



Long-term efficiency and distributional impacts of energy saving policies in the French residential sector

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Stratégie nationale bas-carbone mandates:

1. Reduction of energy use by 20% in 2030 and 50% in 2050 compared to 2012
2. Yearly renovation of 500,000 dwellings
3. Elimination of EPC labels F et G by 2025
4. Performance label B or higher widespread by 2050
5. Fuel poverty alleviation by 15% in 2020

Supporting policies:

1. Income tax credit
 2. Zero-interest loans
 3. Reduced VAT
 4. Carbon tax
 5. White certificates
 6. Building codes
- + others



***Effectiveness to targets?
Policy efficiency and distributional impacts?***

- An assessment using a significantly updated version of **Res-IRF**, a behaviorally-rich model of residential energy efficiency

Res-IRF

Giraudet et al., En J, 2011
 Giraudet et al., En Econ, 2012
 Branger et al., Env Mod Soft, 2015

TECHNICAL PARAMETERS

Renovation and construction costs
 Demolition rates



INPUTS

Population
+0.3% p.a.

Household income
+1.2% p.a.

Fuel prices
~ +1.5% p.a.

	G	F	E	D	C	B	A
G	Yellow						
F	Grey	Yellow					
E	Grey	Grey	Yellow				
D	Grey	Grey	Grey	Yellow			
C	Grey	Grey	Grey	Grey	Yellow		
B	Grey	Grey	Grey	Grey	Grey	Yellow	
A	Grey	Grey	Grey	Grey	Grey	Grey	Yellow

OUTPUTS

Renovation and constr.
(ext./int. margins)

Resulting consumption
for elec, ngas, oil, wood

Heating comfort



Landlord-tenant dilemma
 Barriers to decision-making in collective housing
 Non-energy costs
 Credit constraints

BEHAVIORAL PARAMETERS

*Main extension
 in version 3.0
 (based on
 Phébus survey)*

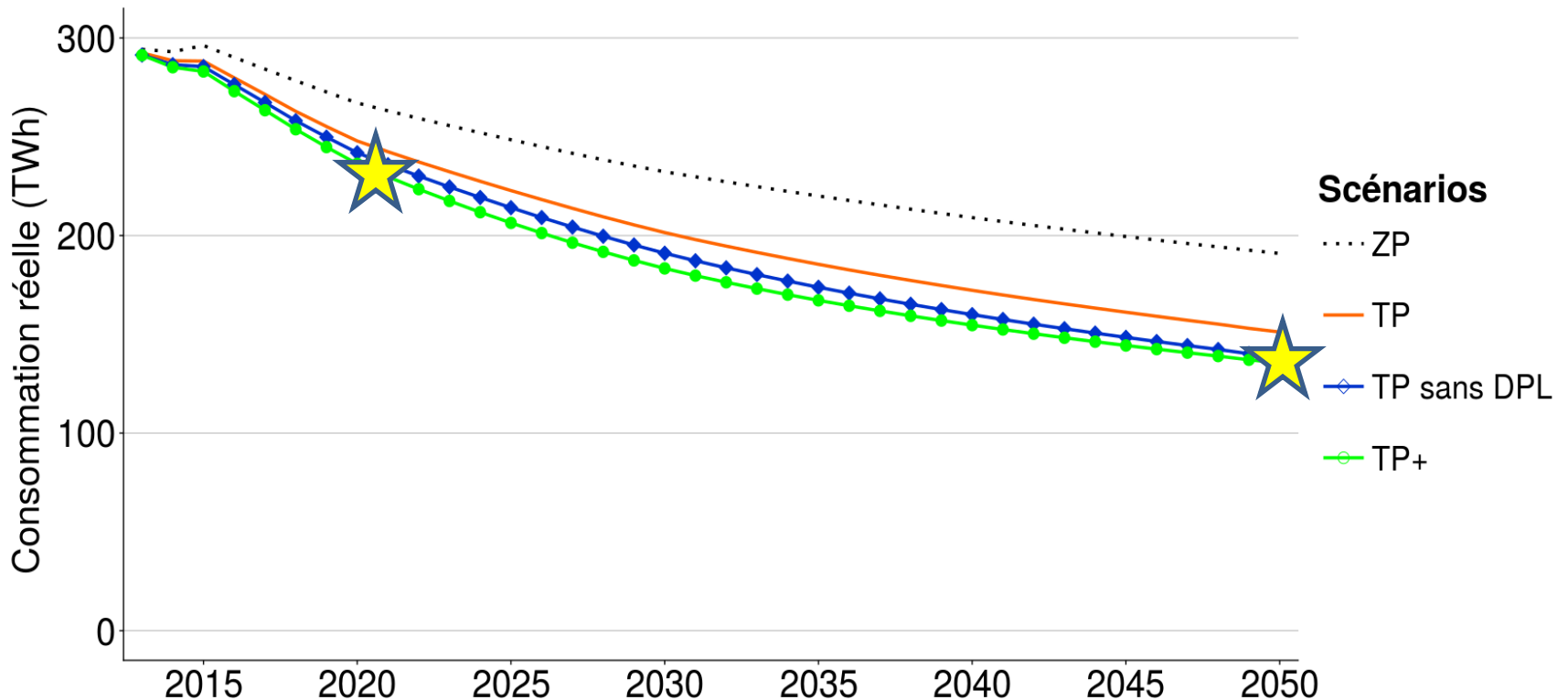
Policy parameters

	Reference variant	Tighter variant
CITE	17% ad valorem subsidy, uniform rate	Restricted to high performance
EPTZ	~9% ad valorem subsidy, restricted to HP	Higher rate ~23%
CEE	Non-uniform subsidy, equivalent to an average ad valorem rate 5% + energy tax	Subsidy and tax components x3
Taxe C	Myopic expectation	Perfect expectation
TVA r	VAT rate of 5,5% instead of 10%	
RT 2020	BEPOS level mandatory in 2020	

4 scenarios

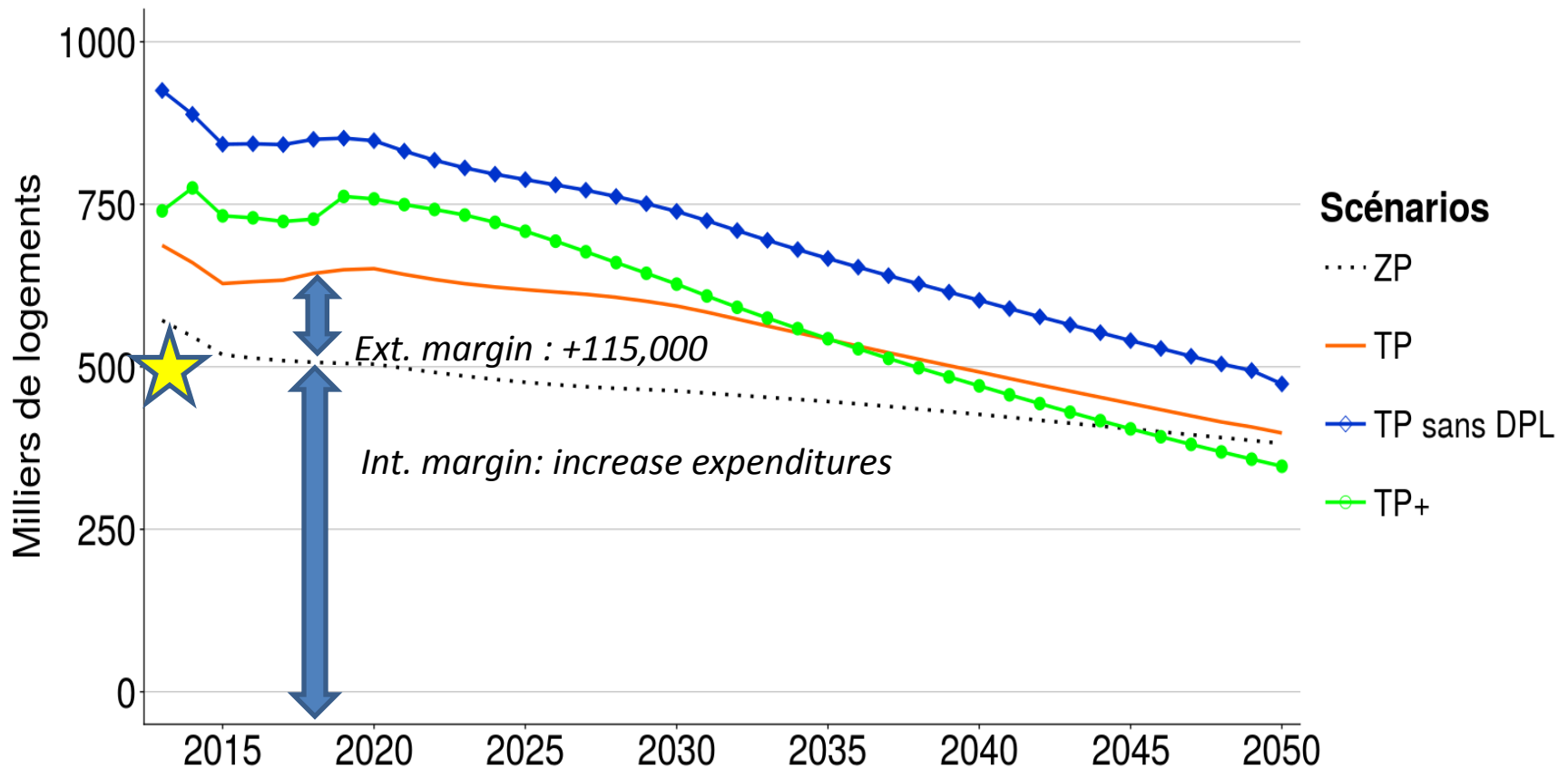
- All policies (TP)
 - No policy (ZP)
 - All policies in their tighter variant (TP+)
 - All policies, no land./ten. dilemma (TP sans DPL)
- ~ reference
} counterfactuals

