



Do proposed policies meet French energy conservation targets? Insights from prospective modelling

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French energy conservation policy

- Environmental targets implying energy conservation

Goal	Target	Time horizon	Scope	Requirement level
Reduce GHG emissions	-75%	2050, compared to 1990	All sectors	French Law, 2005
Reduce energy consumption	-38%	2020, compared to 2008	Building sector	French Law, 2009

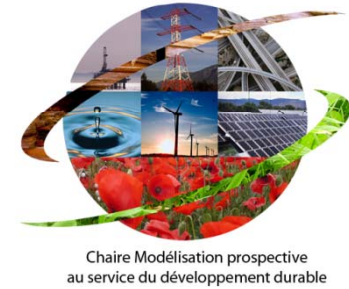
- Focus on policies targeting the household sector
 - Implemented: income tax credits (2005), 0% rate loans (2009)
 - Agreed: stringent building codes for 2012 and 2020
 - Considered: carbon tax (2010?), retrofitting obligation (2020?)

→ *Means appropriate to targets? Policy interaction?*

Outline

1. Modeling framework
2. Stand-alone policy comparison
3. Policy combination

Nb: focus on retrofitting actions



1. Modeling framework

Model overview

- A dynamic recursive hybridation of
 - **IMACLIM-R France**: CGE model of the French economy
 - Res-IRF: simulation module of residential heating demand (66% of total D)
- Scope of Res-IRF
 - Building stock represented by energy class (from G to A)
 - Energy carriers: electricity, natural gas, fuel oil
- A discrete-continuous approach of energy conservation
 - *Efficiency*: discrete choice for energy class upgrade (e.g. G→F,...,A)
 - *Sufficiency*: continuous adjustment of equipment utilization to energy prices
- Incorporation of some « barriers » to energy efficiency
 - *Split incentives* through heterogeneous discount rates (7% to 40%)
 - *Imperfect information* through intangible costs

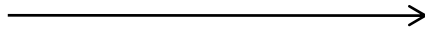
Drivers of energy conservation

- Energy efficiency improvements in existing dwellings
 - Life-cycle cost comparison for energy class transitions
 - Increase both the *quantity* and *quality* of retrofits
- Self-reinforcing processes on energy efficiency demand and supply
 - *Information acceleration*: intangible costs decreasing with cumulated retrofits
 - *Learning-by-doing* on investment costs
- Impediment of net energy savings
 - Exhaustion of the techno-economic potential
 - Direct rebound effect or *sufficiency relaxation* (for some policies)

Policy implementation

Income tax credit 2009-2020

- Rebate by 50% of investment cost
- Capped at 8,000€ per dwelling



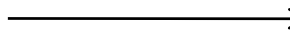
0% rate loans 2009-2020

- Loan soften by 4% over 10 years
- Base capped at 30,000€ per dwelling

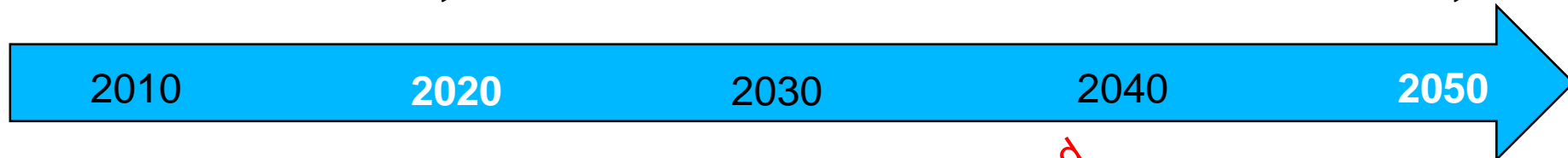


Stringent building code

- Low consumption level in 2012
- Passive level in 2020

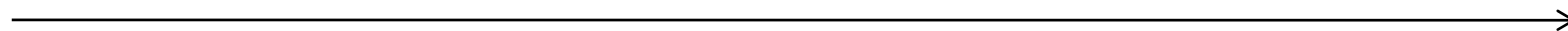


Agreed



Carbon tax

- 32 €/tCO₂ in 2010
- Increase by 5.8% pa until 2030, 4% afterwards

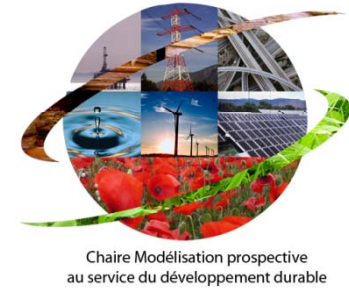


Considered

Retrofitting obligation for each occupancy change

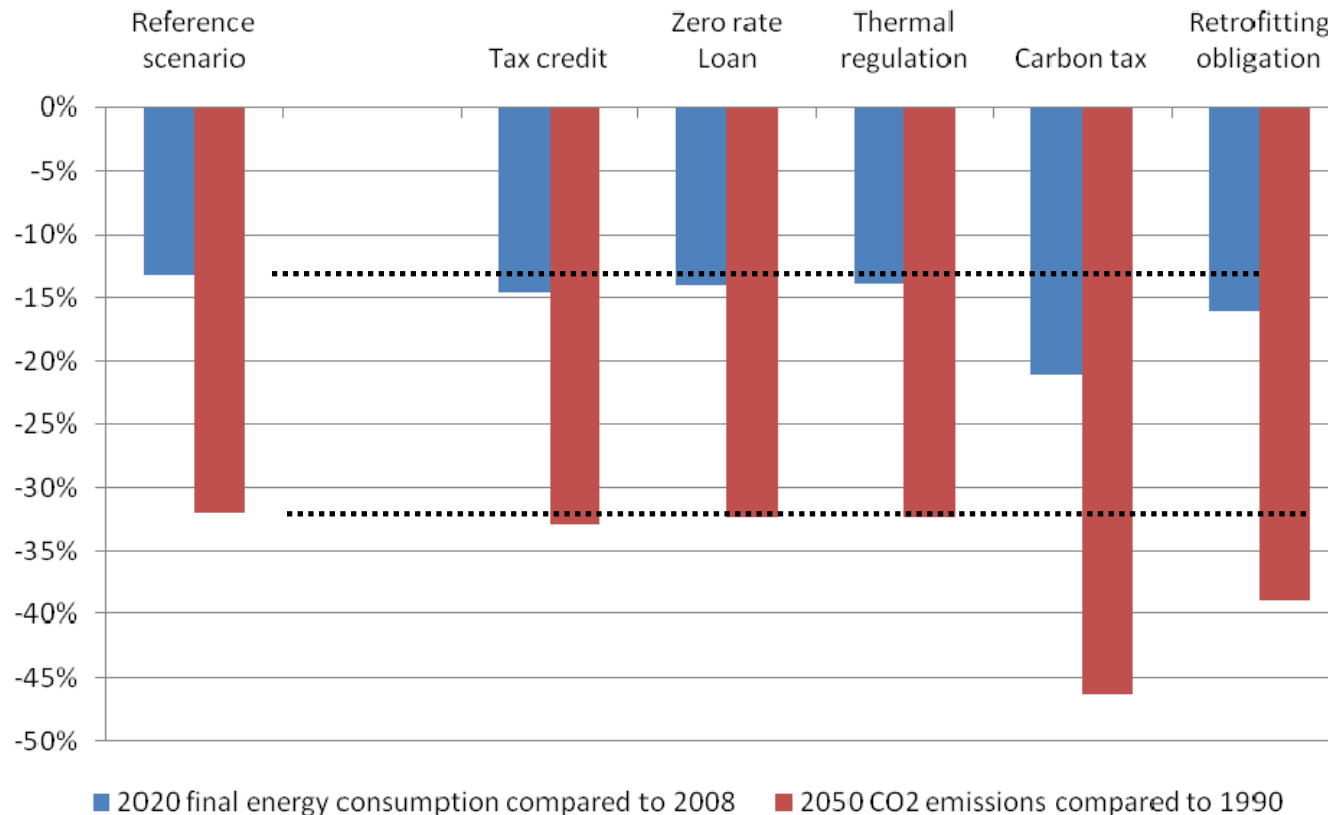
- Dwellings rated below class C must upgrade to minimum class C
- Incremental implementation, from class G in 2016...to class D in 2028





