Race, Ethnicity, and the Distribution of Energy Efficiency Incentives

Grant D. Jacobsen*

Oregon State University

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Abstract

This paper examines the distribution of energy efficiency incentives by race and ethnicity among residential American households based on data from the Residential Energy Consumption Survey. Across a variety of types of incentives, non-Hispanic White households are the mostly likely to have received an incentive relative to American Indian or Alaskan Native; Asian; Black or African American; Hispanic White; Native Hawaiian or Other Pacific Islander; or multi-racial households. I compute concentration indices to compare the degree of inequality by type of incentive. Tax credits, utility rebates, and subsidies for home energy audits have similar levels of inequality by race and ethnicity. Subsidies for efficient light bulbs have a more equal rate of uptake. The driving mechanism for these disparities appears to be that non-Hispanic White households are more likely to be homeowners, as the differences in uptake disappear in models that control for homeowner/renter status.

JEL Codes: Q48, Q52, