Supplementary materials

I. Literature

Table I-1: Income and price elasticities in the literature

Authors	Country	Level of analysis	Price elasticity	Income elasticity
Parti and Parti (1980)	US	San Diego county	Electricity: -0.58	0.15
Dubin and McFadden (1984)	US	Household	Electricity: -0.26	0.02
Baker et al. (1989a)	UK	Household	Electricity: -0.758 Gas: -0.311	-
Bernard et al. (1996)	Canada	Household	Electricity short-run: -0.67	0.14
Nesbakken (1999)	Norway	Household	All energy types: -0.50	0.01
Vaage (2000)	Norway	Household	Heating energy: -1.24	
Nesbakken (2001)	Norway	Household	All energy types: -0.21	006
Halvorsen and Larsen (2001)	Norway	Household	Short-run: -0.43	---
Labandeira et al. (2006)	Spain	Household	Electricity: -0.79 Gas: -0.04	
Rehdanz (2007)	Germany	Household	Oil: [-2.03; -1.68] Gas: [-0.63; -0.44]	
Meier and Rehdanz (2010)	Germany	Household	Oil: -0.4 Gas: [-0.34; -0.36]	
Alberini and Filippini (2011)	US	State level data	Electricity: [− 0.860; − 0.667] Gas: [− 0.693; − 0.566]	0.02
Bernard et al. (2011)	Canada	Household	Electricity short-run: [-0.51]	0.08
Fan and Hyndman (2011)	South Australia	State level data	Electricity: [-0.36; -0.43]	
Brounen et al. (2012)	Germany	Household	Electricity: -0.4310 and Space heating: -0.5008	
Meier et al. (2013)	UK	Household	Electricity price on energy spending: 0.7360	[0.2; 0.6]
Filippini et al. (2014)	EU	EU member countries	All energy types: [-0.26; -0.19]	
Krishnamurthy and Kriström (2015)	11 OECD countries	EU member countries	Electricity: [−0.16; -1.4] France: −0.6523	[0.07; 0.108]
Miller and Alberini (2016)	US	Household	All energy types: [-0.56; -0.76]	
Risch and Salmon (2017)	France	Household	All energy types: -0.485	0.0295
Schulte and Heindl (2017a)	Germany	Household	Electricity: -0.4310 and Space heating: -0.5008	
Campbell (2017)	Jamaica	Sectorial	-0.42	0.42
Damette et al. (2018)	France	Household	Wood [-1.553;-2.394] Electricity: -1.33 Gas: -1.22	[0.0294;0.0443]