Target 1: Energy use



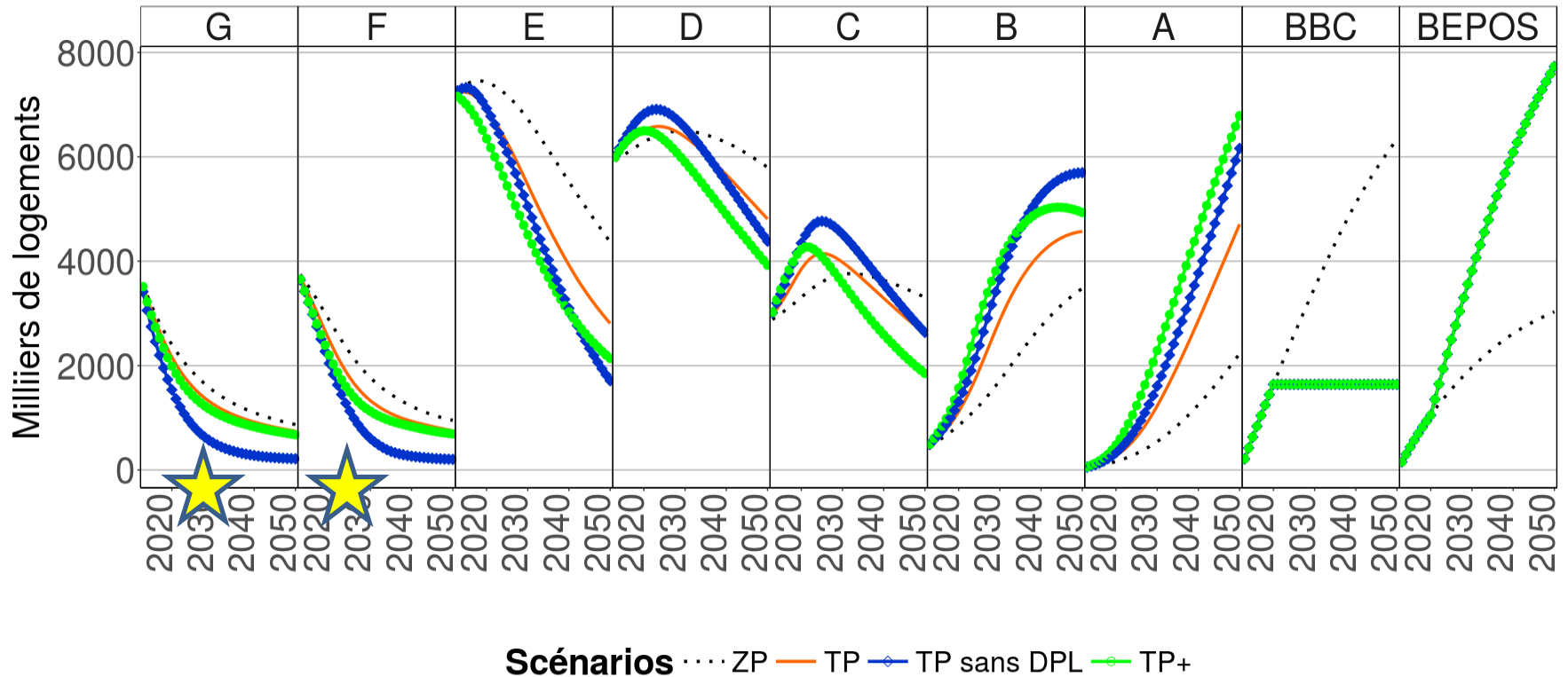
- Feasible...with tight policies maintained until 2050!
- 2/3 are autonomous improvements (energy prices, building codes, etc.)

