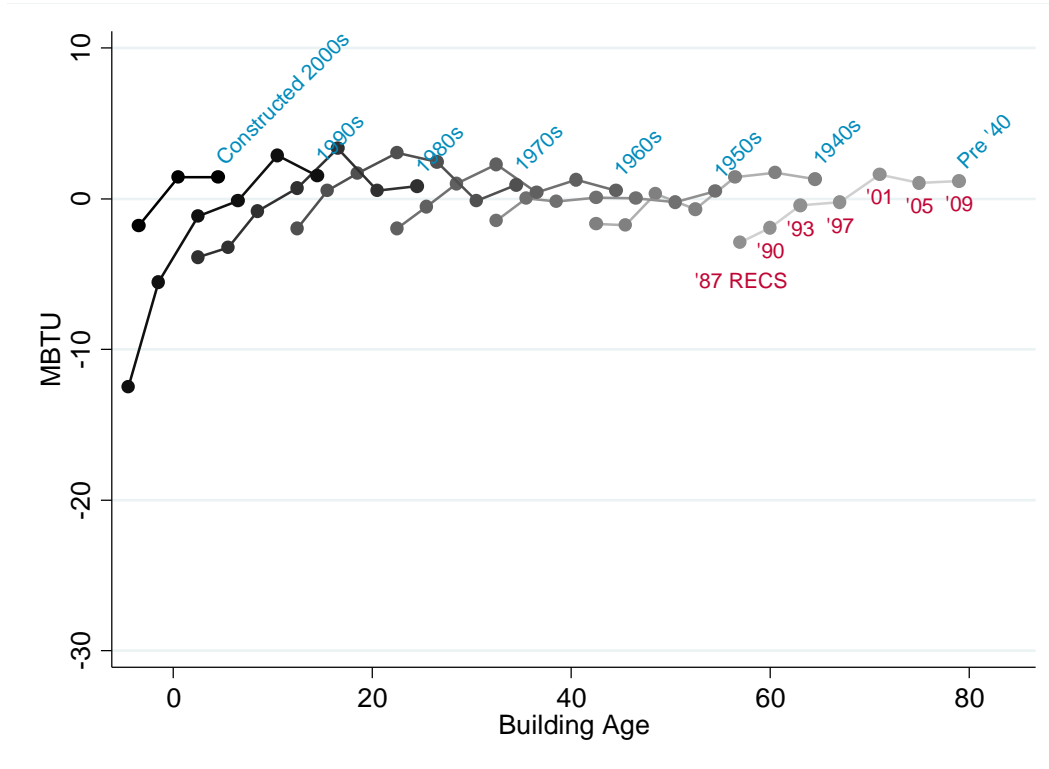


Online Appendix

How Much Energy Do Building Energy Codes Save? Evidence from California Houses

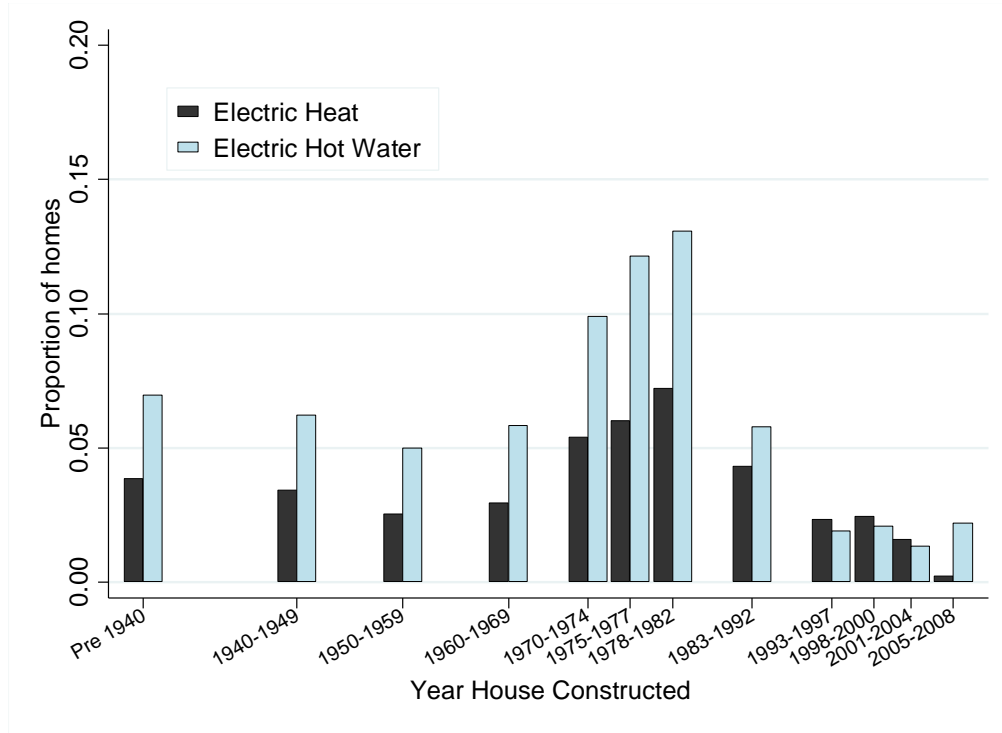
Arik Levinson

**Figure A1. Electricity Residuals
After Controlling for Building and Occupant Characteristics**



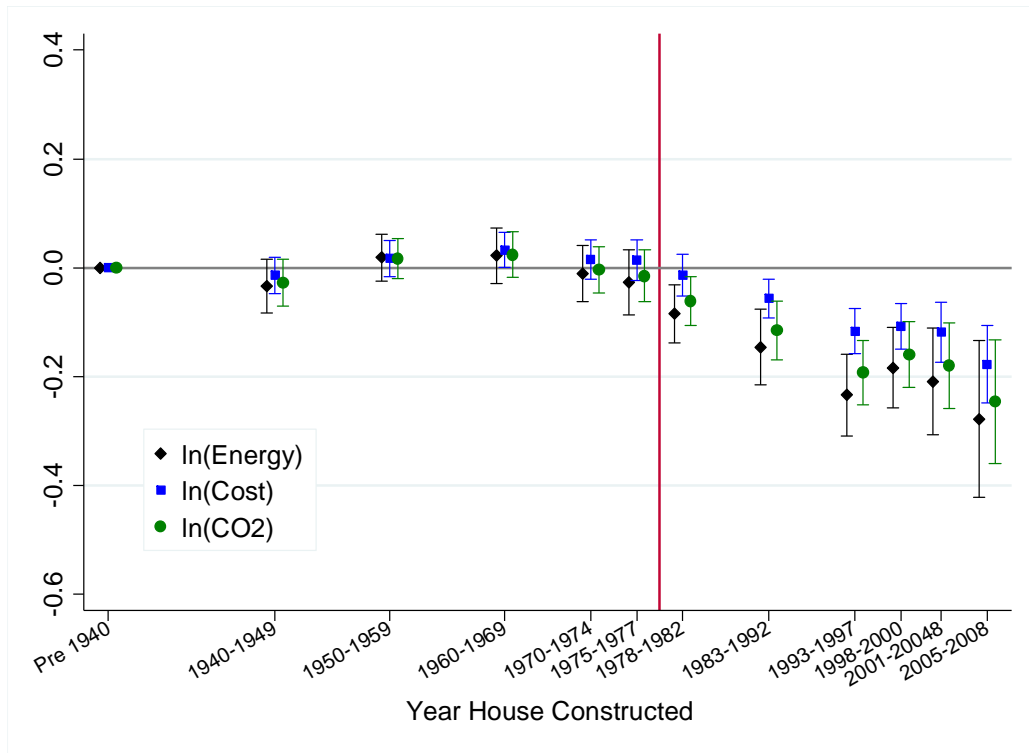
This figure is an analog to Figure 2 in the paper. It plots the residuals, after regressing household electricity (the vertical axis in Figure 2) on household and resident characteristics, excluding the age of the home. See footnote 17.

Figure A2. Proportion of California Homes with Electric Heat or Hot Water



Note: RASS 2003 and 2009, single-family detached California homes.

Figure A3. Combined Energy Use, Controlling for Characteristics



This figure is an analog to Figures 3 and 4. It plots the residuals, after regressing the sum of household electricity and natural gas on household and resident characteristics, based on the regressions in Appendix Table A4.