II. Data

Table II-1: Energy prices provided by the PEGASE database

	2011	2012
ELECTRICITY TARIFF		
Electricity. blue rate. base option in euros (tax included)		
Annual subscription cost 3 kVA	64.94606	67.40325
Annual subscription cost 6 kVA	77.45169	80.36592
Annual subscription cost 9 kVA	90.3377	93.76717
Annual subscription cost 12 kVA	142.84527	148.13392
Annual subscription cost 15 kVA	164.85725	171.04758
Annual subscription cost 18 kVA	219.2238	227.44092
Price for 100 kWh (power 3 kVA)	17.02237	17.7994
Price for 100 kWh (power 6 kVA)	16.23193	16.9816
Electricity. blue rate. peak hours rate in euros (tax included)		
Annual subscription cost 6 kVA	93.13223	96.59658
Annual subscription cost 9 kVA	111.76704	115.91475
Annual subscription cost 12 kVA	189.49559	196.56458
Annual subscription cost 15 kVA	223.04773	231.32342
Annual subscription cost 18 kVA	254.38013	263.81675
Annual subscription cost 24 kVA	529.87303	549.78758
Annual subscription cost 30 kVA	652.50116	677.02358
Annual subscription cost 36 kVA	754.42164	782.73067
100 kWh peak-hours	12.91385	13.54292
100 kWh off-peak	8.76965	9.23933
Price for 100 kWh (power 6 kVA)	14.03546	14.70435
Price for 100 kWh (power 9 kVA)	13.02266	13.65389
Price for 100 kWh (power 12 kVA)	12.77758	13.39973
Electricity. blue rate. tempo option in euros (tax included)		
Annual subscription cost 9 kVA	109.04157	113.022
Annual subscription cost 12 kVA	203.35865	210.90942
Annual subscription cost 30 kVA	456.64613	473.54025
Annual subscription cost 36 kVA	566.42158	587.43975
100 kWh blue days and off-peak	6.8142	7.2111
100 kWh blue days and peak-hours	8.20155	8.65528
100 kWh white days and off-peak	9.8401	10.35061
100 kWh white days and peak-hour	11.7537	12.33594
100 kWh red days and off-peak	18.5589	19.40033
100 kWh red days and peak-hour	49.16455	51.17409
Electricity. market rate. in euros (tax included)		
All rates	13.41974	13.82434
DA rate	24.45679	25.13133
DB rate	15.8404	16.3847
DC rate	14.02566	14.45913
DD rate	12.84391	13.2134
DE rate	12.54369	12.91665
GAS RATE		
Natural Gas. price in euros (tax included)		
Annual subscription cost - base rate	43.8933	46.92645
Annual subscription cost - B0 rate	58.0092	61.97075
Annual subscription cost - B1 rate	185.18415	195.4546
Annual subscription cost - B2I rate	185.18415	195.4546
100 kWh PCS - base rate	9.3988	9.96987
100 kWh - B0 rate	8.0742	8.51871
100 kWh- B1 rate	5.58353	5.86163
100 kWh - B2I rate	5.58353	5.86163
Price for 100 kWh B0 rate	11.74238	12.42551
Price for 100 kWh B1 rate	7.08853	7.44654
Price for 100 kWh B2I rate	6.79365	7.13536

DOMESTIC OIL RATE		
Tariff of one ton of propane in tank	1670.297	1791.087
100 kWh PCI (Lower calorific value) propane in tank	12.96815	13.90596
Price of one ton of propane	1670.297	1791.087
100 kWh PCS (Higher calorific value) of propane	12.1036	12.97889
100 kWh PCI of propane	13.06961	14.01476
Bottle of 13 kg butane	30.19	31.75
100 liters of oil at Rate C1	88.79	96.88
100 kWh oil PCI at Rate C1	8.90482	9.71618
WOOD RATE		
One ton of bulk pellets	250	260
One stere of logs	63	67
100 kWh PCI of bulk wood	3.70588	3.94118

