
# Do Liberal Home Owners Consume Less Electricity? A Test of the Voluntary Restraint Hypothesis

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# Do Liberal Home Owners Consume Less Electricity? A Test of the Voluntary Restraint Hypothesis

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Abstract

Using a unique data set that merges an electric utility's residential customer monthly electricity consumption in 2008 with household level data on demographics, structure and neighborhood characteristics and the political party of registration for the head of household, this paper documents that liberal households consume less electricity than observationally identical households. In the absence of first best carbon pricing, such "voluntary restraint" helps to mitigate the challenge of climate change.

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## Introduction

The U.S. residential sector consumes roughly 30% of overall electricity, thus contributing to the carbon dioxide which is a byproduct of electricity generation. In 2009, 1,216 pounds of carbon dioxide were produced per megawatt of power generated.[1] In the absence of Federal carbon mitigation legislation, a Pigouvian externality exists. No household has an incentive to unilaterally reduce its emissions.

Some households may engage in "voluntary restraint" even in the absence of explicit pollution pricing (Kotchen and Moore 2007). The motivation for such actions might be a direct disutility from causing environmental damage. This motivation is distinct from "green conspicuous consumption" of publicly observable products such as solar panels on roofs or driving a Prius hybrid (Bollinger and Gillingham 2013, Kahn 2007). Residential electricity consumption offers a test of the "voluntary restraint" hypothesis because households' electricity consumption is private information unobserved by neighbors.

This paper estimates household level electricity consumption equations to test whether political ideology plays a role in determining resource conservation. Using a large micro data set of residential electricity consumption in 2008 for home owners in a California County, we compare the consumption of different types of home owners. Controlling for detailed information on the demographics of the household and the home's physical characteristics, we focus on the role that political ideology plays in determining monthly electricity consumption. Our main finding is that, all else equal, liberal households who live in liberal communities consume roughly 10% less electricity than conservative households who live in conservative communities.

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1 http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2012V1_0_year09_SummaryTables.pdf

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**Empirical Framework**

A household values electricity as an input in producing comfort (e.g. indoor temperature) and leisure and household production activities. A household's total monthly electricity purchases depend in part on household demographics and time use at a given point in time and a whole collection of past actions (such as durables choices and decisions about the construction of the home) that are only partially observed by the econometrician.

We estimate reduced form household/month electricity consumption regressions as a function of household income and demographic characteristics, electricity rates, year built, and proxies for household ideology. Our regression model is

$$(1) \quad \log(\mathrm{kWh})_{hbcm} = \beta_0 \varphi_{cm} + \beta_1 \mathrm{Structure}_{hb} + \beta_2 \mathrm{Demographics}_{hb} + \beta_3 \mathrm{Ideology}_{hb} + U_{hbm}$$

where the unit of analysis is a household (h) in each month (m) who lives in census block b and faces a rate structure c, Structure is a vector of housing characteristics, Demographics is a vectors of household characteristics, and Ideology is a vector of individual household and block characteristics. Fixed effects, $\varphi_{cm}$, are included for each rate category/month to control for climate conditions and the average electricity price that households face (see Ito 2010 for estimates of the average electricity price elasticity).

**Data**

Our data come from a California utility which serves an entire county and a small part of another. Compared to the nation as a whole, this county has the same proportion of college graduates (24 percent in the nation versus 25 percent in this county) and the same proportion of residents above age 64 (12 percent in the nation versus 11 percent in this county), but its

population has a smaller share of whites (76 percent in the nation versus 66 percent in this county).

Our primary data set consists of residential billing data from January 2008 to December 2008. These data provide us with information on kilowatt hours purchased per billing cycle. We merge 2008 credit bureau data to our residential billing data. These credit bureau data provide us with household income; demographic characteristics of the household such as ethnicity, age of the household head, and number of persons in the household. These data also provide information about the home's attributes.[2]

The 2008 credit bureau data contain information on 520,835 households and we restrict the sample to the 280,470 single family homeowners for whom we have close to complete information.[3] These households are slightly older and include fewer household members compared to a random sample of single family homeowners in the metropolitan area of our utility in the American Community Survey (ACS) of 2005-2008.