2. Stand-alone policy comparison

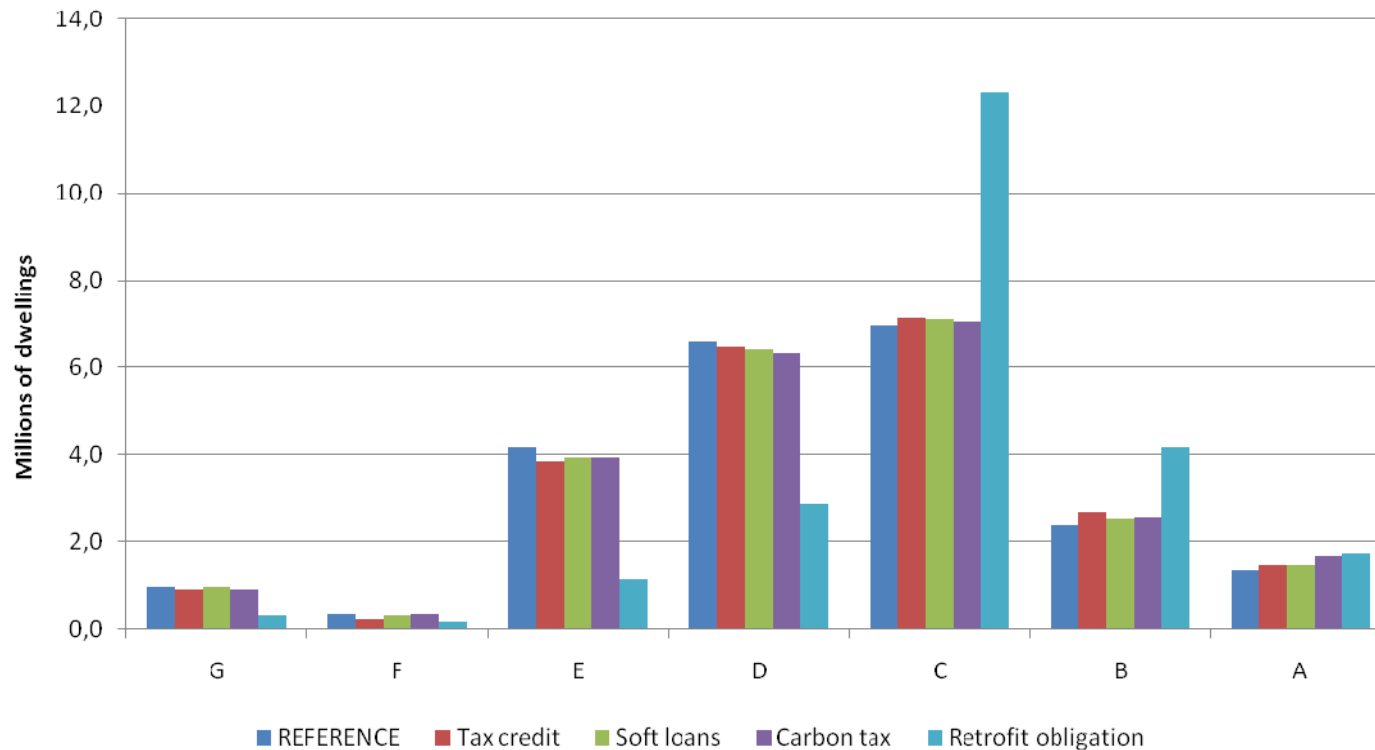
Effectiveness to targets



- Carbon tax and retrofitting obligation outperform
- Savings from other instruments are poorly additional to the reference