Target 2: Yearly renovations



- Easily reached – at odds with Hulot’s resignation statement ?!?!
- Note the definition: renovation = upgrade by at least one EPC label
- Estimate in line with Ademe’s latest TREMI survey (2018)

Targets 3 & 4: Dwelling stock

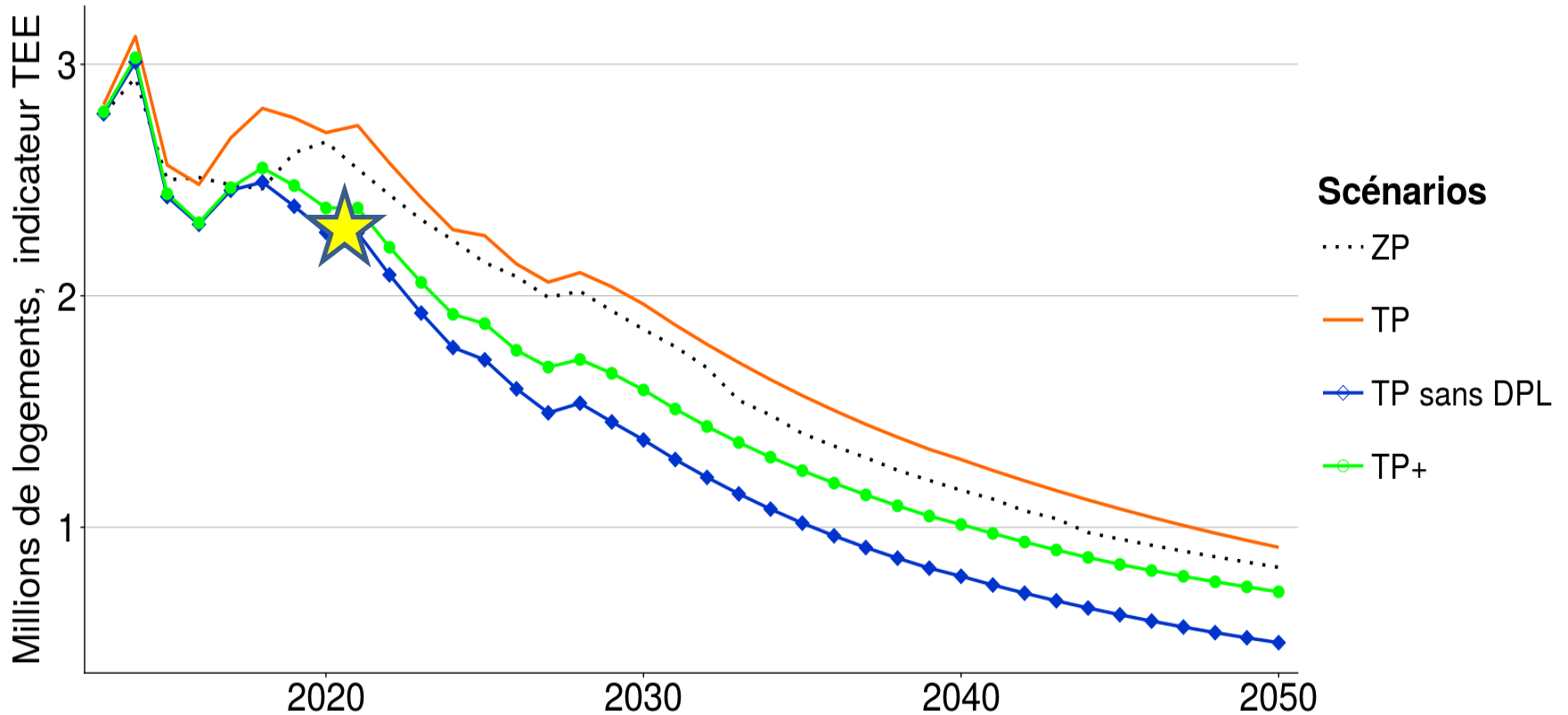


-75% in 2025.

50% to 70% in 2050

Target met in 2040 if landlord-tenant dilemma is overcome.