Source: PEGASE database, French Ministry of Energy

Figure II-1: Methodology used to merge energy prices

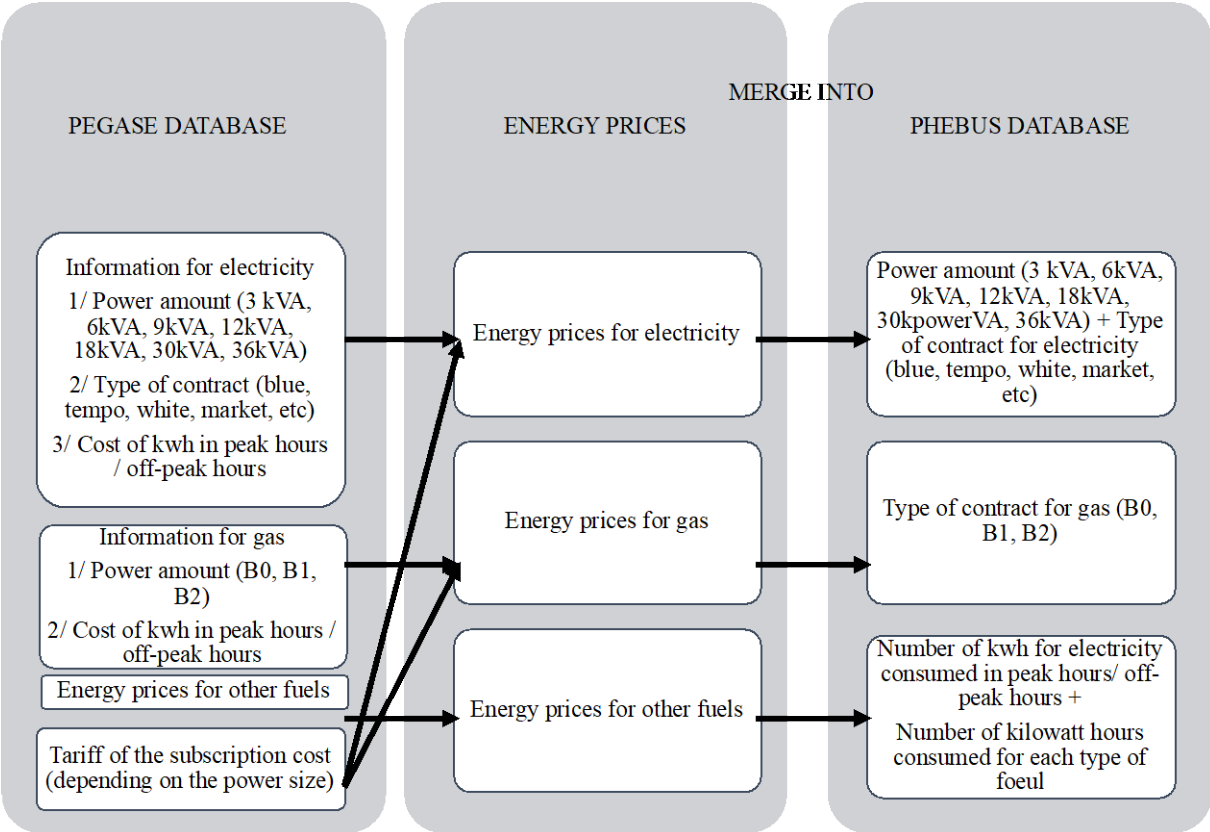
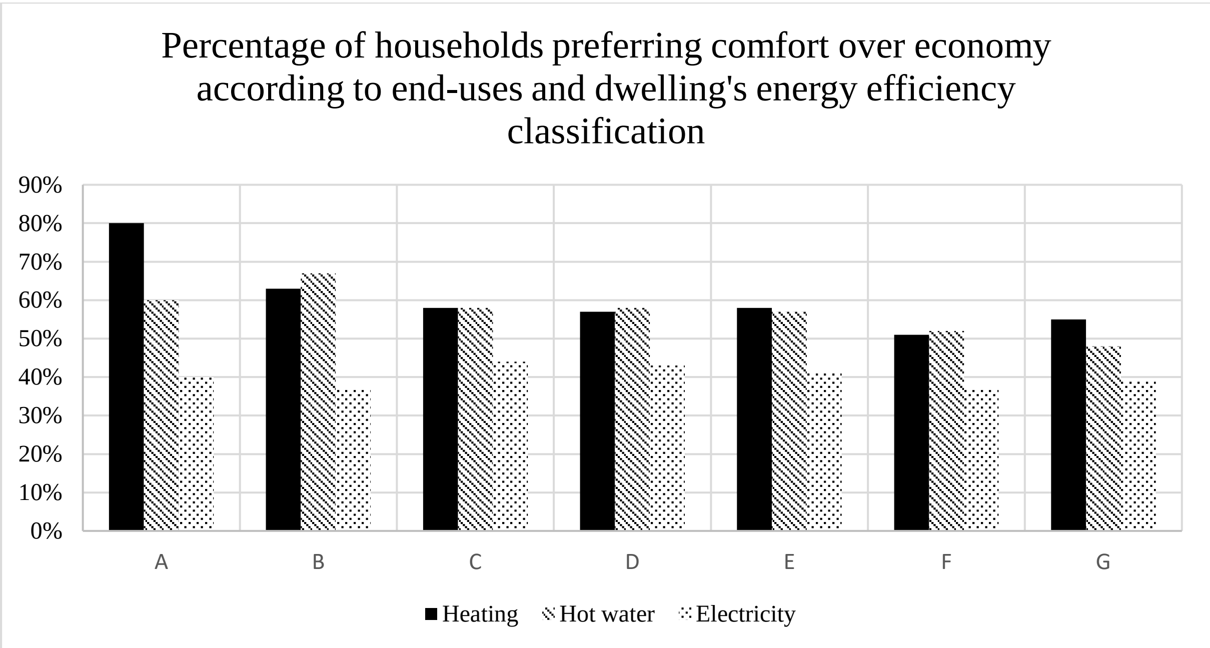
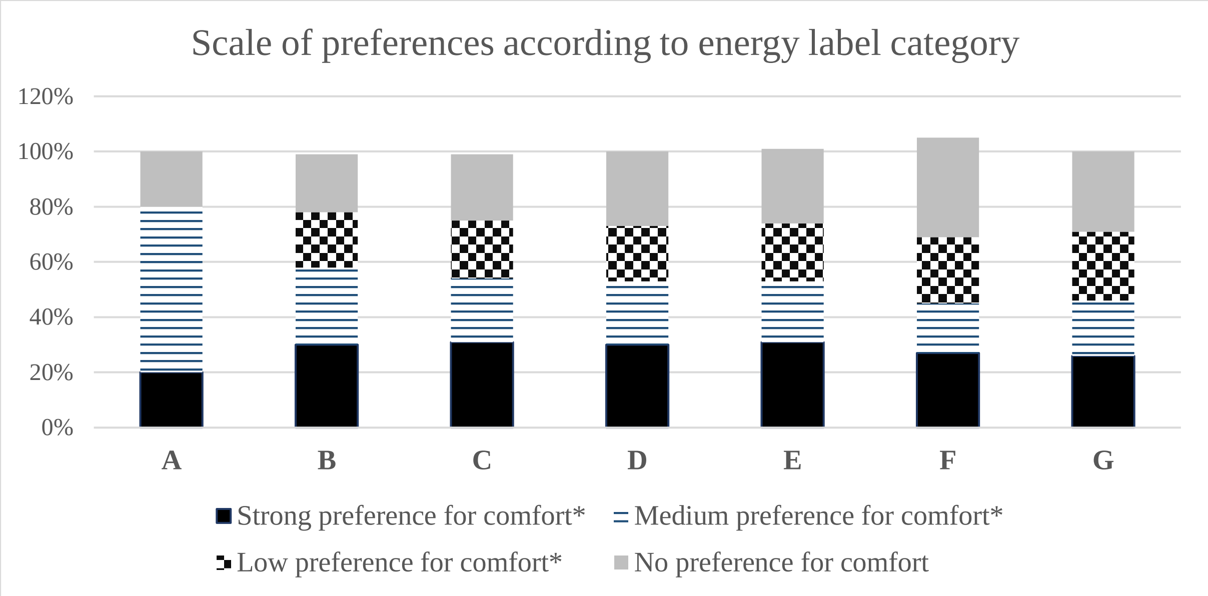


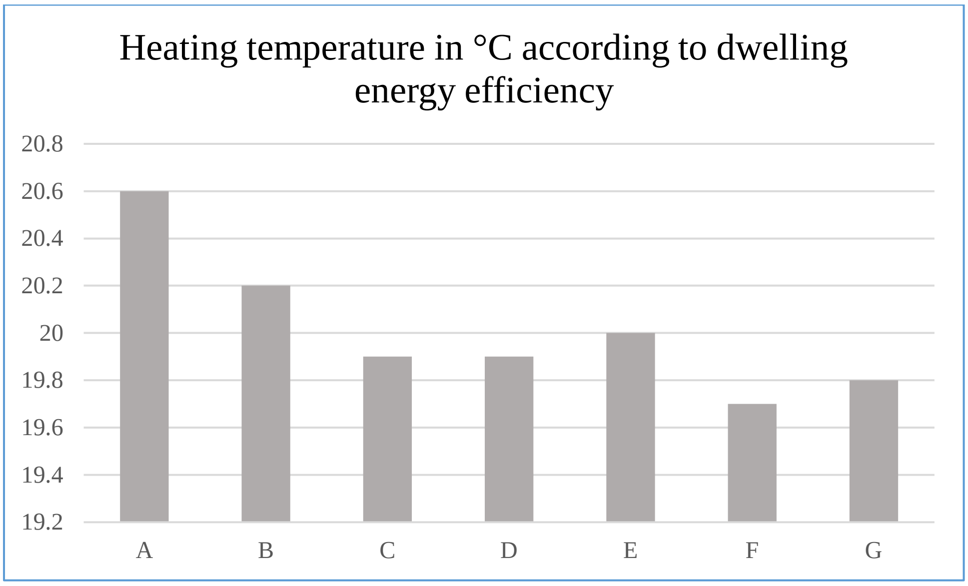
Figure II-2: Preferences and dwelling energy efficiency classification





