination of **macro and micro scales**

Model architecture at a glimpse

- Hybrid CGE IMACLIM extended to secondary income distribution
 - Calibrated on harmonised [energy/economy](#) matrices
 - Household consumption centred on [urban economics](#) to project [housing size driver of energy use](#) (with demography)
 - Households' [heating mix](#) and [building renovation](#) trade-offs calibrated on engineering model RES-IRF
 - [Secondary distribution of income](#) extending to household quintiles
- 'Microaccounting' with reweighting (Agénor, 2004)
 - 10240 households of 2006 survey scaled up to 2035 for [9](#) consumptions and [6](#) income sources, according to IMACLIM results for each quintile
 - [Reweighting](#) of households to accommodate [Linking Aggregate Variables](#) allows re-creating variability within each quintile

Application to
Fuel Poverty outlook
in 2035 France

4 scenarios aligned on CAS

Variations 2006-2035		WCS	UGS	SGC	SGC+
GDP (CAS)		+48% (1.35%/year)	+58% (1.58%/year)	+75% (1.95%/year)	+80% (2.04%/year)
Unemployment (CAS)		-0.3 pts (8.5%)	-1.3 pts (7.5%)	-2.3 pts (6.5%)	-4.3 pts (4.5%)
Real E prices (AIE)	Oil	+102%	+102%	+79%	+79%
	Gas	+44%	+44%	+30%	+30%
	Coal	+82%	+82%	+67%	+67%
Average TR impact		-47%	-47%	-70%	-70%
Carbon tax (CAS)		€0	€0	€127	€127

Shared scenario assumptions (1)

- Demography (INSEE and COR)
 - Total population +13%
 - Active population -1%
 - Retired population +54% ⇒ budget unbalance
- Labour productivity adjusted to match GDP target
- Exports growing at 2%/year outside price effects
- Constant fiscal system (rates, bases, real excises)
- Public expenses and investment constant GDP shares

Shared scenario assumptions (2)

- Public debt brought back to 60% of GDP
 - By adjustment of social transfers (u. benefits, pensions, remainder): highly regressive hypothesis...
 - ...But any additional tax proceeds fuels social transfers thus has progressive recycling
 - No 'optimisation' of recycling option in sustainable scenarios
- Average wage differentials across quintiles kept constant
 - Progressive bias? Will require further exploration

Fuel Poverty prevalence

Low-Income & High-Cost measure

	2006	4 scenarios 2035
Households in FP	1.9 million	2.5 – 2.8
<i>Proportion</i>	7.5%	7.9% - 8.8%
Residential E of FP	€3.8 billions	5.5 – 5.9
<i>Proportion</i>	10%	11% - 12%
...as share of GDP	0.21%	0.20% - 0.21%
... for Q1 households	0.12%	0.16% - 0.17%

Expenses in constant 2006 euros.

Fuel Poverty risk

3 variants

- Oil and gas price volatility (+25%)
 - WCS +374k FP households of which 246k Q1
 - CSS+ +306k FP households of which 172k Q1
- Persisting labour market disequilibrium
 - WCS with 10% u +118k FP households of which 48k Q1
 - (CSS vs CSS+ = +154k FP households of which 43k Q1)
- Increased income inequality
Lag of 40, 30, 20, 10% of wage increases of Q1, ..., Q4 compared to Q5
 - WCS +120k FP households of which 51k Q1
 - CSS+ +171k FP households of which 74k Q1

Conclusions

Slightly growing and volatile FP

- 2035 Fuel Poverty slightly above 2006, fairly stable across macroeconomic scenarios
 - 0.6 to 0.9 million additional FP households, slight increase of prevalence (+0.4 to +1.3 pts)
 - Total weight in GDP stable... but Q1 weight increasing
- FP volatile following international fossil prices, income inequalities and unemployment rate
 - 600k+ households under threat whatever the growth scenario (+20/+25%)
 - ... of which 56% Q1 households in low-growth scenarios vs. 42% Q1 households in high-growth & carbon tax scenarios

Methodological *Caveat*

- **Outlook, not prediction**
 - Combination of assumptions 'all other things equal'
- 2 influential default assumptions
 - Fix distribution of average wage constrains inequality dynamics
 - Fix distribution of unemployment across quintiles causes lower quintiles more sensitive to u assumption
- Behavioural functions of quintiles require further work
 - Validity and differentiation of residential E trade-offs
 - Relevance of urban economics core
 - Link to work on modal share

Cf.