Table A1. Sample Creation for the RASS Data

	2003	2009	Total
	(1)	(2)	(3)
RASS homes	21,920	25,721	47,641
Single-family detached	11,874	14,263	26,137
Data on income, bedrooms, area, residents, years at address, race, fridges, vintage	8,704	10,808	19,512
No electric heat or hot water	7,961	10,116	18,077
County identified	7,961	10,078	18,039
<u>Part I</u>			
One complete year of monthly bills			
Electricity	7,201	6,844	14,045
Natural gas	6,391	5,967	12,358
<u>Part II</u>			
At least 12 monthly bills (possibly nonconsecutive)			
Electricity	7,738	8,869	16,607
Natural gas	6,822	7,585	14,407

Table A2. Electricity Consumption in the RASS

Dependent variable: ln(annual electricity)	Building, occupant (1)	Appliances (2)	Age of AC (3)	Levels (5)	With electric heat and water (6)
Cooling degree-days (100s)	0.028 (0.005)	0.021 (0.003)	0.021 (0.003)	0.556 (0.084)	0.020 (0.003)
Heating degree-days (100s)	-0.002 (0.004)	-0.001 (0.004)	-0.001 (0.004)	-0.007 (0.087)	-0.001 (0.004)
ln(square feet)	0.366 (0.020)	0.266 (0.016)	0.266 (0.016)	5.316 (0.436)	0.264 (0.015)
Bedrooms	0.031 (0.007)	0.025 (0.007)	0.025 (0.007)	0.566 (0.208)	0.027 (0.007)
Electric cooking	0.036 (0.009)	0.036 (0.007)	0.036 (0.007)	0.641 (0.202)	0.046 (0.007)
Remodeled	0.035 (0.011)	0.027 (0.010)	0.026 (0.010)	0.602 (0.289)	0.025 (0.011)
ln(years at address)	0.025 (0.004)	0.026 (0.005)	0.027 (0.005)	0.641 (0.112)	0.026 (0.005)
ln(number of residents)	0.257 (0.011)	0.243 (0.009)	0.243 (0.010)	5.429 (0.278)	0.248 (0.011)
ln(household income)	0.116 (0.009)	0.095 (0.008)	0.095 (0.008)	2.292 (0.191)	0.096 (0.008)
Residents aged 0–5	-0.0487 (0.005)	-0.049 (0.005)	-0.050 (0.005)	-1.291 (0.115)	-0.051 (0.005)
Residents aged 65–99	-0.024 (0.006)	-0.031 (0.007)	-0.031 (0.007)	-0.798 (0.171)	-0.031 (0.007)
Household head graduated college	-0.068 (0.009)	-0.051 (0.007)	-0.051 (0.007)	-1.275 (0.228)	-0.055 (0.007)
Disabled resident	0.156 (0.009)	0.143 (0.009)	0.142 (0.009)	3.585 (0.328)	0.147 (0.009)
Household head Black	0.036 (0.019)	0.049 (0.021)	0.049 (0.021)	0.759 (0.447)	0.039 (0.020)
Household head Latino	-0.093 (0.015)	-0.085 (0.013)	-0.085 (0.013)	-2.217 (0.317)	-0.092 (0.013)
Own home	-0.036 (0.018)	-0.055 (0.017)	-0.055 (0.017)	-1.597 (0.289)	-0.052 (0.016)
Refrigerators		0.191 (0.007)	0.191 (0.007)	4.973 (0.194)	0.187 (0.007)
Room AC		0.058 (0.011)	0.058 (0.011)	1.212 (0.248)	0.052 (0.011)
Central AC		0.141 (0.029)	0.153 (0.031)	-1.302 (0.826)	0.129 (0.028)
Central AC x sq. feet		0.030 (0.009)	0.030 (0.009)	3.184 (0.330)	0.028 (0.009)
Age of central AC			-0.0012 (0.0005)		
Electric heating					0.221 (0.019)
Electric hot water					0.332 (0.020)
RASS 2009	0.067 (0.010)	0.052 (0.008)	0.052 (0.008)	1.296 (0.258)	0.056 (0.008)