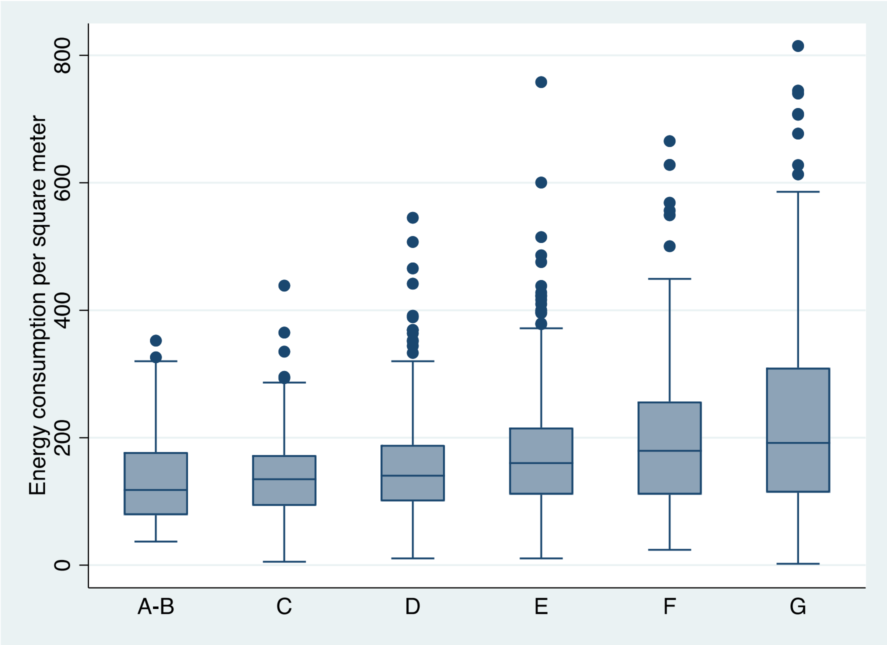
Source: PHEBUS Survey 2012, authors' calculations.
The scale of preferences is compounded from PHEBUS data: strong preference for comfort means that a household declared that it prefers comfort over economy for all three energy uses: specific electricity, heating, and hot water; a medium preference means that this preference for comfort concerns two of the three energy uses; and finally, a low preference means that the preferences for comfort concerns only one energy use. Energy efficiency classification are defined in supplementary materials (Figure 2 and Table 4).
Note for the reader: This graph shows that the percentage of respondent preferring comfort over energy savings for all or two of the energy uses (strong preference for comfort and medium preference for comfort) is increasing when we move to the left, e.g when the dwelling is more energy efficient. Thus, energy efficiency of the dwelling is associate with more frequent preference for comfort, which can be an indirect evidence of rebound effect in energy efficient dwellings. This is also an evidence of restriction behavior regarding energy consumption in low energy efficient dwellings.

Figure II-3 Heating temperature in °C and dwelling energy efficiency



Source: PHEBUS Survey 2012, authors' calculations

Figure II-4: Energy consumption according to dwelling energy efficiency



Source: PHEBUS Survey 2012, authors' calculations

Table II-2: *Analysis of preferences: t test*

	Obs	Mean		*t*	Critical probability
		0 (No)	1 (Yes)		
Revenue, by preference for comfort for heating	2040	37271.82	42791.16	*t* = -5.0449	0.00000
Revenue, by strong preference for comfort	2040	38665.47	44532.82	*t* = -4.9310	0.00000
Revenue, by preference for comfort for hot water	2040	37430.96	44601.38	t = -6.5383	0.00000
Revenue, by preference for comfort for electricity	2040	37265.54	42888.56	*t* = -5.1529	0.00000
Real energy consumption, by strong preference for comfort	2040	164.389	175.3014	*t* = -2.4484	0.0072
Real energy consumption, by preference for comfort for heating	2040	170.3639	171.0365	*t* = -0.1386	0.4449
Theoretical energy consumption, by strong preference for comfort	2040	208.7363	190.8599	*t* = 2.9913	0.0014

