The Political Economy of Financing Climate Policy - Evidence from the Solar PV Subsidy Programs

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Introduction

- Need to stop CO_2
- Pigouvian taxes politically complicated
- (High) technology subsidies often used instead
- No empirical evidence that politicians benefit from this
- This paper: electoral impact excessive subsidies for residential solar panels in Belgium

Introduction

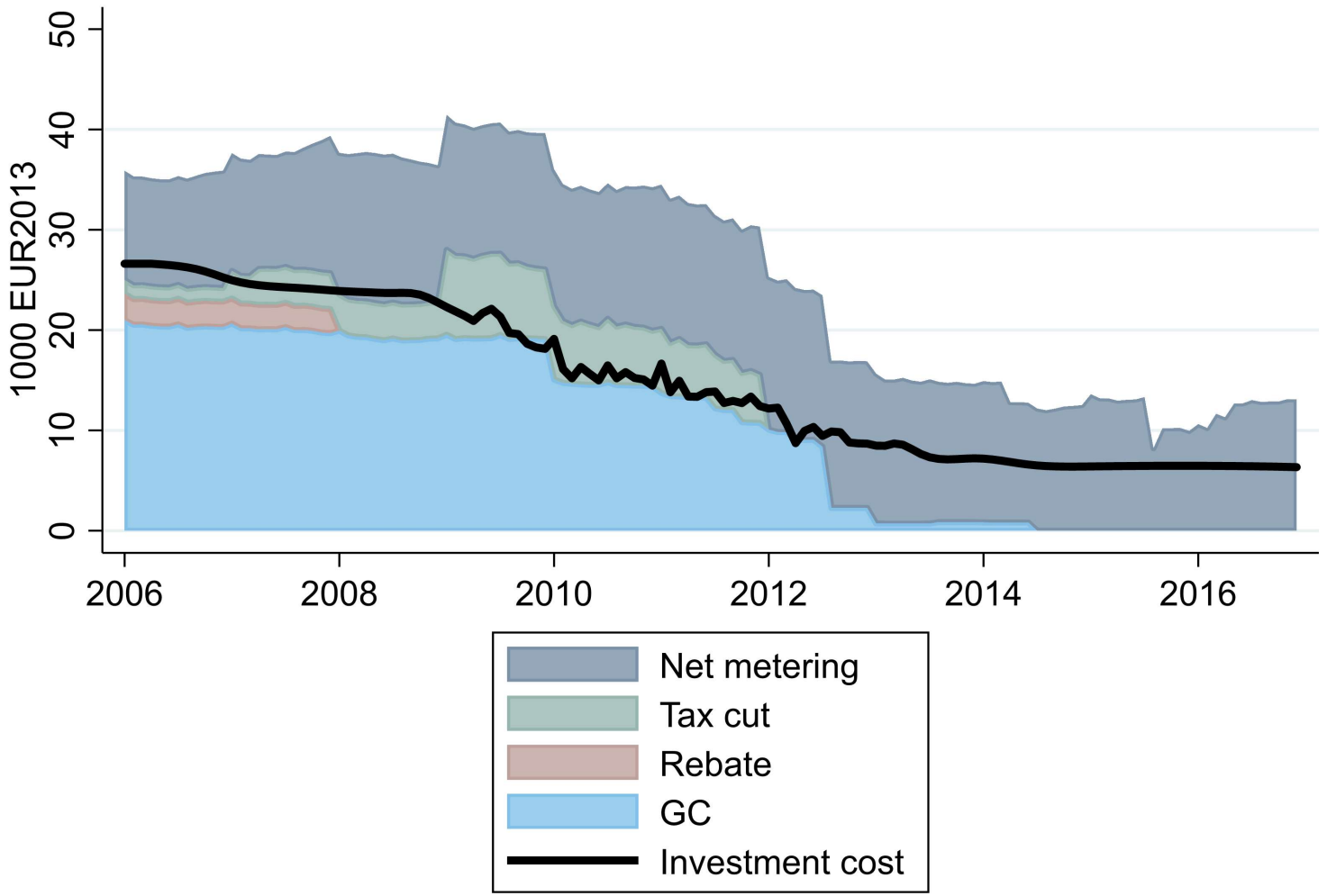
- 2006-2008: regional governments introduced technology-specific support for green electricity production
- For solar: on average 671 EUR/ton CO_2
- Empirical strategy: compare changes in votes in high and low adoption areas
  - Adoption = intensity of treatment
  - More adopters + more salient policy
- Main result: incumbent parties punished in high adoption areas
- Further analysis: non-adopting neighbors switch to anti-establishment parties