Objectif 5: Fuel poverty

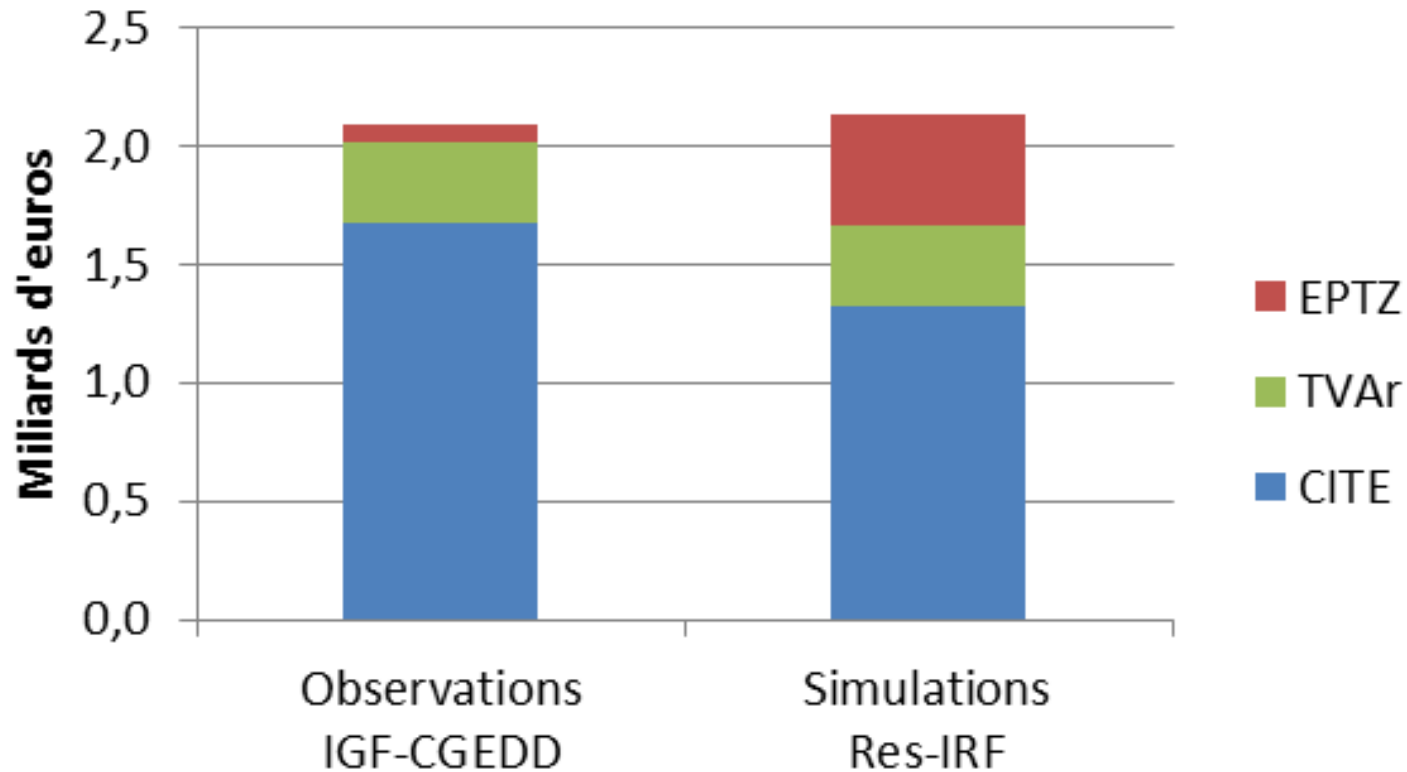


- Energy-to-income ratio: heating conventional expend. >10% income
- Natural decline, despite structural increase $\sim 0.6\%$ p.a. ($=0.3\%+1.5\%-1.2\%$)
- Carbon tax has a retarding effect, subsidies accelerating