Table II-3: Descriptive statistics between preferences and income decile

Source: PHEBUS Survey 2012, authors' calculations
**Income is defined by deciles: D1 (decile 1) to D10 (decile 10)*

	Energy consumption in kwh/m²		Strong preference for comfort		No preference for comfort		Preference for comfort for heating		Preference for comfort for electricity		Preference for comfort for hot water	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
D1*	308.3	171.8	27.47%	44.75%	41.76%	49.44%	42.10%	49.49%	37.57%	48.55%	47.63%	50.07%
D2	309.8	206.4	17.77%	38.32%	30.78%	46.27%	45.88%	49.95%	30.66%	46.22%	50.66%	50.12%
D3	263.0	166.1	29.21%	45.59%	32.83%	47.07%	52.50%	50.06%	37.60%	48.56%	52.40%	50.06%
D4	260.9	140.9	26.70%	44.35%	28.89%	45.44%	53.33%	50.01%	36.19%	48.17%	56.12%	49.75%
D5	264.8	134.5	31.58%	46.60%	27.06%	44.53%	58.70%	49.36%	42.27%	49.52%	53.91%	49.97%
D6	248.7	115.8	27.19%	44.60%	33.22%	47.22%	54.25%	49.94%	33.13%	47.18%	57.27%	49.59%
D7	253.3	132.3	36.13%	48.16%	19.41%	39.65%	62.64%	48.49%	50.54%	50.12%	63.32%	48.31%
D8	241.5	112.4	32.46%	46.94%	18.59%	39.00%	66.07%	47.46%	47.56%	50.06%	60.02%	49.11%
D9	235.7	128.3	33.56%	47.34%	18.73%	39.11%	62.10%	48.63%	51.63%	50.10%	61.16%	48.86%
D10	229.08	115.30	38.78%	48.84%	18.77%	39.15%	61.43%	48.79%	54.85%	49.89%	66.74%	47.23%

Table II-4: Analysis of preferences: Correlation between individual preferences and socio-economic characteristics

	Age	**Number of consumption units**	**Revenue**	**Strong preference for comfort**	**Medium preference for comfort**	**Low preference for comfort**
Number of consumption units	-0.4104*					
Revenue	-0.1131*	0.3718*				
Strong preference for comfort	0.0242	-0.0262	0.1086*			
Medium preference for comfort	-0.0568*	0.0687*	0.0602*	-0.3414*		
Low preference for comfort	-0.0347	-0.0011	-0.0396	-0.3384*	-0.2766*	
Preference for comfort for heating use	0.0060	0.0224	0.1111*	0.5663*	0.2210*	-0.0947*

*Significance level $p<0.05$

Figure II-5: EPC energy-efficiency classification

Energy classification is based on Energy Performance Certificates (EPCs). EPCs are a rating scheme to assess the energy efficiency of dwellings. Information about energy efficiency is given as:

• a numerical value of the energy performance of the dwelling (theoretical energy consumption expressed in kilowatt-hours per square meter) calculated with an engineering model from observed technical characteristics

• a ranking into categories of energy performance based on the previous numerical value. Seven categories are defined gradually from G (lower energy efficiency) to A (higher energy efficiency)

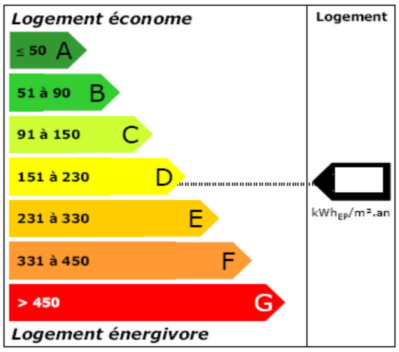


Table II-5: Distribution of national dwelling stock into energy-efficiency classifications

Energy Class	Number of observations	At national scale	Share of housing stock (%)
A-B	48	439 585	2
C	281	2 724 895	12.6
D	564	5 483 573	25.4
E	598	6 322 821	28.3
F	301	3 361 569	15.6
G	248	3 257 038	15

III. Regressions

1 Quality test of instruments

First, we performed tests to determine whether endogenous regressors in the model are in fact exogenous. After a 2SLS estimate with an unadjusted VCE, the Durbin (Jiang et al. 2014) and Wu–Hausman (Hausman 1978; Wu 1974) statistics were reported.