Gherzi, F., Ricci, O. (2014), *A macro-micro outlook on fuel poverty in 2035 France*, CIREN Working Paper 56
(soumis)

Gherzi, F., (2014), *The IMACLIM-P model version 3.4*,
CIREN Working Paper 57

Merci !

Extra Material

IMACLIM-P

A hybrid CGE

extended to distributive issues
applied to prospective outlook (P)
in a framework of exogenous growth
with a systemic approach
to household consumption

IMACLIM-P: a hybrid CGE

- Economy-wide coverage
 - All productions, all factors following national accounting (IOT), +/- aggregated
- At "equilibrium"
 - Prices balance out supply and demand
 - ...but **imperfect markets**: mark-up pricing
- Performing on a hybrid IOT
 - Consistency of national accounting and Energy balance
 - Calibration of specific margins to account for **agent-specific prices** of E goods and m² housing
 - Behavioural functions calibrated on BU model: heating

Extended to distributive issues 1

- **Primary income distribution** to 3 domestic agents
 - Households, firms, public administrations, share factor income on K and L
- **Secondary income distribution**: transfers between agents including interests on net financial debt = accumulated C/I unbalances
- The **Rest of the World** supplies and demands at international prices and balances out financial flows (no specified behaviour)

Extended to distributive issues 2

Household **quintiles** differ by

- Demography
 - Total, occupied, unemployed, retired population
- Income structure
 - Labour payments, capital payments, share of GOS (rents), unemployment benefits, pensions, social transfers, other transfers
- Expense structure
 - Direct taxes, savings, consumption trade-offs

...hence differentiation of impacts of macro evolutions including that of unemployment

Exogenous growth outlook

- Exogenous growth drivers
 - Domestic growth: demography, labour productivity (Harrod), unemployment rate
 - Prices of imported energy
 - Growth of global markets
- *Mission Rocard* (2009) model IMACLIM-S v2.3 except
 - Accumulation of agents' net debts
 - Exogenous unemployment rate (vs. wage curve)
 - Constant public policies without balance constraint (vs. “budget neutrality”)

Systemic approach to household consumption

- Core system: **urban economy** approach
 - Budget share of housing constant in consumed income net of constrained transport
 - **Housing surfaces induce constrained transport needs**
- Residential energy disaggregated in uses
 - Specific electricity grows with population, exogenous
 - Other non-heating uses: population trend but variable mix
 - Heating follows housing surface corrected from thermal regulation and is traded against Buildings as in Giraudet (2011)
- Trade off between public transport and vehicle fuel for constrained and free transport

Microaccounting 2035

Disaggregation
of IMACLIM quintiles 2035
via upscaling and reweighting of
10240 households of 2006 budget survey

Motivation

- From 5 aggregate classes to 10240 household types
 - Distributive impact at finer grain (Gini only: over 10 classes)
 - Possibility of further disaggregation, re-aggregation on other criterion (income, SPG, localisation, housing type, *etc.*)
- Access to numerous budget survey series to enrich outlook
 - Outlook, not prediction! Substantial societal shifts if weights are massively changed
 - Possibility of additional constraints on survey variables not covered by IMACLIM: link to other expertise

Characterisation of survey households used as Linking Aggregate Variables

- 6 income sources
- 4 demographic variables
- 9 expenses: real & imputed rents, housing renovation work, public transport, vehicle fuel, electricity, light fuel oil and bottled gas, mains gas, coal and derivatives
- 1 housing surface
- 1 'weight' measuring representativeness
- 1 living-standard (income per CU) quintile

Calibration of IMACLIM-P quintiles

Aggregation of original survey in quintiles provides disaggregation keys of 2006 national aggregates of

- Demography (including unemployed)
- Income sources
- Investment (via its return)
- Housing surfaces → calibration of average rent specific to quintiles via specific margins
- Expenses (via budget shares)

Return from IMACLIM run to survey: Micro-accounting with reweighting

- Creation of a **pseudo-base** of 10240 households in 2035
 - Upscaling of 6 income sources and 9 expenses of each survey household by use of *per capita* variations computed by IMACLIM for their quintiles
- Reweighting of **pseudo-base** 2035
 - Adjustment of representativeness weights of households to match weighted survey totals to IMACLIM results and exogenous demography, for each quintile and for each LAV