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Year home built

1940s	0.027 (0.017)	0.012 (0.017)	0.012 (0.017)	-0.126 (0.415)	0.006 (0.016)
1950s	0.047 (0.028)	0.033 (0.026)	0.033 (0.026)	0.095 (0.545)	0.020 (0.024)
1960s	0.089 (0.022)	0.062 (0.022)	0.062 (0.022)	0.549 (0.513)	0.054 (0.022)
1970–1974	0.089 (0.024)	0.057 (0.025)	0.057 (0.025)	0.551 (0.630)	0.047 (0.023)
1975–1977	0.121 (0.025)	0.070 (0.027)	0.071 (0.027)	0.927 (0.728)	0.068 (0.026)
1978–1982	0.115 (0.025)	0.065 (0.027)	0.067 (0.027)	0.668 (0.646)	0.058 (0.026)
1983–1992	0.105 (0.023)	0.038 (0.024)	0.042 (0.024)	0.142 (0.524)	0.034 (0.023)
1993–1997	0.065 (0.026)	-0.005 (0.026)	-0.004 (0.025)	-1.282 (0.573)	-0.010 (0.025)
1998–2000	0.052 (0.021)	-0.016 (0.022)	-0.019 (0.021)	-1.675 (0.464)	-0.026 (0.021)
2001–2004	0.041 (0.035)	-0.025 (0.030)	-0.030 (0.029)	-2.077 (0.717)	-0.035 (0.029)
2005–2008	-0.003 (0.026)	-0.087 (0.028)	-0.094 (0.028)	-4.315 (0.667)	-0.091 (0.028)
Observations	14,045	14,045	14,045	14,045	15,132
R-squared	0.374	0.437	0.437	0.417	0.447

Notes: RASS 2003 and 2009. Standard errors clustered by county. Regressions also include 13 climate zone indicators. Excluded construction category is homes “Built pre-1940.”

Table A3. Natural Gas Consumption in the RASS

Dependent variable: ln(annual natural gas)	Full Controls (1)	Age of Heater (2)	Levels (3)	With electric heat and water (4)
Cooling degree-days (100s)	-0.016 (0.006)	-0.016 (0.006)	-0.452 (0.160)	-0.015 (0.006)
Heating degree-days (100s)	0.029 (0.007)	0.028 (0.007)	1.353 (0.286)	0.029 (0.007)
ln(square feet)	0.377 (0.021)	0.387 (0.025)	22.255 (1.848)	0.366 (0.023)
Bedrooms	0.016 (0.008)	0.009 (0.007)	0.796 (0.392)	0.017 (0.008)
Electric cooking	-0.037 (0.007)	-0.032 (0.008)	-1.415 (0.396)	-0.038 (0.007)
Remodeled	-0.010 (0.013)	-0.011 (0.013)	-0.750 (0.710)	-0.009 (0.012)
ln(years at address)	0.011 (0.004)	0.010 (0.004)	0.065 (0.244)	0.009 (0.004)
ln(number of residents)	0.131 (0.013)	0.138 (0.013)	4.496 (0.498)	0.130 (0.013)
ln(household income)	0.064 (0.008)	0.058 (0.007)	3.226 (0.422)	0.064 (0.008)
Residents aged 0–5	0.014 (0.006)	0.011 (0.006)	0.546 (0.332)	0.014 (0.006)
Residents aged 65–99	0.058 (0.008)	0.056 (0.008)	3.238 (0.473)	0.061 (0.008)
Household head graduated college	-0.034 (0.011)	-0.038 (0.012)	-1.237 (0.471)	-0.031 (0.010)
Disabled resident	0.080 (0.017)	0.083 (0.016)	4.072 (0.785)	0.079 (0.018)
Household head Black	0.116 (0.023)	0.106 (0.023)	5.120 (1.594)	0.114 (0.024)
Household head Latino	-0.029 (0.014)	-0.024 (0.013)	-1.133 (0.573)	-0.025 (0.014)
Own home	-0.078 (0.025)	-0.087 (0.024)	-4.766 (1.122)	-0.073 (0.025)
Water heater age		-0.0005 (0.0006)		
Home heater age		0.0017 (0.0005)		
Electric heating				-0.440 (0.030)
Electric hot water				-0.410 (0.093)
RASS 2009	-0.161 (0.017)	-0.159 (0.017)	-7.167 (0.737)	-0.159 (0.016)

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<u>Year home built</u>				
1940s	-0.055 (0.023)	-0.054 (0.021)	-4.016 (1.088)	-0.049 (0.022)
1950s	-0.037 (0.020)	-0.041 (0.023)	-3.872 (0.880)	-0.031 (0.021)
1960s	-0.051 (0.025)	-0.051 (0.027)	-5.157 (0.956)	-0.050 (0.026)
1970–1974	-0.094 (0.027)	-0.101 (0.026)	-7.486 (1.271)	-0.094 (0.030)
1975–1977	-0.113 (0.026)	-0.126 (0.028)	-7.857 (1.022)	-0.109 (0.028)
1978–1982	-0.161 (0.029)	-0.174 (0.031)	-10.115 (1.184)	-0.154 (0.031)
1983–1992	-0.196 (0.025)	-0.200 (0.026)	-12.234 (1.214)	-0.191 (0.027)
1993–1997	-0.255 (0.030)	-0.245 (0.030)	-15.963 (1.559)	-0.249 (0.031)
1998–2000	-0.278 (0.034)	-0.257 (0.025)	-16.927 (1.684)	-0.277 (0.035)
2001–2004	-0.313 (0.036)	-0.298 (0.032)	-19.219 (1.582)	-0.303 (0.037)
2005–2008	-0.350 (0.041)	-0.323 (0.038)	-20.661 (2.046)	-0.332 (0.046)
Observations	12,358	11,644	12,358	12,543
R-squared	0.266	0.267	0.247	0.270