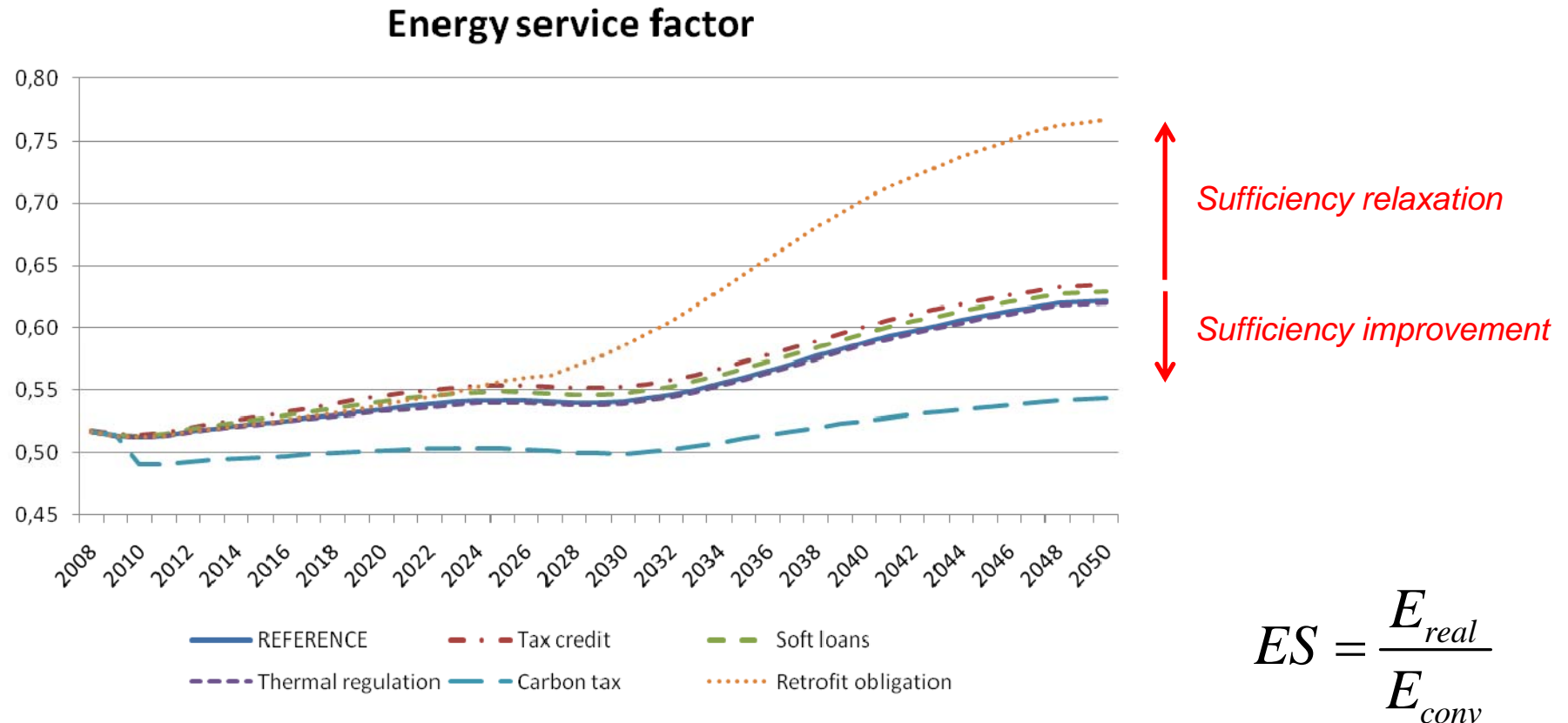
Impacts on efficiency choices

Structure of the existing building stock in 2050



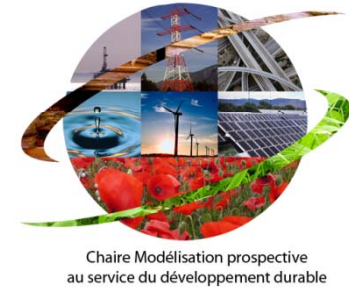
- Retrofitting obligation taps potentials untackled otherwise
- Choice restriction favors the most efficient solutions

