

Environmental fiscal incentives: Effectiveness or free-riding effect?

An econometric evaluation of the French energy tax credit

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Introduction: context

- Energy consumption and GHG emissions: key concerns in France
 - Grenelle Act:
 - Divide by 4 GHG emissions by 2050 compared to 1980
 - Decrease energy consumption in the building sector by 38% by 2020 compared to 2008
 - Encourage the development of renewable energies
- Residential sector:
 - 1/3 of energy consumption, 16% of GHG emissions (*Ministère du développement durable, 2008*)
 - Represents a significant potential in energy saving

Introduction: context

- The challenge is to induce households to invest in energy efficiency renovations
 - Tax credit
 - Introduction in 2005
 - For all households who realize energy-saving renovations (but only renovations performed by qualified building professionals)
- From 2005 to 2008: 4.2 million households received a tax credit
Public cost: 7.8 billion euros
Effectiveness ?

Introduction: literature

- Similar tax credits :
 - Significant impact of the measure on the probability to renovate (Hasset and Metcalf, 1995; Alberini et al., 2011)
 - Free-riding (Dubin and Henson, 1988; Grösche and Vance, 2009; Malm, 1996)
 - Free-riders: households who would have made energy efficiency investments even in the absence of public policy
- French tax credit:
 - Simulation model: impact of the measure at an aggregated level (Giraudet et al., 2011 ; MEDDTL et al., 2011 ; Charlier and Risch, 2012)
 - Mauroux (2012): fiscal data / effect of the tax credit increase for some renovations

Introduction: objectives

Our objectives:

1. Estimating the impact of the introduction of the tax credit on the renovation rate (i.e., extensive effect).
2. Assessing the extent to which the tax credit increases renovation expenditures (i.e., the intensive effect).

Data

- *ADEME-SOFRES Maîtrise de l'Energie* surveys – from 2001 to 2008
 - 41 057 households
- Information available on:
 - The realization or not of renovation and the type of renovation undertaken
 - Households characteristics
 - Housing characteristics
 - Energy used and energy bill

Data: renovation rate and expenditures

Before tax credit:

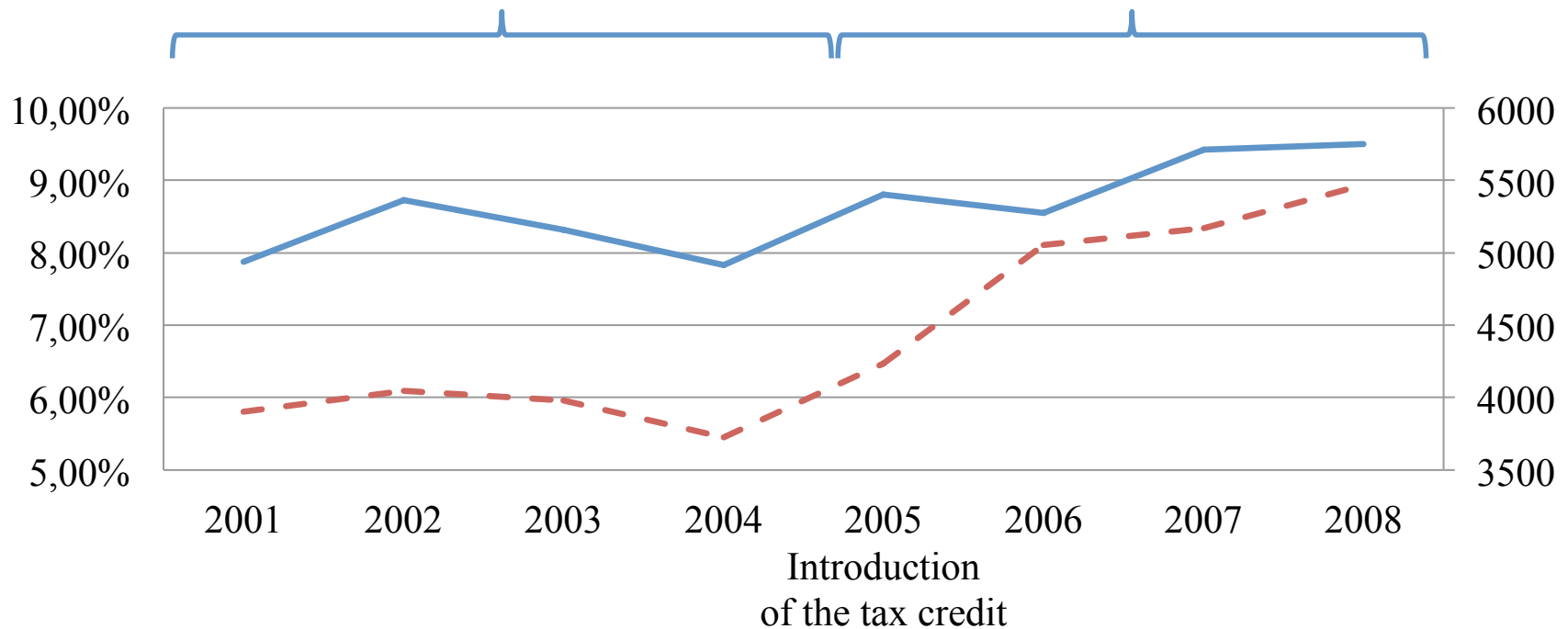
Average renovation rate: 8.2%

Average expenditures: 3913 €

After tax credit:

Average renovation rate: 9.2%

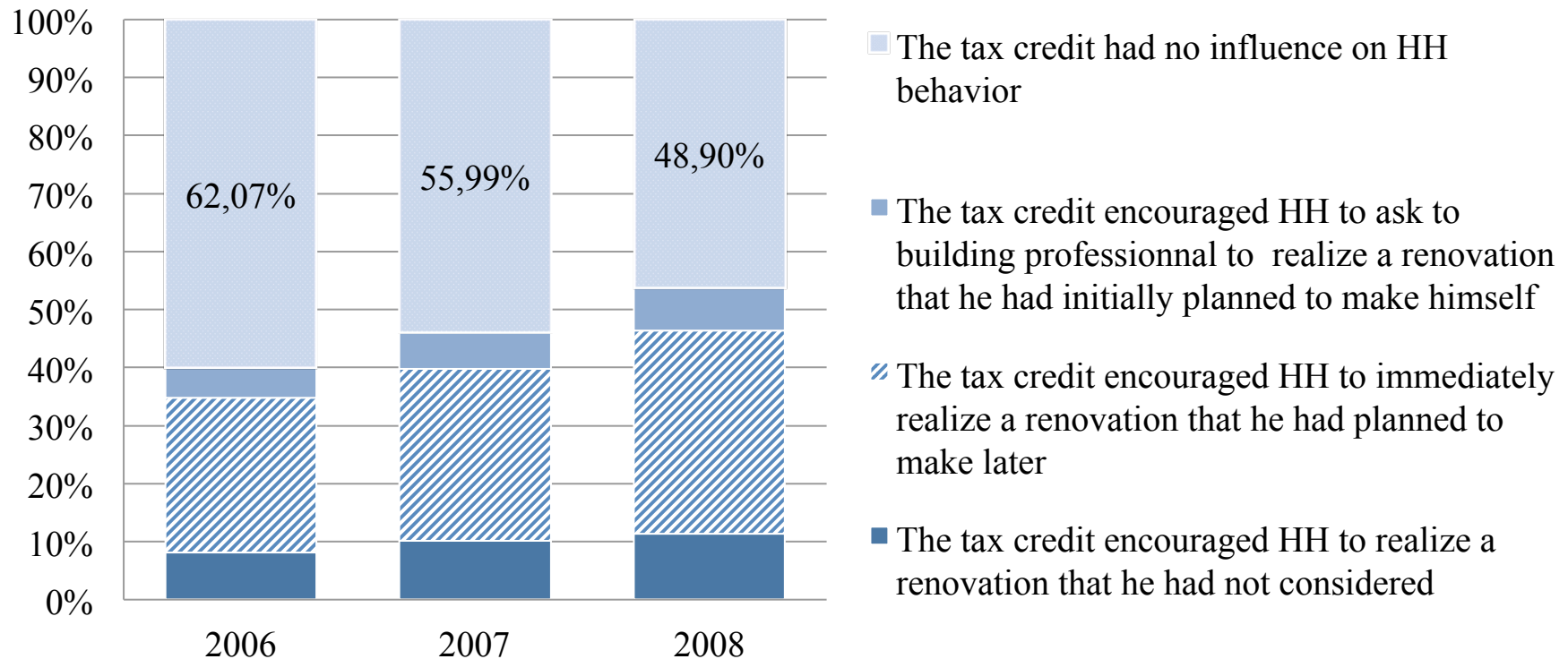
Average expenditures: 5053 €



— Renovation rates - only for renovation eligible to the tax credit (% - left axis)

- - Average expenses for renovations (€ - right axis)

Data: free-ridership ?



- More than 50% of households receiving the tax credit would have performed the renovation without this subsidy.

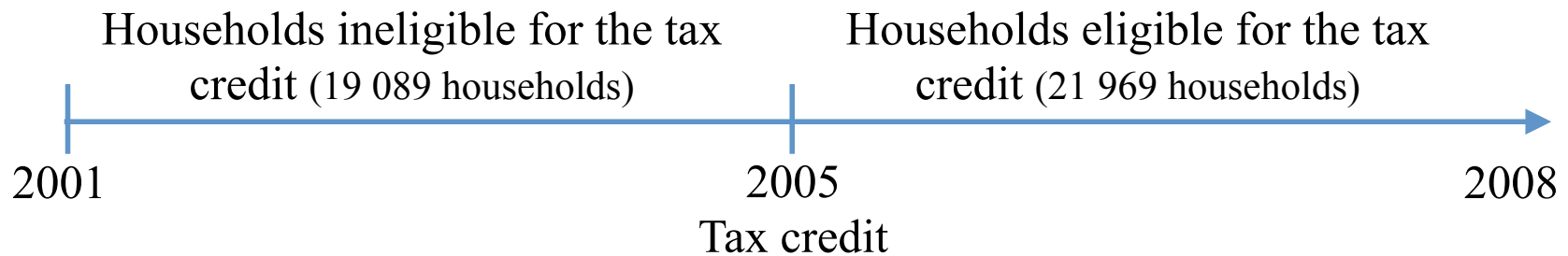
Method: public policy evaluation

- Tax credit impact = renovations with the policy – renovations without the policy