Solar panel policy

- Electricity production
  - Net metering
  - Green Certificates (GC)
- Investment cost reduction
  - Tax cuts
  - Rebates

Costs and benefits of adoption (4kW)

High gains from investment because of production subsidies



Region: Flanders

Costs and benefits of adoption (4kW)

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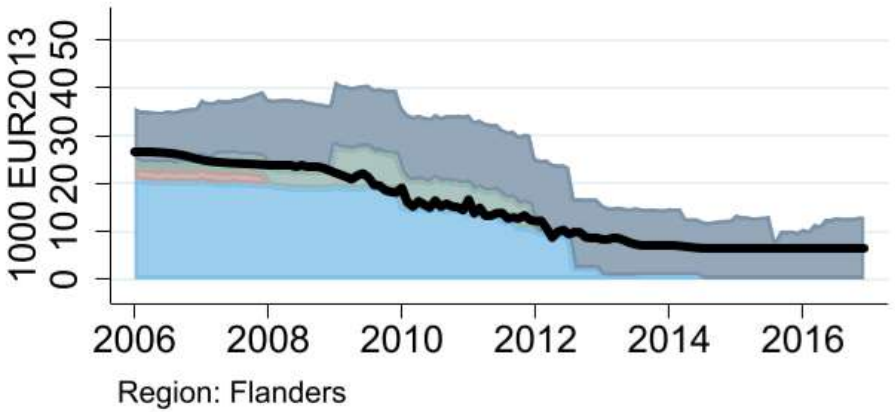
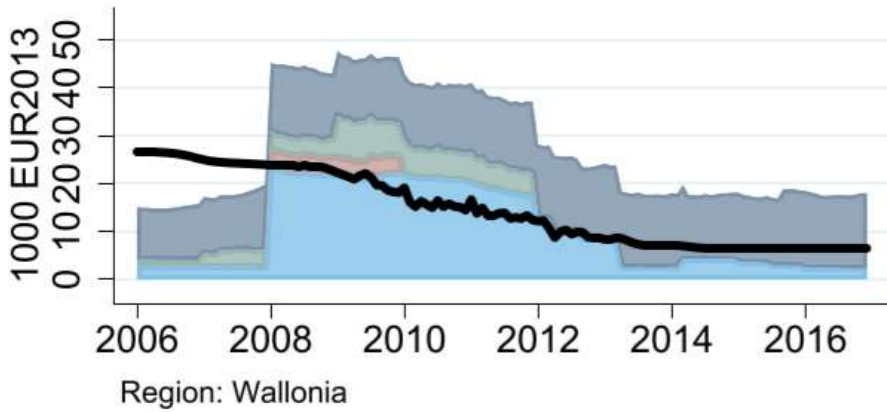
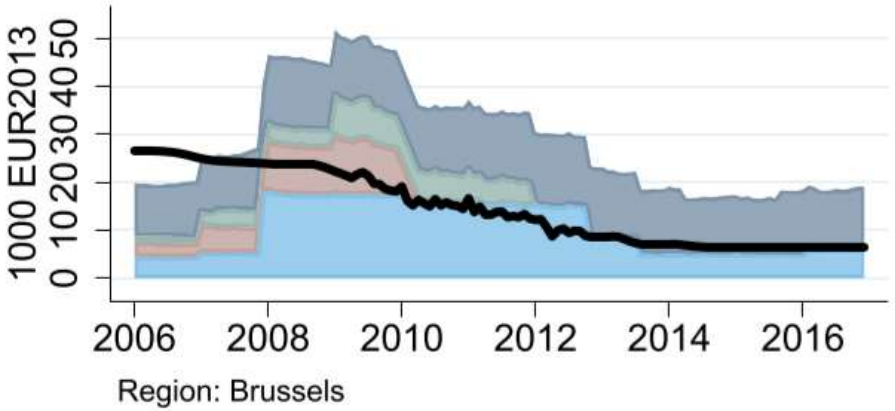
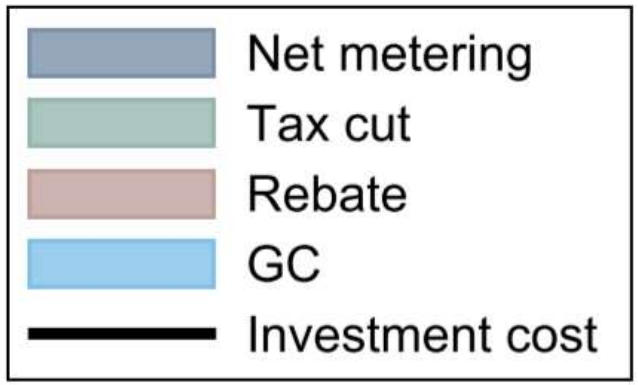


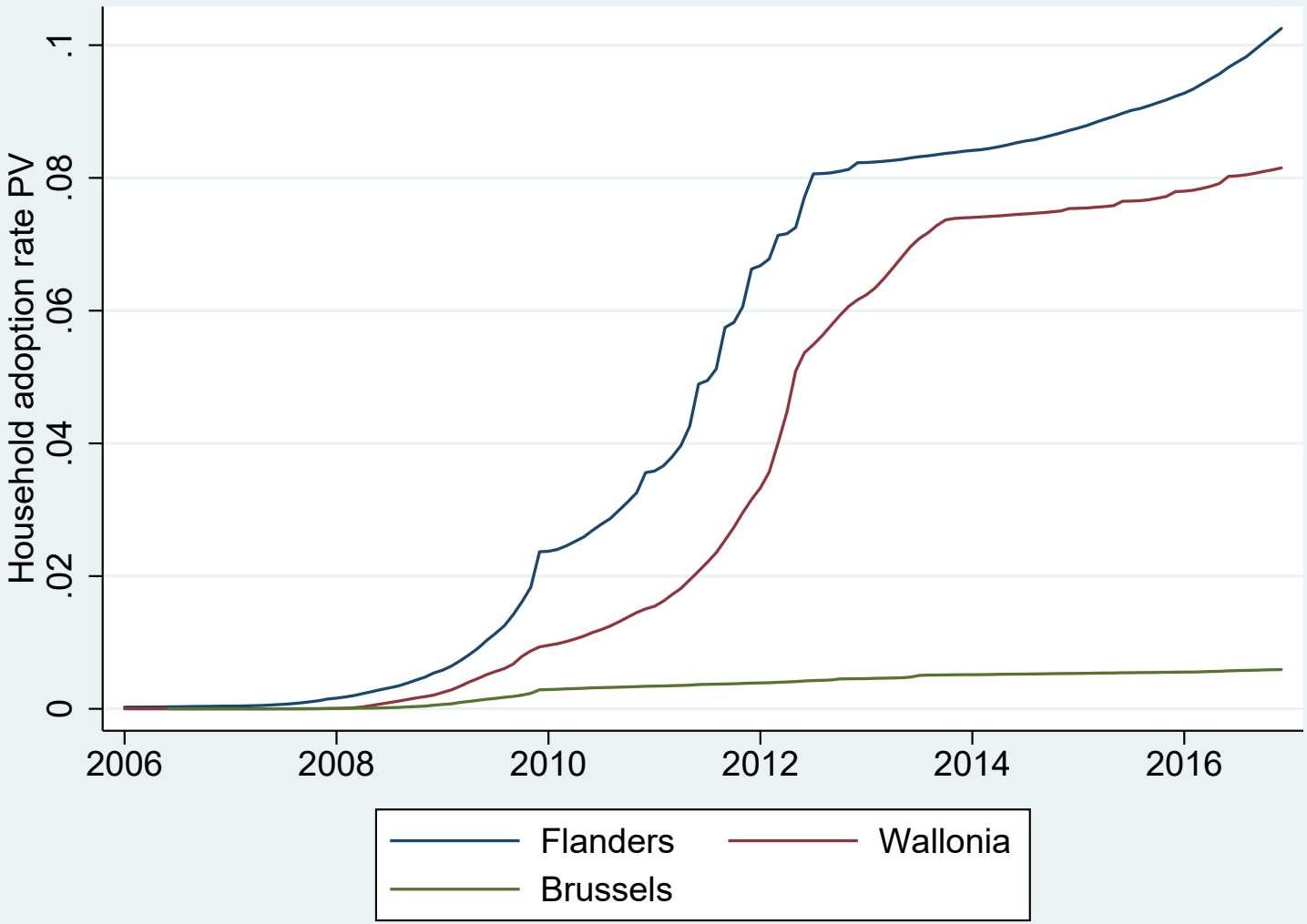






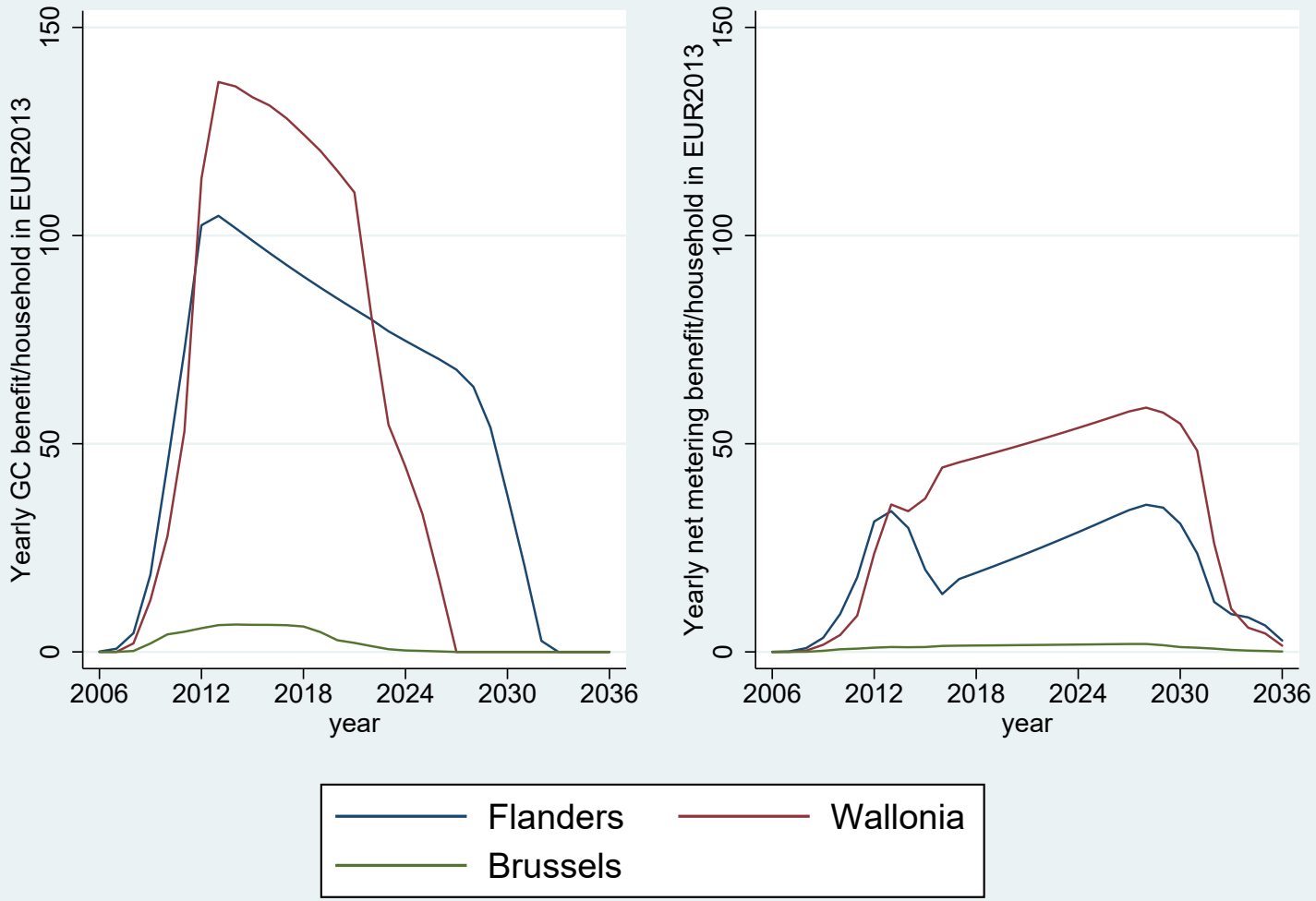
Adoption rates

High adoption rates



Cost of production subsidies

High costs for a long time



Note: adoptions of 2006-2016, constant policy after 2016.

Cost of production subsidies

- Large losses for grid operators
  - Buy certificates and sell at a loss
  - Net metering price >> commodity price

=> Extra surcharges on electricity price Electricity price

=> Introduction of "prosumer fee" for adopters

=> Change of granting period certificates

Empirical framework

$$Y_{mt} = \gamma PV_m \times I(t \geq 2009) + \beta X_m \times I(t \geq 2009) + FE_m + FE_{rt} + e_{mt}$$

- Y_{mt}: incumbent votes in municipality m and election t
- Incumbent: (centrist) regional (r) government parties in 2004-2009
- PV_m: Adoption rate during main subsidization phase
- X_m: Demographics

- 6 elections t, 589 municipalities m
- Aggregation at 208 cantons in first 4 elections
- Clustering at canton level