Notes: RASS 2003 and 2009. Standard errors clustered by county. Regressions also include 13 climate zone indicators. Excluded construction category is homes “Built pre-1940.”

Table A4. Combining Electricity and Natural Gas Consumption in the RASS

	ln(Total BTUs)	ln(Cost)	ln(CO ₂)
	(1)	(2)	(3)
Cooling degree-days (100s)	-0.0013 (0.0143)	0.0109 (0.0071)	0.0030 (0.0114)
Heating degree-days (100s)	-0.0171 (0.0141)	-0.0056 (0.0075)	-0.0121 (0.0115)
ln(square feet)	0.2281 (0.0223)	0.2538 (0.0156)	0.2386 (0.0193)
Bedrooms	0.0523 (0.0112)	0.0345 (0.0073)	0.0448 (0.0095)
Electric cooking	-0.0431 (0.0123)	0.0014 (0.0070)	-0.0267 (0.0098)
Remodeled	0.0092 (0.0103)	0.0176 (0.0092)	0.0114 (0.0096)
ln(years at address)	0.0209 (0.0051)	0.0238 (0.0041)	0.0215 (0.0044)
ln(number of residents)	0.1815 (0.0105)	0.2056 (0.0061)	0.1882 (0.0080)
ln(household income)	0.0622 (0.0089)	0.0792 (0.0065)	0.0679 (0.0073)
Residents aged 0–5	-0.0117 (0.0068)	-0.0301 (0.0046)	-0.0178 (0.0057)
Residents aged 65–99	0.0142 (0.0063)	-0.0067 (0.0053)	0.0079 (0.0056)
Household head graduated college	-0.0319 (0.0113)	-0.0417 (0.0079)	-0.0353 (0.0097)
Disabled resident	0.1189 (0.0168)	0.1314 (0.0105)	0.1230 (0.0143)
Household head Black	0.1338 (0.0292)	0.0871 (0.0242)	0.1161 (0.0271)
Household head Latino	-0.0382 (0.0159)	-0.0647 (0.0119)	-0.0481 (0.0136)
Own home	-0.0836 (0.0200)	-0.0686 (0.0172)	-0.0776 (0.0186)
Refrigerators	0.0918 (0.0091)	0.1433 (0.0068)	0.1093 (0.0080)
Room AC	0.0537 (0.0113)	0.0541 (0.0103)	0.0531 (0.0106)
Central AC	0.0699 (0.0363)	0.0915 (0.0262)	0.0723 (0.0308)
Central AC x sq. feet	0.0425 (0.0107)	0.0386 (0.0080)	0.0421 (0.0092)
RASS 2009	-0.0844 (0.0286)	-0.0264 (0.0156)	-0.0680 (0.0232)

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<u>Year home built</u>			
1940s	-0.0341 (0.0246)	-0.0141 (0.0168)	-0.0277 (0.0214)
1950s	0.0188 (0.0214)	0.0171 (0.0165)	0.0166 (0.0185)
1960s	0.0225 (0.0255)	0.0325 (0.0161)	0.0240 (0.0210)
1970–1974	-0.0112 (0.0258)	0.0152 (0.0180)	-0.0039 (0.0214)
1975–1977	-0.0273 (0.0297)	0.0142 (0.0186)	-0.0148 (0.0240)
1978–1982	-0.0846 (0.0267)	-0.0135 (0.0192)	-0.0611 (0.0221)
1983–1992	-0.1457 (0.0347)	-0.0564 (0.0178)	-0.1149 (0.0270)
1993–1997	-0.2339 (0.0374)	-0.1169 (0.0206)	-0.1927 (0.0297)
1998–2000	-0.1837 (0.0367)	-0.1080 (0.0208)	-0.1595 (0.0298)
2001–2004	-0.2090 (0.0490)	-0.1181 (0.0274)	-0.1801 (0.0392)
2005–2008	-0.2778 (0.0717)	-0.1773 (0.0357)	-0.2460 (0.0568)
Observations	14,045	14,045	14,045
R-squared	0.2489	0.3631	0.2832

