

Housing Market Institutions Drive Race and Ethnicity Differences in Energy Consumption

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March 15, 2015

Abstract

When socio-demographic factors are considered in any kind of analysis of household electric and gas utility data, it is common to observe differences in energy use between households with different self-reported race and ethnicity compositions. These differences persist controlling for structure type, e.g., single family dwelling, age and size of housing units, and, other common control variables. Without the information necessary to better explain these differences, they are commonly summarized simply as cultural differences. This paper demonstrates that these differences can be partially explained by differential sorting by structure and ownership, i.e., endogenizing housing choice and rental decisions. We will show that these differences in energy consumption may be because of housing market institutions and restrictions.

1 Introduction

[12]

Figure 1: Annual kWh by Rent/Own and Race

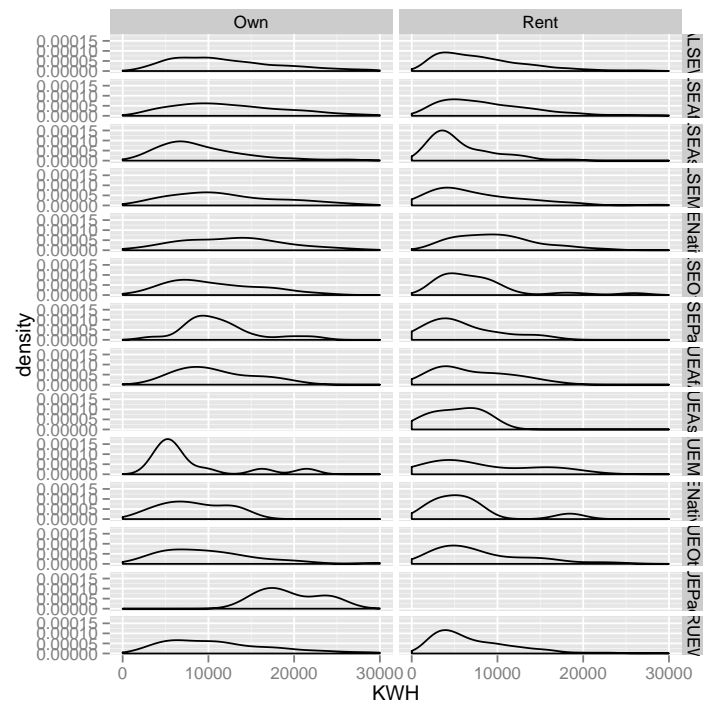
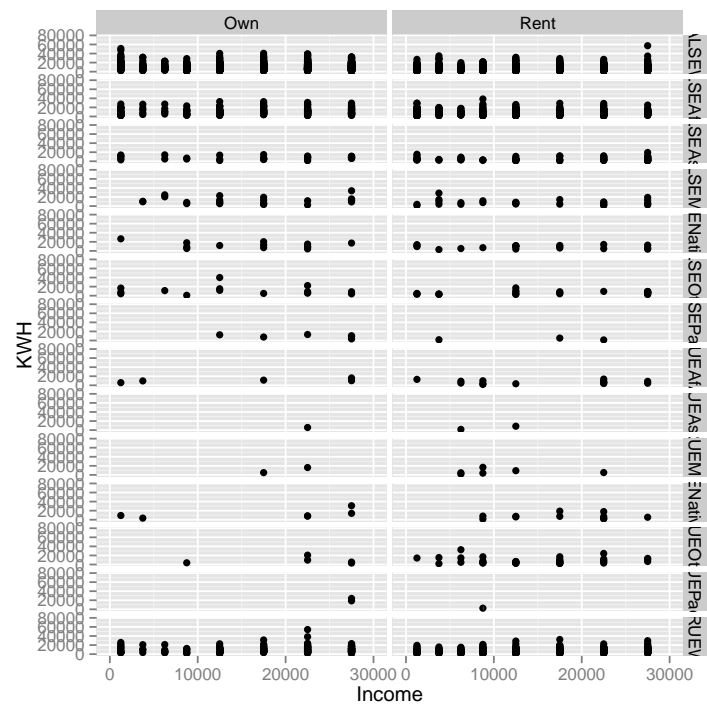