Main results

	(1) **Base**	(2) **+ demo**	(3) **Yearly effects**	(4) **Regional effects**
Local PV adoption rate				
$\times I(year \geq 2009)$	-0.373	-0.793		-0.569
	(0.132)	(0.226)		(0.271)
$\times I(year = 1995)$			0.148	
			(0.128)	
$\times I(year = 1999)$			0.132	
			(0.095)	
$\times I(year = 2009)$			-0.667	
			(0.227)	
$\times I(year = 2014)$			-0.605	
			(0.205)	
$\times I(year = 2019)$			-0.813	
			(0.221)	
$\times I(year \geq 2009) \times Flanders$				-0.578
				(0.259)
$\times I(year \geq 2009) \times Brussels$				3.974
				(6.893)
Municipality FE	YES	YES	YES	YES
Year x region FE	YES	YES	YES	YES
Demographics $\times I(year \geq 2009)$	NO	YES	YES	YES

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Neighbor effects

$$
\begin{aligned}
Y_{mt} &= \gamma_1 PV_m \times I(t \geq 2009) + \beta_1 X_m \times I(t \geq 2009) \\
&+ \gamma_2 \widetilde{PV_m} \times I(t \geq 2009) + \beta_2 \widetilde{X_m} \times I(t \geq 2009) + FE_m + FE_{rt} + e_{mt}
\end{aligned}
$$

- $\widetilde{PV_m}$: Adoption rate neighboring municipality
- X_m: Demographics neighboring municipality

Neighbor effects

	(5) Neighbor effect	(6) + controls
Local PV adoption rate	-0.505	-0.088
$\times I(year \geq 2009)$	(0.299)	(0.382)
Neighbor PV adoption rate	-0.427	-1.066
$\times I(year \geq 2009)$	(0.230)	(0.373)
Municipality FE	YES	YES
Year $\times$ region FE	YES	YES
Demographics $\times I(year \geq 2009)$	YES	YES
Neighbor demographics $\times I(year \geq 2009)$	NO	YES
P-value local effect = neighbor effect = 0	0.000	0.000
P-value local effect = neighbor effect	0.874	0.179

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Party-specific results

	(7) **Rad left**	(8) **Green**	(9) **Social**	(10) **Center**	(11) **Liberal**	(12) **Rad right**
Local PV adoption rate $\times I(year \geq 2009)$						
$\times$ *Flanders*	0.208	-0.141	-0.430	-0.482	-0.174	0.730
	(0.061)	(0.091)	(0.164)	(0.304)	(0.237)	(0.167)
$\times$ *Wallonia*	0.100	0.141	-0.427	-0.129	0.214	0.230
	(0.084)	(0.093)	(0.181)	(0.233)	(0.211)	(0.100)
Municipality FE	YES	YES	YES	YES	YES	YES
Demo $\times I(year \geq 2009)$	YES	YES	YES	YES	YES	YES
Year $\times$ region FE	YES	YES	YES	YES	YES	YES
P-value no regional diff.	0.164	0.009	0.985	0.191	0.066	0.004

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Conclusion

- Inefficient green technology-specific subsidies do NOT benefit politicians
- Democracy works!... at least for a very salient policy
  - Large public debate
  - Adoptions very visible in the street
  - Costs very visible on electricity bill
- Further research: look further into role of dedicated taxes to finance subsidy programs on political accountability

Main summary statistics

	Mean	SD	Min	Max
Vote share 2004-2009 government	0.601	0.171	0.093	0.904
Vote share radical left	0.035	0.043	0.000	0.268
Vote share green	0.100	0.049	0.027	0.318
Vote share left	0.206	0.111	0.024	0.564
Vote share center	0.304	0.166	0.030	0.783
Vote share liberal	0.227	0.102	0.054	0.727
Vote share radical right	0.092	0.077	0.000	0.397
Local PV adoption rate	0.097	0.042	0.002	0.287
Neighbor PV adoption rate	0.099	0.033	0.000	0.191
Flanders	0.508	0.500	0.000	1.000
Wallonia	0.457	0.498	0.000	1.000
Brussels	0.035	0.184	0.000	1.000

Table: Summary statistics, vote and PV adoption

Local demographics

	Mean	SD	Min	Max
Ln(population density)	5.752	1.168	3.215	10.100
Income group 2	0.212	0.377	0.000	1.000
Income group 3	0.203	0.364	0.000	1.000
Income group 4	0.178	0.346	0.000	1.000
Income group 5	0.181	0.361	0.000	1.000
% home owned	0.721	0.097	0.252	0.911
% higher education	0.303	0.071	0.127	0.592
% male	0.493	0.009	0.454	0.553
% foreign	0.071	0.075	0.009	0.497
Average household size	2.394	0.145	1.658	2.802
Number of rooms	5.842	0.396	4.202	7.184
Average year of construction house (/1000)	1.962	0.011	1.931	1.982

Table: Summary statistics: local demographics

Electricity prices

Increase in electricity prices