We checked the consistency of the results with a VCE estimate. In all cases, if the test statistic is significant, then the variables being tested must be treated as endogenous.

H_0: variables are exogenous	
Durbin (score) χ^2 = 14.7703	p = 0.0001
Wu-Hausman F (1.2012) = 14.6739	p = 0.0001

Robust score χ^2 (International Energy Agency (IEA))(International Energy Agency (IEA))(International Energy Agency (IEA))(International Energy Agency (IEA)) = 8.18694	$p = 0.0042$
Robust regression F (1.2012) = 9.12298	$p = 0.0026$

We now explore the degree of correlation between the additional instruments (energy prices in 2011 and electricity rates) and the endogenous regressor (energy prices in 2012). Our exogenous variable can be considered a valid instrument if it is correlated with the included endogenous regressors but uncorrelated with the error term. Using a Stock and Yogo (2005) test, we discuss the validity of the instruments. The null hypothesis of each of Stock and Yogo's tests is that the set of instruments is weak. To perform the Wald tests, we choose a relative rejection rate of 5%. If the test statistic exceeds the critical value, we can conclude that our instruments are not weak. In our model, the *F* statistic is 459.896 and largely exceeds the critical value. Our instruments are not weak.

Minimum eigenvalue statistic = 459.896

	5%	10%	20%	30%
2SLS relative bias	13.91	9.08	6.46	5.39
2SLS Size of nominal 5% Wald test	22.30	12.83	9.54	7.80
LIML Size of nominal 5% Wald test	6.46	4.36	3.69	3.32

Finally, to confirm our results, we perform tests of overidentifying restrictions. With the 2SLS estimator, Sargan's (Sargan 1958) and Basmann's (Basmann 1960) χ^2 tests are reported. A statistically significant test statistic always indicates that the instruments may not be valid. Here, the tests are not significant, so our instruments are valid.

Sargan (score) χ^2 (2) = 2.45102	$p = 0.2936$
Basmann χ^2 (2) = 2.41909	$p = 0.2983$

In order to ensure the quality of the lag of energy prices as instrument, we test also as instrument the energy prices in 2010. The Durbin score and the Wu-Hausman score test rejects the null hypothesis of the absence of endogeneity. Sargan's (Sargan 1958) and Basmann's (Basmann 1960) χ^2 tests still indicate the validity of instruments.

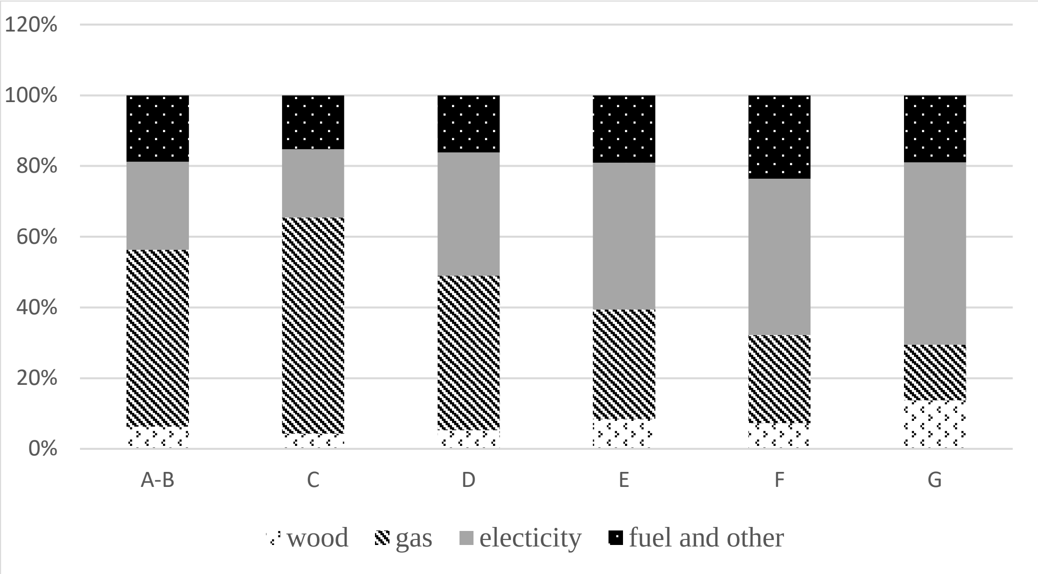
Table III-1: Reduced form for the IV regression (whole sample)