Impacts on sufficiency



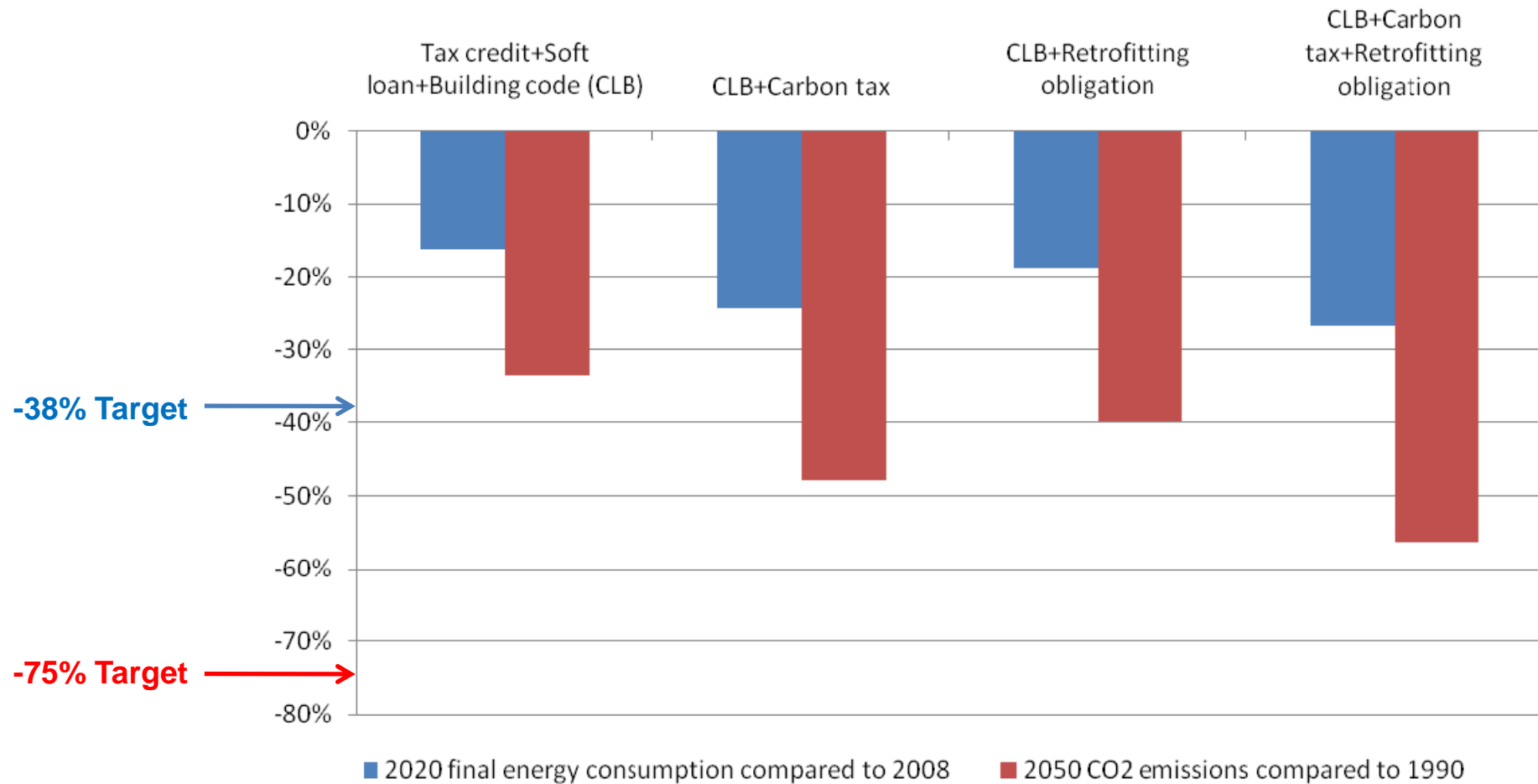
$$ES = \frac{E_{real}}{E_{conv}}$$

- Higher energy prices lower utilization rate (carbon tax)
- Otherwise, the larger the energy efficiency improvements, the stronger sufficiency relaxation