We merge individual voter registration and marketing data (purchased from Aristotle Inc.) to our data set. For registered voters we know the party affiliation. We were able to link half of our sample to the voter registration data. (We do not limit our sample to the registered.) We linked either the person whose name was on the utility bill or the first person on the utility bill. Only 5% of households were "mixed" between conservatives and liberals.

Using data from the UC Berkeley Statewide Database, we merge to our data year 2000 census block data on the percentage of the block that are college educated and the percent of the block that are liberal registered voters. This latter variable is constructed as the sum of the Democrat, Green Party and Peace and Freedom Party. The neighborhood human capital

[2] We include dummy variables for missing household and structure attributes.
[3] The credit bureau data indicate that there are 309,149 single family homeowners.

measure allows us to control for Tiebout sorting in the pursuit of good schools and peer effects that might be correlated with the block's average political ideology. In all of the regressions, the standard errors are clustered by block group.

The unique contribution of our data collection effort is to have household level information on resource consumption, political ideology, socioeconomic and demographic characteristics, and house characteristics. Table One reports the summary statistics.

*Electricity Purchase Regression Results*

Table Two reports five OLS regression estimates of equation (1). In column (1), we report the results using all of the data from 2008. If a household lived in the same house for all twelve months, it would appear twelve times in our data set. In columns (2) to (5), we stratify the sample by three month intervals. This stratification allows us to test how voluntary restraint affects electricity consumption during hotter summer months.

Controlling for standard household demographics, climate conditions, electricity prices, and the home's physical attributes such as its year built, size, we focus on the association between political ideology and household electricity consumption.[4] Relative to Republican registered households, Democrats consume 5.1% less electricity and Green Party registered voters consume 15.5% less.[5] This differential grows larger in the hotter summer months. Based on the results in column (4), we estimate that during the summer Democrats consume 6.6% less

[4] Our demographic results on household income, age, and household size are consistent with previous estimates (see Lutzenhiser 1993; Wilson and Dowlatabadi 2007).

[5] In this calculation, we evaluate community attributes at their sample means for each party of registration. For example, for those who are registered Democrats, we calculate the average block percent college graduates and percent Liberal where they live.

electricity than observationally identical Republicans while Green Party households consume 19.1% less electricity than Republican households.

## Conclusion

Our results show that ideology explains some of the cross-sectional variation in residential electricity consumption when there are un-priced environmental externalities. Because electricity consumption is private information that is not observed by neighbors, our results are explained by ideology not by peer pressure. Liberal households engage in voluntary restraint, largely by lowering air-conditioning in the summer relative to conservatives. In a year, liberal households in liberal communities consume 10% less electricity than conservative households in conservative communities. Assuming an elasticity of -0.055 with respect to average price (Ito 2010), a 10% reduction in consumption would require a 182% increase in price.

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Table One: Summary Statistics

| | N | Mean | S.D. |
|---|---|---|---|
| Electricity Consumption Per Day | 3297831 | 28.275 | 16.726 |
| % Liberal Registered Voters | 280470 | 0.460 | 0.106 |
| % College Educated | 280470 | 0.283 | 0.162 |
| Household Income | 273510 | 67022.930 | 43198.160 |
| Interior Square Feet | 204920 | 1725.560 | 686.764 |
| Swimming Pool | 282266 | 0.127 | 0.333 |
| Age of Head of Household | 194426 | 56.531 | 14.956 |
| Year Moved In | 282266 | 1995.735 | 11.757 |
| Number of People in Household | 270212 | 2.094 | 1.155 |
| Registered but Party Missing | 282266 | 0.029 | 0.168 |
| American Independent | 282266 | 0.009 | 0.097 |
| Democrat | 282266 | 0.230 | 0.421 |
| Reform | 282266 | 0.001 | 0.029 |
| Green | 282266 | 0.002 | 0.050 |
| Libertarian | 282266 | 0.002 | 0.042 |
| Not Registered | 282266 | 0.493 | 0.500 |
| Peace and Freedom | 282266 | 0.001 | 0.033 |
| Republican | 282266 | 0.195 | 0.396 |
| Unaffiliated | 282266 | 0.037 | 0.190 |

Table Two: Residential Electricity Consumption Regressions

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | | 2008 Data Sample and Subsamples | | | |
| Explanatory Variables | All | Jan-Mar | Apr-Jun | Jul-Sep | Nov-Dec |
| Political Party of Registration | | | | | |
| American Independent | 0.038*** | 0.039*** | 0.041*** | 0.034*** | 0.039*** |
| | (0.009) | (0.010) | (0.009) | (0.010) | (0.009) |
| Democrat | 0.007 | 0.008 | 0.006 | 0.001 | 0.012** |
| | (0.005) | (0.006) | (0.006) | (0.005) | (0.005) |
| Reform | 0.008 | 0.021 | 0.009 | -0.009 | 0.012 |
| | (0.029) | (0.032) | (0.032) | (0.034) | (0.029) |
| Green | -0.091*** | -0.065*** | -0.098*** | -0.114*** | -0.089*** |
| | (0.017) | (0.019) | (0.019) | (0.019) | (0.017) |
| Libertarian | 0.049*** | 0.066*** | 0.058*** | 0.028 | 0.046** |
| | (0.018) | (0.020) | (0.020) | (0.021) | (0.020) |
| Not Registered | -0.044*** | -0.032*** | -0.041*** | -0.063*** | -0.041*** |
| | (0.005) | (0.005) | (0.006) | (0.005) | (0.005) |
| Peace and Freedom | 0.024 | 0.035 | 0.035 | 0.017 | 0.010 |
| | (0.025) | (0.027) | (0.027) | (0.028) | (0.029) |
| Republican | 0.044*** | 0.040*** | 0.047*** | 0.040*** | 0.051*** |
| | (0.005) | (0.006) | (0.006) | (0.005) | (0.006) |
| Unaffiliated | -0.021*** | -0.015** | -0.021*** | -0.028*** | -0.018*** |
| | (0.006) | (0.007) | (0.007) | (0.006) | (0.006) |
| Block Group Attributes | | | | | |
| % Liberal Registered Voters | -0.387*** | -0.247*** | -0.293*** | -0.703*** | -0.295*** |
| | (0.037) | (0.044) | (0.043) | (0.041) | (0.041) |
| % College Educated | -0.177*** | -0.095*** | -0.163*** | -0.289*** | -0.160*** |
| | (0.027) | (0.029) | (0.032) | (0.034) | (0.029) |
| Household Level Variables | | | | | |
| Swimming Pool | 0.338*** | 0.301*** | 0.378*** | 0.319*** | 0.354*** |
| | (0.005) | (0.005) | (0.005) | (0.005) | (0.004) |
| Log(Interior Square Footage) | 0.328*** | 0.339*** | 0.323*** | 0.323*** | 0.328*** |
| | (0.009) | (0.010) | (0.009) | (0.009) | (0.010) |
| Log(Household Income) | 0.082*** | 0.071*** | 0.087*** | 0.085*** | 0.083*** |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| Age of Head of Household | -0.004*** | -0.003*** | -0.004*** | -0.005*** | -0.004*** |

| | | | | | |
|---|---|---|---|---|---|
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Number of People in the Household | 0.087*** | 0.084*** | 0.092*** | 0.086*** | 0.088*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Year Moved In | -0.001*** | -0.001*** | -0.002*** | -0.001*** | -0.001*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant | 2.364*** | 2.085*** | 3.729*** | 2.308*** | 1.137*** |
| | (0.370) | (0.411) | (0.395) | (0.366) | (0.427) |
| Observations | 3,273,536 | 805,327 | 823,805 | 833,450 | 810,954 |
| R-squared | 0.297 | 0.320 | 0.267 | 0.219 | 0.260 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The unit of analysis is a household/month. This table reports five estimates of equation (1). The standard errors are clustered by block group. Fixed effects for month/rate category are included in each regression. Fixed effects for the home's year built are included. Dummy variables indicating missing data are included. The omitted category is a household that does not own a pool and whose political party of registration is "included in Aristotle but political party missing". The block group data from the 2000 Census. % Liberal is the sum of the block group's %Democrat plus % Green plus % Peace and Freedom.