Figure 2: Annual kWh by Income



	FALSEWt	FALSEAfAm	FALSEAsian	FALSEMulti	FALSENativeAm	FALSEOth
Mobile	371	24	1	6	7	5
SFDetached	5694	754	231	87	35	1
SFAttached	544	121	48	14	9	1
SmApartment	430	174	52	12	7	1
LgApartment	951	382	113	27	15	2

Table 1: Count of Observations by Race and Structure Type

1.1 Race and Ethnicity in Conditional Demand

1.2 How Race and Ethnicity are Interpreted

2 RECS

2.1 Race and Ethnicity Differences in Equipment and Structure

2.2 Differences in Reported Behavior

2.3 HUD Complaints

3 Conditional Demand Estimation

3.1 Orthodox Results

3.2 Single Equation Methods

3.3 Multiple Equation Methods

4 Summary and Conclusions

References

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	State	Population	Reports (per 100,000)
1	Alabama	4,677,464	7.50
2	Alaska	688,125	13.01
3	Arizona	6,499,377	3.68
4	Arkansas	2,867,764	9.26
5	California	36,580,371	3.03
6	Colorado	4,935,213	1.97
7	Connecticut	3,502,932	20.50
8	Delaware	876,211	14.00
9	District of Columbia	590,074	14.00
10	Florida	18,423,878	3.93
11	Georgia	9,697,838	2.06
12	Hawaii	1,287,481	13.01
13	Idaho	1,527,506	9.94
14	Illinois	12,842,954	2.88
15	Indiana	6,388,309	9.14
16	Iowa	2,993,987	19.92
17	Kansas	2,797,375	10.31
18	Kentucky	4,287,931	7.50
19	Louisiana	4,451,513	9.26
20	Maine	1,319,691	20.50
21	Maryland	5,658,655	14.00
22	Massachusetts	6,543,595	4.51
23	Michigan	10,002,486	4.97
24	Minnesota	5,230,567	19.92
25	Mississippi	2,940,212	7.50
26	Missouri	5,956,335	4.99
27	Montana	968,035	9.94
28	Nebraska	1,781,949	10.31
29	Nevada	2,615,772	5.08
30	New Hampshire	1,321,872	20.50
31	New Jersey	8,663,398	2.34
32	New Mexico	1,986,763	5.08
33	New York	19,467,789	4.60
34	North Carolina	9,247,134	4.22
35	North Dakota	641,421	19.92
36	Ohio	11,528,072	9.14
37	Oklahoma	3,644,025	9.26
38	Oregon	3,782,991	13.01
39	Pennsylvania	12,566,368	1.87
40	Rhode Island	1,053,502	20.50
41	South Carolina	4,503,280	4.22
42	South Dakota	804,532	19.92
43	Tennessee	6,240,456	2.61
44	Texas	24,304,290	4.18
45	Utah	2,727,343	9.94
46	Vermont	621,049	20.50
47	Virginia	7,795,424	2.03
48	Washington	6,566,073	13.01
49	West Virginia	1,814,873	14.00
50	Wisconsin	5,627,610	1.81
51	Wyoming	532,981	9.94