Summary

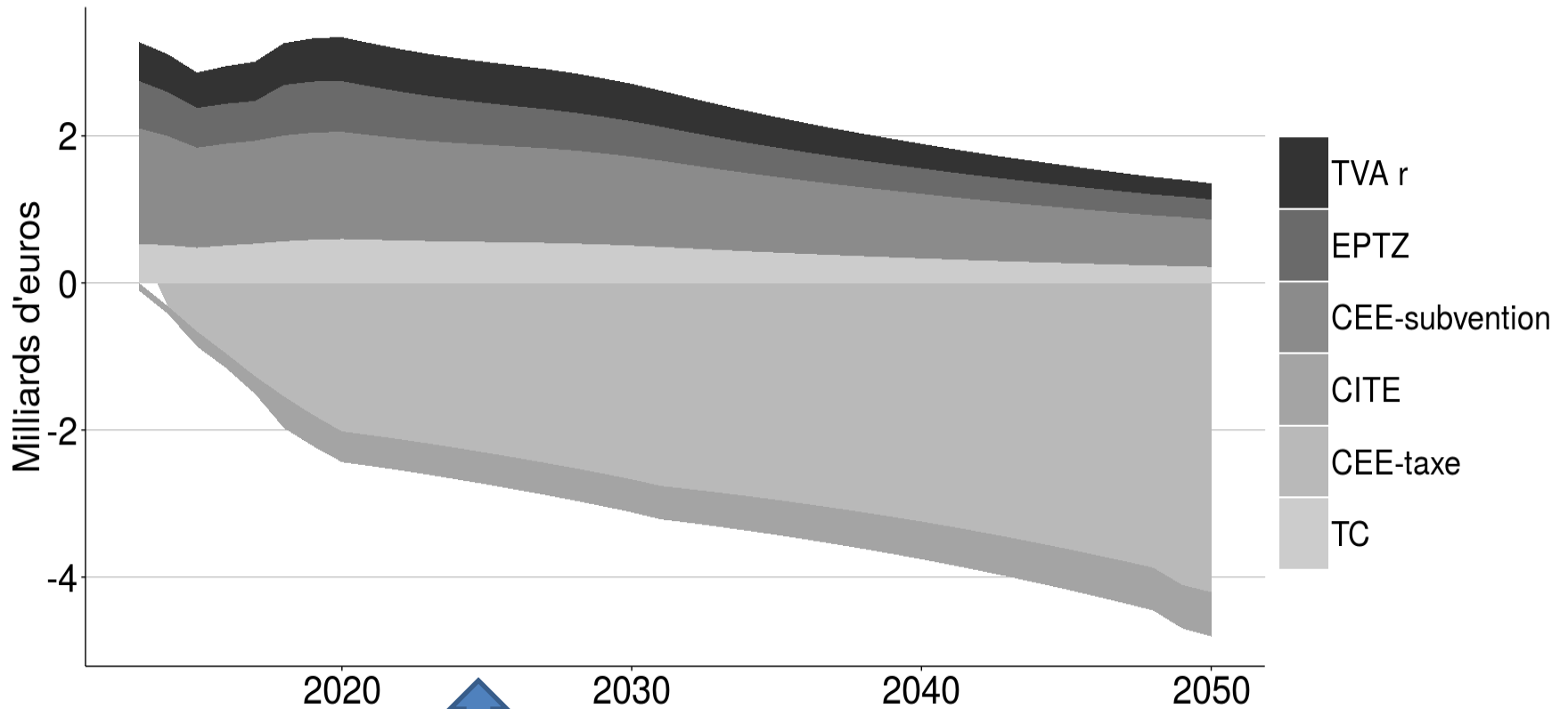
Target		Fulft	Comment
1	Reduction of energy use by 20% in 2030 and 50% in 2050	?	<ul style="list-style-type: none"> • Non-specific to the residential sector • Requires tight policies maintained until 2050 • Progress largely autonomous
2	Yearly renovation of 500,000 dwellings, incl. 120,000 in social housing	VX	<ul style="list-style-type: none"> • Largely fulfilled in private housing • Largely missed in social housing • The definition matters!
3	Elimination of labels F and G by 2025	X	<ul style="list-style-type: none"> • Important progress, -75% en 2025 • Target fulfilled in 2040 if landlord-tenant dilemma overcome
4	Label B or higher widespread by 2050	X	<ul style="list-style-type: none"> • 50% to 70% at best with tight policies
5	Fuel poverty alleviation by 15% in 2020	?	<ul style="list-style-type: none"> • Fulfilled only with tightest policies

Simulations vs. Observations, 2016



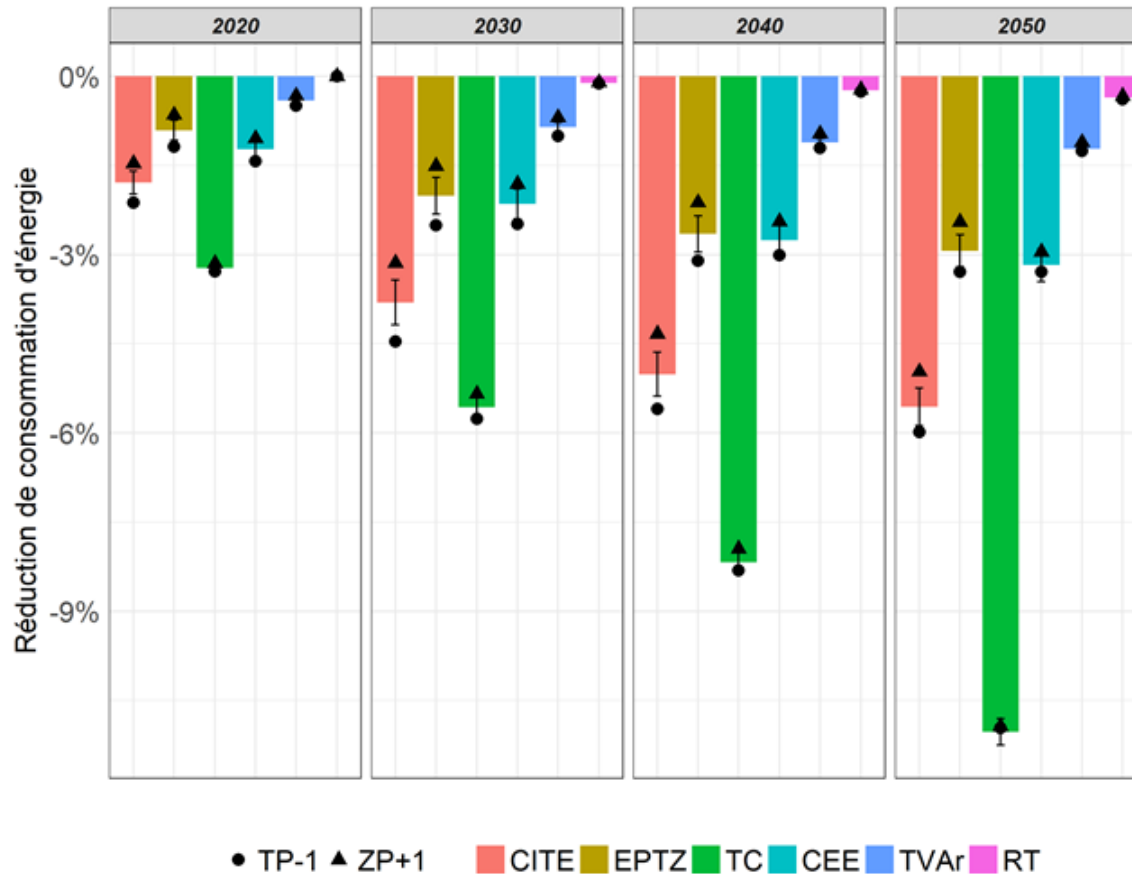
- EPTZ over-estimated by one order of magnitude!
- Unaccounted for barriers on the demand and supply sides?