Variables	(1) Energy price 2012 (log)
Energy price 2011 (log)	0.987*** (0.00235)
Electricity rate 1	0.00867*** (0.00174)

Electricity rate 2	-0.00391
	(0.00786)
Constant	0.0174***
	(0.00589)
Observations	2,040
R^2	0.989

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure III-1: Percentage of each type of heating energy source by energy class



Source: PHEBUS Survey 2012, authors' calculations

Table III-2: Marginal effects for the ordered probit model

	Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5	Outcome 6
Whole sample						
	Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5	Outcome 6
Energy price in 2012	-0.0072	-0.0232	-0.0180	0.0073	0.0159	0.0251
Income (log)	0.0053	0.0170	0.0132	-0.0053	-0.0117	-0.0184
No. of persons	0.0023	0.0073	0.0057	-0.0023	-0.0051	-0.0080
Preference for comfort: high	0.0001	0.0002	0.0002	-0.0001	-0.0002	-0.0003
Preference for comfort: medium	0.0029	0.0092	0.0072	-0.0029	-0.0063	-0.0100
Preference for comfort: low	0.0025	0.0081	0.0063	-0.0025	-0.0055	-0.0087
Control for individual characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Control for building characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Control for locality	Yes	Yes	Yes	Yes	Yes	Yes
Decile 1-2-3						
	Outcome 1	Outcome 2	Outcome 3	outcome 4	Outcome 5	Outcome 6
Energy price in 2012	0.0006	0.0024	0.0026	0.0004	-0.0016	-0.0045
Income (log)	0.0048	0.0202	0.0221	0.0036	-0.0133	-0.0375
No. of persons	0.0028	0.0117	0.0127	0.0021	-0.0077	-0.0217
Preference for comfort: high	-0.0029	-0.0120	-0.0131	-0.0022	0.0079	0.0223
Preference for comfort: medium	-0.0030	-0.0127	-0.0139	-0.0023	0.0083	0.0236
Preference for comfort: low	-0.0008	-0.0034	-0.0037	-0.0006	0.0022	0.0063
Control for individual characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Control for building characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Control for locality	Yes	Yes	Yes	Yes	Yes	Yes
Decile 8-9-10						
	Outcome 1	Outcome 2	Outcome 3	outcome 4	Outcome 5	Outcome 6
Energy price in 2012	-0.0322	-0.0911	-0.0410	0.0494	0.0607	0.0543
Income (log)	-0.0175	-0.0494	-0.0222	0.0268	0.0329	0.0294
No. of persons	0.0020	0.0055	0.0025	-0.0030	-0.0037	-0.0033
Preference for comfort: high	0.0139	0.0393	0.0177	-0.0213	-0.0262	-0.0234
Preference for comfort: medium	0.0222	0.0627	0.0283	-0.0340	-0.0418	-0.0374
Preference for comfort: low	0.0224	0.0634	0.0286	-0.0344	-0.0423	-0.0378
Control for individual characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Control for building characteristics	Yes	Yes	Yes	Yes	Yes	Yes

Table III-3: Distribution of income deciles for each energy-efficiency classification (%).

	A	B	C	D	E	F	G
D1	0	12	4	7	8	14	21
D2	0	5	7	6	11	15	16
D3	0	2	9	10	10	9	13
D8	20	14	14	10	11	6	6
D9	20	16	14	13	7	10	5
D10	20	12	14	13	8	9	5

Legend: 42% of the dwellings belonging to energy class B are occupied by households in the three highest income deciles. 50% of the dwellings of energy class G are occupied by households of the three lowest income deciles