Inobservable: counterfactual

- Matching method (Rosenbaum and Rubin, 1983; Heckman, Ichimura and Todd, 1998)



- Control and treated groups are observed in a different time period
→ Sensitivity analysis

Results: impact on renovation rate

- Effect of tax credit on renovation rate

	Renovation rate
Effect of the tax credit	0.0086
Standard error	(0.0031)***

- 900 000 dwellings renovated between 2005-2008 as a result of the introduction of the tax credit.
 - Comparison with the public cost (€7.8 billion) :
 - Public cost per housing = €8,658 > average expenditures = €5,054
 - Comparison with the number of households who received the tax credit (4.2 million) :
 - Free riding: 79% of households who received a tax credit would have performed the renovation without the subsidy.

Results: impact on renovation expenditures

- Effect of tax credit on renovation expenditures

	Renovation expenditures	
	Current prices	Constant prices
Effect of the tax credit	0.2465	0.0890
Standard error	(0.0463)***	(0.0512)***

- Increase of the renovation expenditures as a result of the tax credit, but the 2/3 of this rise is due to an increase of the prices.

Conclusion

Efficiency of tax credit is questionable:

- Significant and positive effect on renovation rate and renovation expenditures
 - But the effect is low, particularly given the public cost of the measure (7.8 billion €)
- Presence of free-riding
- Building professionals capture a part of earnings from the tax credit through price increases.

Sensitivity analysis

	Fraction $u=1$ by treatment/outcome				Outcome effect	Selection effect	Tax credit impact	SE
	P_{11}	P_{10}	P_{01}	P_{00}				
Renovation rate								
No confounder	0	0	0	0	-	-	0.0086	0.0005***
Neutral confounder	0.50	0.50	0.50	0.50	0.999	0.998	0.0086	0.00002***
<i>Confounder like:</i>								
Owner	0.93	0.70	0.89	0.70	3.472	1.006	0.0084	0.00027***
Energy expenditure (>50%)	0.48	0.48	0.38	0.37	1.079	1.558	0.0079	0.0001***
Income (groups 5 and 6)	0.66	0.57	0.53	0.47	1.274	1.486	0.0070	0.0003***
<i>Espaces Info-Energie</i>	0.25	0.18	0.16	0.13	1.308	1.526	0.0075	0.0003***
Energy-saving bulbs	0.75	0.68	0.57	0.49	1.273	2.175	0.0056	0.0016***
Renovation expenditures								
At current prices								
No confounder	0	0	0	0	-	-	0.246	0.047***
Neutral confounder	0.5	0.5	0.5	0.5	1.002	1.004	0.246	0.002***
<i>Confounder like:</i>								
Owner	0.98	0.97	0.97	0.95	2.113	1.796	0.243	0.004***
Energy expenditure (>50%)	0.49	0.48	0.38	0.36	1.138	1.642	0.241	0.008***
Income (groups 5 and 6)	0.72	0.64	0.58	0.54	1.178	1.761	0.240	0.009***
<i>Espaces Info-Energie</i>	0.26	0.24	0.15	0.19	0.746	1.640	0.253	0.007***
Energy-saving bulbs	0.74	0.74	0.54	0.57	0.892	2.317	0.254	0.013***
At constant prices								
No confounder	0	0	0	0	-	-	0.089	0.041**
Neutral confounder	0.5	0.5	0.5	0.5	1.002	0.992	0.089	0.002***
<i>Confounder like:</i>								
Owner	0.98	0.97	0.97	0.95	2.449	1.788	0.085	0.004***
Energy expenditure (>50%)	0.49	0.48	0.37	0.37	1.046	1.649	0.088	0.008***
Income (groups 5 and 6)	0.72	0.64	0.57	0.55	1.117	1.755	0.085	0.009***
<i>Espaces Info-Energie</i>	0.26	0.23	0.15	0.19	0.781	1.626	0.095	0.007***
Energy-saving bulbs	0.73	0.75	0.53	0.58	0.844	2.304	0.100	0.012***

Sensitivity analysis

- Matching method, estimations with 2004 – 2005 data

	Estimations with 2001-2008 data		Estimations with 2004-2005 data	
	Marginal effect	SE	Marginal effect	SE
Renovation rate	0.0086	0.0031***	0.0094	0.0057*
Renovation expenditures - Current prices -	0.2465	0.0463***	0.2084	0.0962**
Renovation expenditures - Constant prices -	0.0890	0.0512***	0.1657	0,0996*

Cost benefit analysis

- Number of renovations as a result of the tax credit: 900,000
- Renovation expenditures: + 24.65% or €965
 - Total expenditure in energy-saving renovations resulting from the tax credit: **8.69 billion** euros.
- The cost: **7.8 billion** euros
 - The net benefit: 890,000 or less than €1 per dwelling