Long-term costs



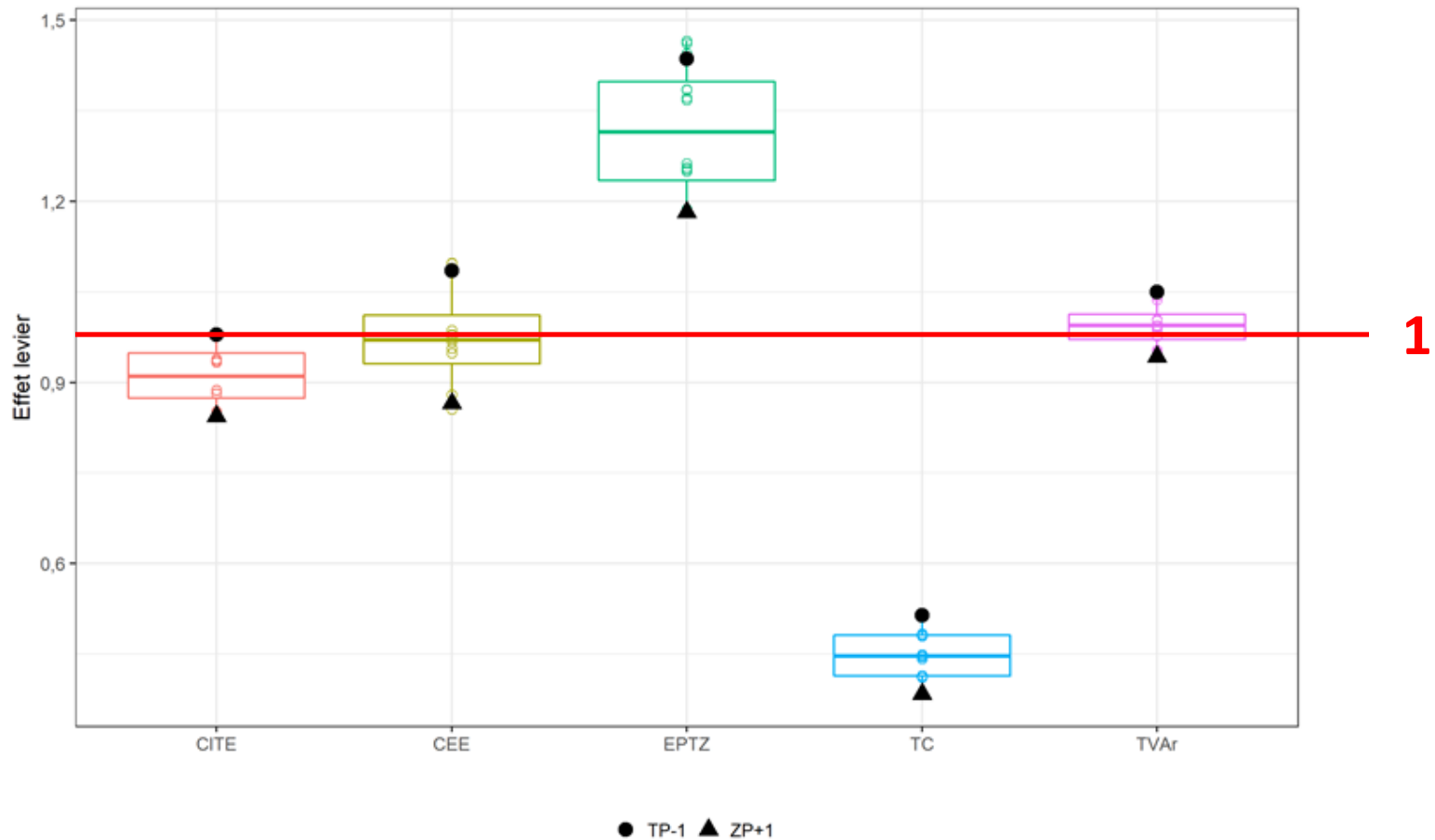
Policy effectiveness

Considering all possible interactions among policies:



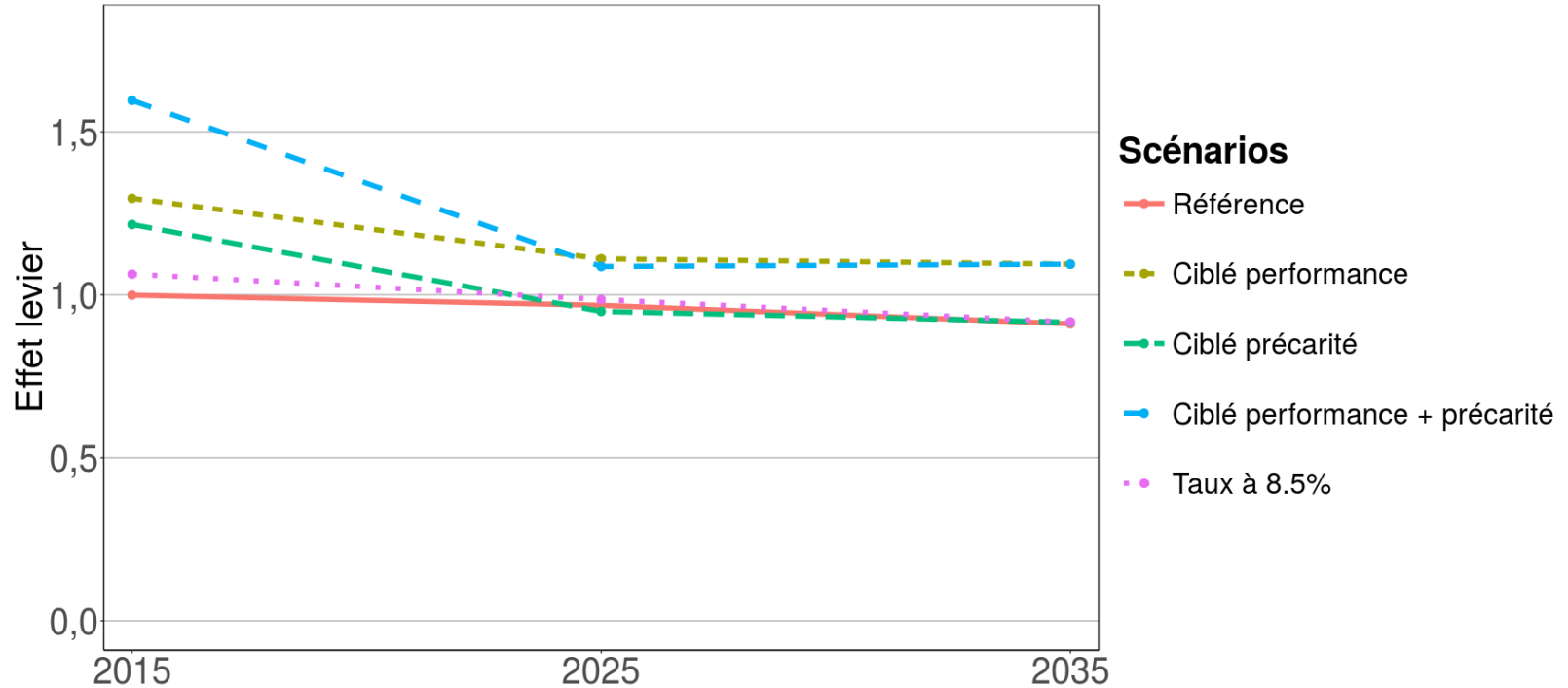
- Carbon tax plays on investment + utilization
- CITE is the most effective of all subsidies

Leverage, 2015



- Subsidies have leverage ≥ 1 , declining over time
- Interactions are mostly over-additive, due to model non-linearities

CITE variants



Leverage increases when...

- Ad valorem rate is reduced
- Eligibility is restricted to the most significant upgrades
- **Eligibility is restricted to the first two income quintiles**

Conclusion

- Key insights
 - Target fulfillment requires **tight policies, extended to rented dwellings** and maintained until 2050
 - If budget constraints were to bind, **restricting eligibility to low-income households** would be a nice opportunity to reconcile efficiency and equity
 - The 500,000 target needs to be properly defined!
- Contribution
 - Unique integrated assessment framework
 - Simulation/observation gap reveals barriers to EPTZ
 - Original approach to addressing policy interactions