Notes: RASS 2003 and 2009. Standard errors clustered by county. Regressions also include 13 climate zone indicators. Excluded construction category is homes “Built pre-1940.” Column 1 sums electricity and natural gas by heat content (BTUs). Column 2 uses residential costs, at 12.23¢ and 14.74¢ per kWh in 2003 and 2009, and \$9.13 and \$9.43 per thousand feet of natural gas. Column 3 uses carbon content, at 639 and 630 lbs per MWh electricity in 2003 and 2009, and 117 lbs per million BTU of natural gas in both years. Source: www.eia.gov.

Table A5. Electricity Use and Monthly Cooling Degree-days (CDD) in California

Dependent variable: ln(monthly electricity)	No controls (1)	Full controls (2)	Only homes with central AC	
			Age of AC (3)	AC age x CDD (4)
CDD per month (10s)	0.0200 (0.0041)	0.0005 (0.0030)	0.0014 (0.0032)	0.0003 (0.0044)
Avg. monthly CDD in zip code		0.0208 (0.0031)	0.0185 (0.0040)	0.0185 (0.0040)
Age of AC			-0.0023 (0.0005)	-0.0017 (0.0007)
CDD x built 1940s	0.0051 (0.0015)	0.0046 (0.0017)	0.0071 (0.0024)	0.0070 (0.0022)
CDD x built 1950s	0.0020 (0.0016)	0.0020 (0.0013)	0.0036 (0.0020)	0.0036 (0.0021)
CDD x built 1960s	0.0014 (0.0019)	0.0012 (0.0014)	-0.0005 (0.0019)	-0.0005 (0.0019)
CDD x built 1970–1974	0.0035 (0.0016)	0.0033 (0.0016)	0.0040 (0.0024)	0.0040 (0.0023)
CDD x built 1975–1977	0.0023 (0.0019)	0.0032 (0.0019)	0.0001 (0.0024)	0.0002 (0.0024)
CDD x built 1978–1982	0.0037 (0.0017)	0.0048 (0.0021)	0.0040 (0.0026)	0.0043 (0.0028)
CDD x built 1983–1992	0.0064 (0.0027)	0.0074 (0.0029)	0.0040 (0.0032)	0.0043 (0.0036)
CDD x built 1993–1997	0.0094 (0.0029)	0.0105 (0.0029)	0.0075 (0.0034)	0.0078 (0.0035)
CDD x built 1998–2000	0.0058 (0.0016)	0.0063 (0.0013)	0.0029 (0.0016)	0.0027 (0.0015)
CDD x built 2001–2004	0.0089 (0.0032)	0.0099 (0.0035)	0.0063 (0.0036)	0.0065 (0.0035)
CDD x built 2005–2008	0.0048 (0.0029)	0.0068 (0.0033)	0.0030 (0.0037)	0.0017 (0.0029)
<u>Year home built</u>				
1940s	0.0062 (0.0277)	0.0144 (0.0182)	-0.0098 (0.0327)	-0.0090 (0.0326)
1950s	0.0879 (0.0342)	0.0340 (0.0298)	0.0241 (0.0493)	0.0247 (0.0498)
1960s	0.2169 (0.0320)	0.0666 (0.0239)	0.0816 (0.0419)	0.0816 (0.0420)
1970–1974	0.2528 (0.0333)	0.0571 (0.0266)	0.0256 (0.0515)	0.0254 (0.0520)
1975–1977	0.3289 (0.0331)	0.0802 (0.0279)	0.0852 (0.0521)	0.0842 (0.0525)
1978–1982	0.3317 (0.0372)	0.0584 (0.0280)	0.0339 (0.0502)	0.0319 (0.0503)
1983–1992	0.3270 (0.0360)	0.0164 (0.0243)	0.0046 (0.0399)	0.0023 (0.0408)
1993–1997	0.2973 (0.0430)	-0.0364 (0.0301)	-0.0533 (0.0479)	-0.0531 (0.0480)
1998–2000	0.3169 (0.0495)	-0.0330 (0.0279)	-0.0570 (0.0395)	-0.0549 (0.0401)
2001–2004	0.3023 (0.0441)	-0.0685 (0.0262)	-0.1114 (0.0385)	-0.1087 (0.0387)