Table 2: HUD Complaints per 100,000 Population

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2181.1197	1792.3947	1.22	0.2237
ElecMealsThreeDay	1338.6588	297.7217	4.50	0.0000
ElecMealsTwoDay	1644.3185	185.0764	8.88	0.0000
ElecMealsOneDay	1685.3404	159.1570	10.59	0.0000
ElecMealsFewWeek	1451.1356	183.7584	7.90	0.0000
ElecMealsOneWeek	1726.8842	406.3322	4.25	0.0000
ElecMealsLessWeek	992.8116	424.8594	2.34	0.0195
NUMFRIG	1574.9574	120.8432	13.03	0.0000
AgeFridge2to4Years	49.6457	195.1174	0.25	0.7992
AgeFridge5to9Years	312.9075	183.1243	1.71	0.0875
AgeFridge20PlusYears	282.4503	328.6753	0.86	0.3902
AgeFridge10to14Years	392.2705	207.4396	1.89	0.0587
AgeFridge15to19Years	3.4299	283.6629	0.01	0.9904
NUMPC	345.0370	64.3126	5.37	0.0000
TIMEON1OneTo3Hrs	-142.2026	160.6198	-0.89	0.3760
TIMEON1ThreeTo6Hrs	-5.9463	186.4186	-0.03	0.9746
TIMEON1SixTo10Hrs	224.2810	239.0840	0.94	0.3482
TIMEON1Gr10	823.2281	214.7291	3.83	0.0001
WELLPUMPTRUE	1501.4018	183.5027	8.18	0.0000
ElecWaterSmall	4421.9192	256.3522	17.25	0.0000
ElecWaterMed	4658.3555	163.9114	28.42	0.0000
ElecWaterLrg	5809.5827	189.7584	30.62	0.0000
ElecWaterTankless	3251.7517	755.3718	4.30	0.0000
SWIMPOOLTRUE	3228.7285	222.3292	14.52	0.0000
ElecPoolTRUE	4604.1557	837.0574	5.50	0.0000
RECBATHTRUE	1013.4653	426.3413	2.38	0.0175
ElecTubTRUE	1218.8041	486.6005	2.50	0.0123
NHSLDMEM	952.0720	42.5506	22.38	0.0000
Income	0.0086	0.0016	5.37	0.0000
TVONWD1LessHour:TVTYPE1Standard	-3266.1101	1800.2730	-1.81	0.0697
TVONWD1OneTo3Hrs:TVTYPE1Standard	-3010.1255	1775.5111	-1.70	0.0900
TVONWD1ThreeTo6Hrs:TVTYPE1Standard	-2516.9211	1772.6818	-1.42	0.1557
TVONWD1SixTo10Hrs:TVTYPE1Standard	-1794.7156	1778.9345	-1.01	0.3131
TVONWD1Gr10:TVTYPE1Standard	-1290.6207	1784.9518	-0.72	0.4697
TVONWD1LessHour:TVTYPE1LCD	-2896.8097	1807.2466	-1.60	0.1090
TVONWD1OneTo3Hrs:TVTYPE1LCD	-2313.1891	1773.9814	-1.30	0.1923
TVONWD1ThreeTo6Hrs:TVTYPE1LCD	-1955.8036	1770.9445	-1.10	0.2695
TVONWD1SixTo10Hrs:TVTYPE1LCD	-1593.9919	1777.1898	-0.90	0.3698
TVONWD1Gr10:TVTYPE1LCD	-485.7205	1785.6404	-0.27	0.7856
TVONWD1LessHour:TVTYPE1Plasma	-1497.7500	1988.0024	-0.75	0.4512
TVONWD1OneTo3Hrs:TVTYPE1Plasma	-1664.7504	1800.8346	-0.92	0.3553
TVONWD1ThreeTo6Hrs:TVTYPE1Plasma	-2001.8306	1788.6852	-1.12	0.2631
TVONWD1SixTo10Hrs:TVTYPE1Plasma	-940.8541	1815.7684	-0.52	0.6044
TVONWD1Gr10:TVTYPE1Plasma	418.9083	1846.1024	0.23	0.8205
TVONWD1LessHour:TVTYPE1Projection	-2094.9059	2146.9297	-0.98	0.3292
TVONWD1OneTo3Hrs:TVTYPE1Projection	-1639.6049	1851.1064	-0.89	0.3758
TVONWD1ThreeTo6Hrs:TVTYPE1Projection	-2152.3377	1812.9470	-1.19	0.2352
TVONWD1SixTo10Hrs:TVTYPE1Projection	-925.1902	1837.7040	-0.50	0.6147
TVONWD1Gr10:TVTYPE1Projection	1530.2305	1911.2140	0.80	0.4234
TVONWD1LessHour:TVTYPE1LED	-4513.1128	2901.1001	-1.56	0.1198
TVONWD1OneTo3Hrs:TVTYPE1LED	-1678.7884	2013.2805	-0.83	0.4044
TVONWD1ThreeTo6Hrs:TVTYPE1LED	-2106.7446	1923.5912	-1.10	0.2735
TVONWD1SixTo10Hrs:TVTYPE1LED	-3418.0720	2390.7609	-1.43	0.1528
TOTSQFT_EN:TYPEGLASSSinglePane	-0.1921	0.1586	-1.21	0.2259
TOTSQFT_EN:TYPEGLASSDoublePane	-0.0336	0.1540	-0.22	0.8271