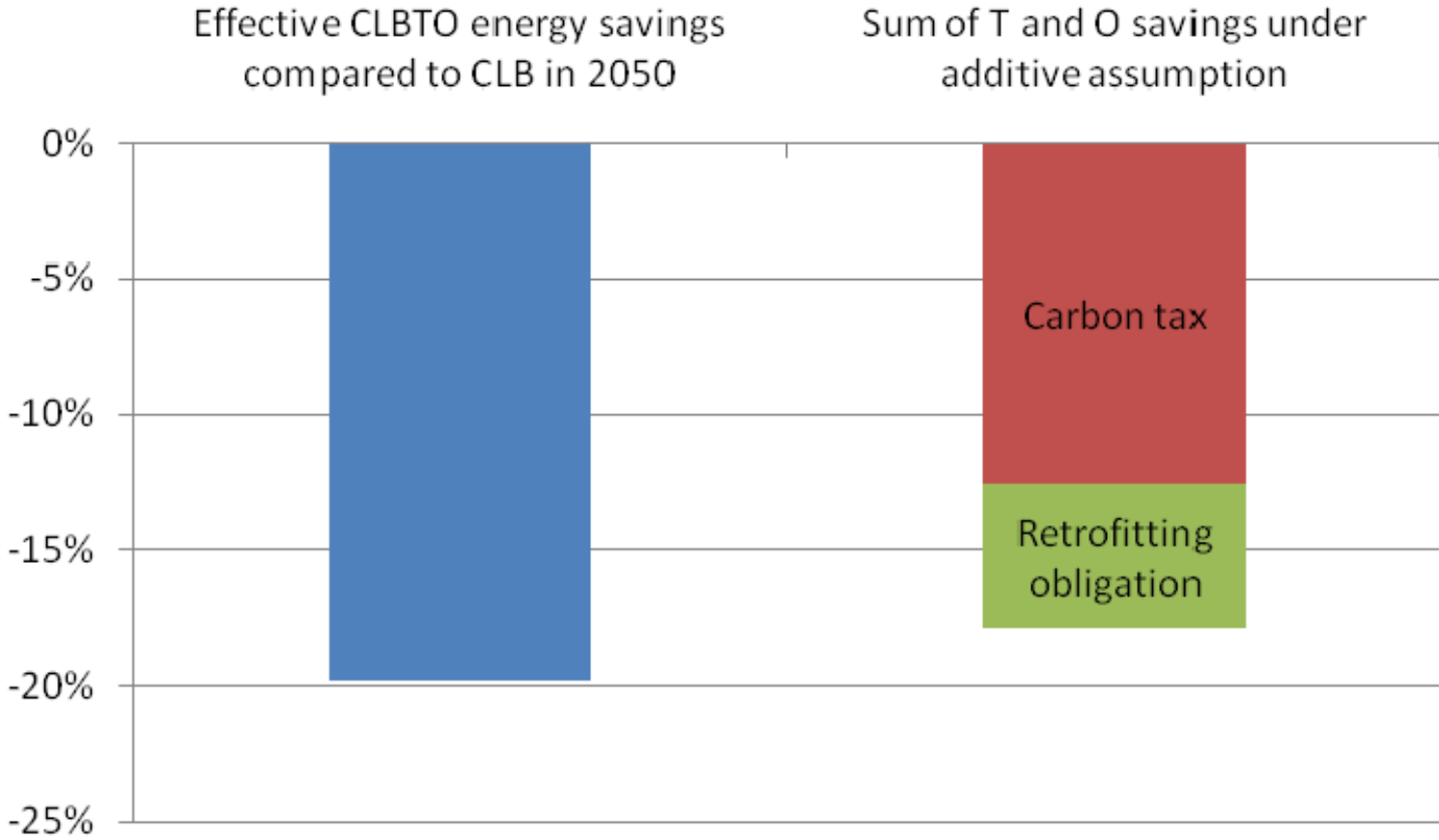


3. Policy combination

Discussed packages do not meet targets

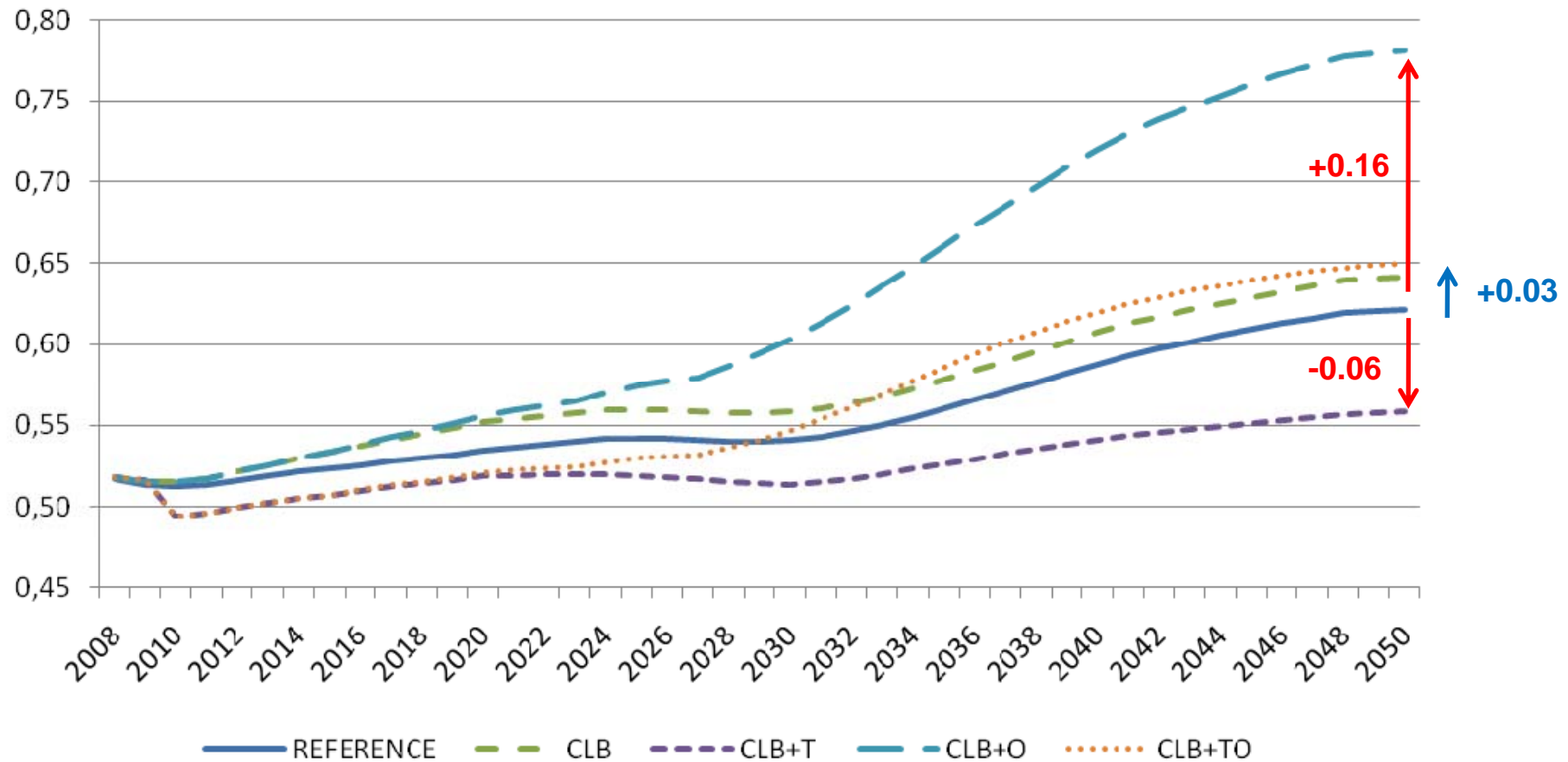


Over-additive interaction of T+O



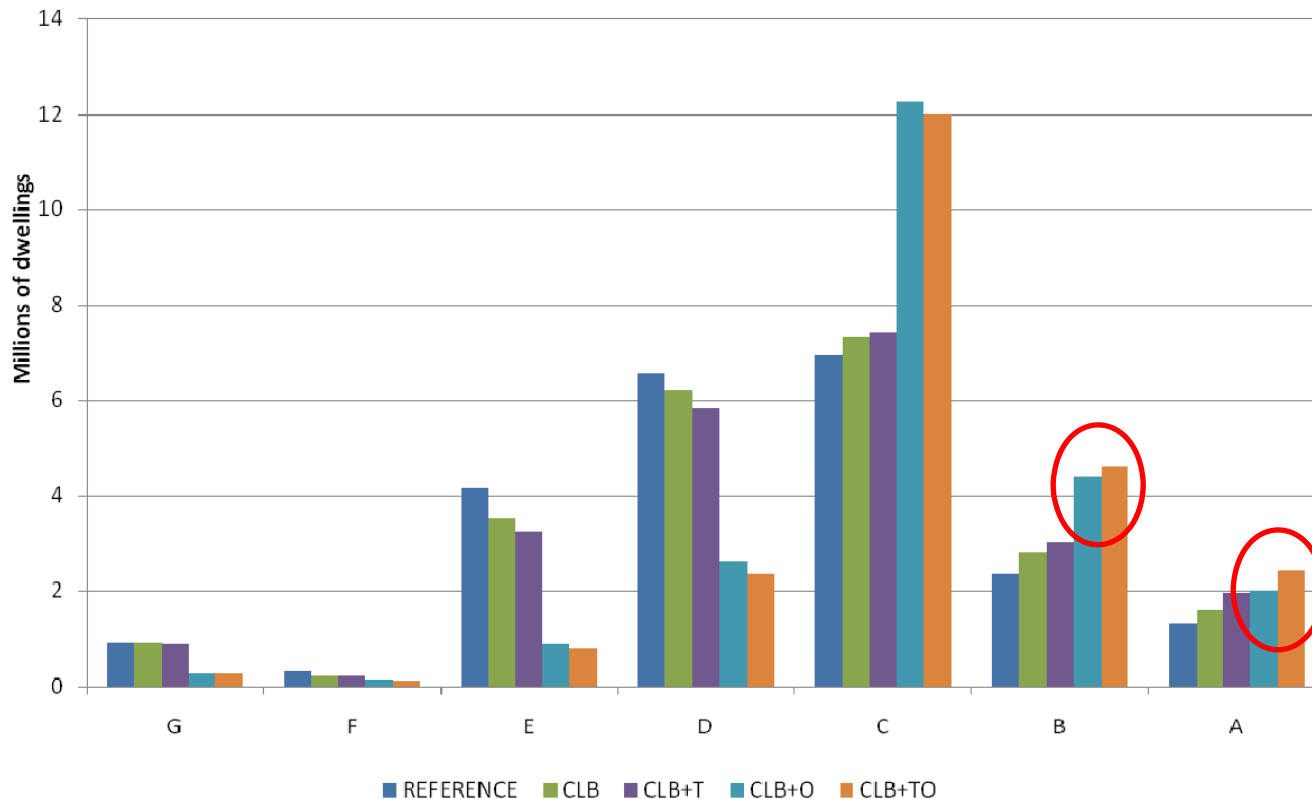
Tax drives sufficiency relaxation

Energy service factor



Obligation drives efficiency choices

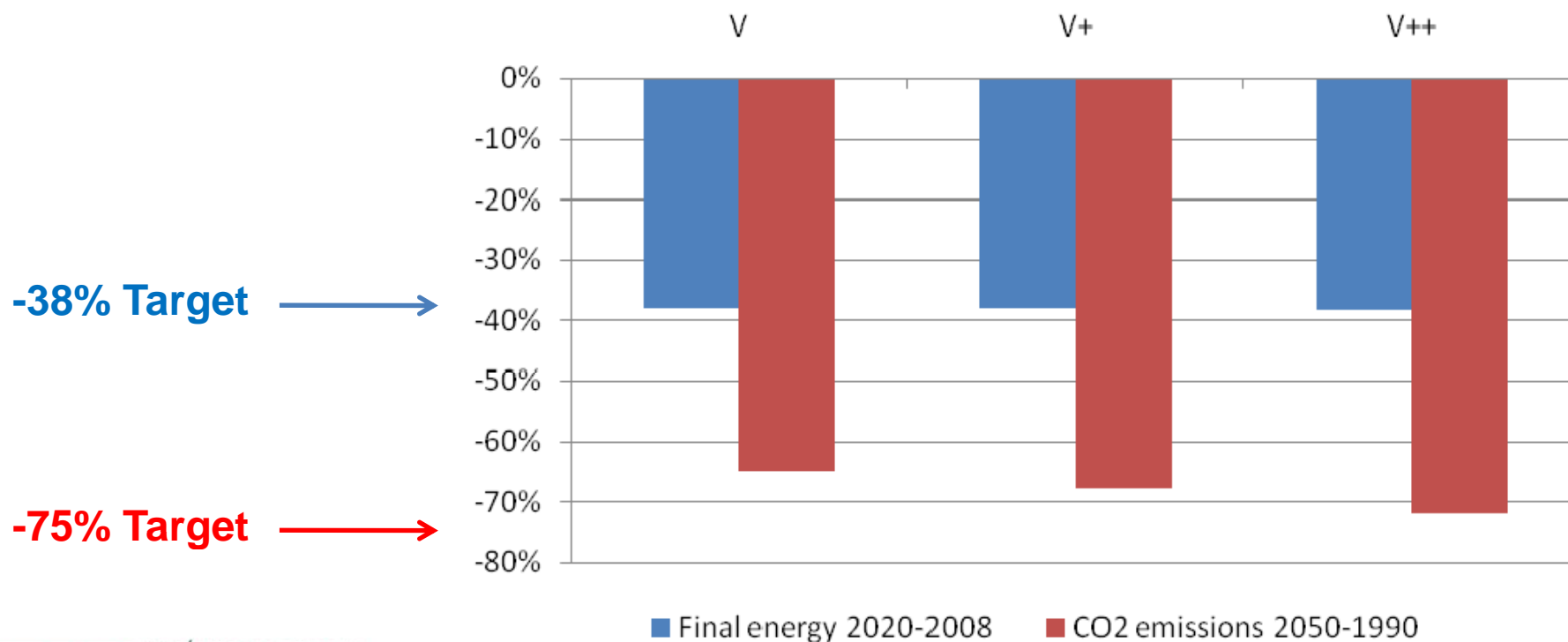
Structure of the existing building stock in 2050



- Tax influences constrained choices towards classes B and A
- Lower rebound effect in those very efficient energy classes

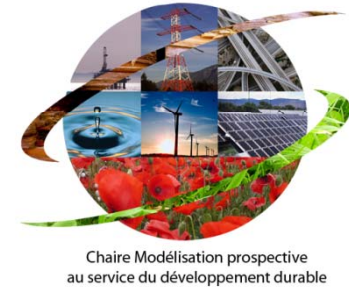
Voluntarist packages closer to targets

- V = CBLTO with a 120€/tCO₂ carbon tax in 2010
- V+ = V with tax credits and soft loans prolonged to 2050
- V++ = V+ with retrofitting obligation to B



CONCLUSIONS

- Limitations
 - Model focused on residential heating
 - Effectiveness assessment (forthcoming cost assessment)
- Policy-making
 - Targets far from being met with proposed packages
 - Need for ambitious carbon tax and stringent obligation
- Methodological issues
 - Model rigidity might be inherent to endogenous feedbacks
 - Stand-alone policy ranking in line with usual results
 - Interactions depend upon policy parameters



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