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2005–2008	0.2811 (0.0495)	-0.1133 (0.0318)	-0.1678 (0.0371)	-0.1638 (0.0363)
ln(square feet)		0.3469 (0.0237)	0.4210 (0.0317)	0.4210 (0.0317)
Bedrooms		0.0310 (0.0077)	0.0188 (0.0106)	0.0189 (0.0105)
Electric cooking		0.0320 (0.0076)	0.0275 (0.0077)	0.0274 (0.0078)
Remodeled		0.0357 (0.0101)	0.0386 (0.0131)	0.0384 (0.0130)
ln(years at address)		0.0339 (0.0043)	0.0343 (0.0060)	0.0344 (0.0058)
ln(number of residents)		0.2715 (0.0095)	0.2506 (0.0122)	0.2507 (0.0123)
ln(household income)		0.1014 (0.0106)	0.1145 (0.0103)	0.1145 (0.0103)
Kids age 0-5		-0.0464 (0.0047)	-0.0456 (0.0051)	-0.0456 (0.0052)
Seniors over 65		-0.0305 (0.0069)	-0.0382 (0.0099)	-0.0382 (0.0099)
Household head graduated college		-0.0693 (0.0083)	-0.0853 (0.0107)	-0.0854 (0.0106)
Disabled resident		0.1467 (0.0112)	0.1578 (0.0156)	0.1578 (0.0155)
Household head black		0.0521 (0.0230)	0.0357 (0.0245)	0.0359 (0.0245)
Household head Latino		-0.0933 (0.0133)	-0.0932 (0.0149)	-0.0935 (0.0149)
Own home		-0.0631 (0.0162)	-0.0961 (0.0208)	-0.0964 (0.0210)
Refrigerators		0.0069 (0.0028)	0.0071 (0.0032)	0.0072 (0.0032)
Room AC		0.0757 (0.0102)	0.0330 (0.0186)	0.0329 (0.0186)
Central AC		0.2010 (0.0146)		
RASS 2009	0.0539 (0.0098)	0.0652 (0.0075)	0.0770 (0.0081)	0.0773 (0.0080)
<u>CDD x AC system age</u>				
CDD x < 1 yrs old				0.0012 (0.0039)
CDD x 1–3 yrs old				0.0032 (0.0026)
CDD x 4–8 yrs old				0.0005 (0.0020)
CHDD x 9–13 yrs old				0.0010 (0.0020)
CDD x 14–30 yrs old				-0.0000 (0.0015)
Observations	265,599	265,599	135,840	135,840
R-squared	0.145	0.368	0.323	0.323

Notes: Standard errors clustered by county. All regressions include month fixed effects. Columns 2 through 4 include county fixed effects.