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1948.2943	80.2307	24.28	0.0000
RENTHELPTTRUE	206.7350	84.1076	2.46	0.0140
StrTenureOwnLgApartment	-1392.2772	72.2081	-19.28	0.0000
StrTenureOwnMobile	-1134.4416	53.9823	-21.02	0.0000
StrTenureOwnSFAttached	-549.6952	49.0434	-11.21	0.0000
StrTenureOwnSmApartment	-779.1076	89.4444	-8.71	0.0000
StrTenureRentLgApartment	-1393.4070	31.1855	-44.68	0.0000
StrTenureRentMobile	-1213.4556	108.7993	-11.15	0.0000
StrTenureRentSFAttached	-856.9121	57.0870	-15.01	0.0000
StrTenureRentSFDetached	-553.5699	38.5786	-14.35	0.0000
StrTenureRentSmApartment	-1161.1082	42.1556	-27.54	0.0000
Income	0.0078	0.0003	29.57	0.0000
reporttot	14.8827	1.8850	7.90	0.0000
EDUCATIONNoHS	98.3357	82.3383	1.19	0.2324
EDUCATIONHS	109.9418	77.9684	1.41	0.1585
EDUCATIONSomeCol	168.9859	78.5995	2.15	0.0316
EDUCATIONAA	171.7528	82.0919	2.09	0.0364
EDUCATIONBA	352.1423	79.7827	4.41	0.0000
EDUCATIONMA	369.0524	84.7068	4.36	0.0000
EDUCATIONProf	623.5784	105.4315	5.91	0.0000
EDUCATIONPHD	499.0001	115.4102	4.32	0.0000
URUrban	-279.5002	25.5669	-10.93	0.0000
reporttot:EthRaceFALSEAfAm	-4.9338	4.5597	-1.08	0.2793
reporttot:EthRaceFALSEAsian	-8.7364	7.7372	-1.13	0.2589
reporttot:EthRaceFALSEMulti	-18.8675	9.8690	-1.91	0.0559
reporttot:EthRaceFALSENativeAm	-14.2408	12.0000	-1.19	0.2354
reporttot:EthRaceFALSEOther	0.6991	12.7324	0.05	0.9562
reporttot:EthRaceFALSEPacific	-37.5385	18.1475	-2.07	0.0386
reporttot:EthRaceTRUEAfAm	-13.9581	28.5075	-0.49	0.6244
reporttot:EthRaceTRUEAsian	-16.9656	33.5615	-0.51	0.6132
reporttot:EthRaceTRUEMulti	2.8707	16.5903	0.17	0.8626
reporttot:EthRaceTRUENativeAm	-22.4893	35.3740	-0.64	0.5249
reporttot:EthRaceTRUEOther	5.1444	11.5405	0.45	0.6558
reporttot:EthRaceTRUEPacific	-34.7671	55.4693	-0.63	0.5308
reporttot:EthRaceTRUEWt	-23.1538	5.5814	-4.15	0.0000

Table 4: Orthodox Square Foot Model