Table A6. Gas Use and Monthly Heating Degree-days (HDD) in California

Dependent variable:	No controls	Full controls	Age of heating system	Heater age x HDD
ln(monthly gas)	(1)	(2)	(3)	(4)
HDD per month (10s)	0.0257 (0.0012)	0.0147 (0.0014)	0.0058 (0.0021)	0.0029 (0.0023)
HDD – avg., monthly HDD		0.0172 (0.0016)	0.0578 (0.0031)	0.0577 (0.0031)
Age of heating system			0.0031 (0.0003)	0.0050 (0.0004)
HDD x built 1940s	-0.0032 (0.0013)	-0.0018 (0.0015)	-0.0027 (0.0017)	-0.0028 (0.0017)
HDD x built 1950s	0.0044 (0.0010)	0.0053 (0.0012)	0.0046 (0.0014)	0.0044 (0.0014)
HDD x built 1960s	0.0060 (0.0013)	0.0074 (0.0013)	0.0064 (0.0016)	0.0060 (0.0016)
HDD x built 1970–1974	0.0033 (0.0013)	0.0045 (0.0013)	0.0032 (0.0015)	0.0029 (0.0016)
HDD x built 1975–1977	0.0038 (0.0014)	0.0044 (0.0016)	0.0027 (0.0018)	0.0026 (0.0018)
HDD x built 1978–1982	0.0052 (0.0012)	0.0056 (0.0011)	0.0031 (0.0014)	0.0031 (0.0014)
HDD x built 1983–1992	0.0038 (0.0012)	0.0040 (0.0012)	0.0006 (0.0021)	0.0007 (0.0021)
HDD x built 1993–1997	0.0021 (0.0014)	0.0025 (0.0015)	-0.0004 (0.0020)	-0.0015 (0.0019)
HDD x built 1998–2000	0.0008 (0.0017)	0.0022 (0.0014)	-0.0014 (0.0017)	-0.0038 (0.0017)
HDD x built 2001–2004	-0.0008 (0.0021)	0.0002 (0.0015)	-0.0034 (0.0018)	-0.0062 (0.0018)
HDD x built 2005–2008	0.0024 (0.0014)	0.0027 (0.0012)	-0.0014 (0.0022)	-0.0049 (0.0022)
<u>Year home built</u>				
1940s	-0.0537 (0.0227)	-0.0518 (0.0235)	-0.0446 (0.0247)	-0.0439 (0.0248)
1950s	-0.0824 (0.0234)	-0.1141 (0.0229)	-0.1066 (0.0252)	-0.1045 (0.0255)
1960s	-0.0740 (0.0276)	-0.1733 (0.0228)	-0.1682 (0.0225)	-0.1643 (0.0231)
1970–1974	-0.0473 (0.0340)	-0.1688 (0.0257)	-0.1761 (0.0209)	-0.1724 (0.0211)
1975–1977	-0.0336 (0.0278)	-0.1759 (0.0266)	-0.1791 (0.0301)	-0.1750 (0.0305)
1978–1982	-0.1027 (0.0324)	-0.2442 (0.0251)	-0.2433 (0.0252)	-0.2393 (0.0252)
1983–1992	-0.1005 (0.0304)	-0.2787 (0.0292)	-0.2745 (0.0271)	-0.2711 (0.0275)
1993–1997	-0.0974 (0.0349)	-0.3172 (0.0294)	-0.2954 (0.0287)	-0.2836 (0.0296)
1998–2000	-0.0685 (0.0551)	-0.3257 (0.0349)	-0.2844 (0.0270)	-0.2640 (0.0264)
2001–2004	-0.0378 (0.0642)	-0.3203 (0.0385)	-0.2821 (0.0301)	-0.2584 (0.0291)

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2005–2008	-0.0894 (0.0546)	-0.3798 (0.0326)	-0.3296 (0.0295)	-0.3016 (0.0281)
ln(square feet)		0.3388 (0.0181)	0.3503 (0.0181)	0.3506 (0.0181)
Bedrooms		0.0221 (0.0061)	0.0184 (0.0057)	0.0183 (0.0057)
Electric cooking		-0.0608 (0.0069)	-0.0580 (0.0080)	-0.0576 (0.0080)
Remodeled		-0.0125 (0.0116)	-0.0091 (0.0127)	-0.0097 (0.0127)
ln(years at address)		0.0153 (0.0044)	0.0135 (0.0040)	0.0139 (0.0040)
ln(number of residents)		0.2155 (0.0132)	0.2209 (0.0129)	0.2212 (0.0128)
ln(household income)		0.0529 (0.0081)	0.0528 (0.0081)	0.0529 (0.0080)
Kids age 0–5		-0.0024 (0.0060)	-0.0041 (0.0063)	-0.0042 (0.0063)
Seniors over 65		0.0338 (0.0078)	0.0341 (0.0088)	0.0336 (0.0088)
Household head graduated college		-0.0389 (0.0106)	-0.0419 (0.0118)	-0.0419 (0.0119)
Disabled resident		0.0632 (0.0169)	0.0660 (0.0161)	0.0656 (0.0162)
Household head black		0.1189 (0.0226)	0.1140 (0.0236)	0.1133 (0.0237)
Household head Latino		-0.0015 (0.0136)	0.0048 (0.0112)	0.0048 (0.0114)
Own home		-0.0991 (0.0218)	-0.1013 (0.0210)	-0.1017 (0.0211)
RASS 2009	-0.1816 (0.0105)	-0.1900 (0.0083)	-0.2171 (0.0102)	-0.2168 (0.0102)
<u>HDD x heating system age</u>				
HDD x < 1 yrs old				0.0068 (0.0014)
HDD x 1–3 yrs old				0.0067 (0.0011)
HDD x 4–8 yrs old				0.0054 (0.0009)
HDD x 9–13 yrs old				0.0037 (0.0010)
HDD x 14–30 yrs old				0.0011 (0.0011)
Observations	227,931	227,931	218,792	218,792
R-squared	0.496	0.554	0.543	0.543

Notes: Standard errors clustered by county. All regressions include month fixed effects. Columns 2 through 4 include county fixed effects.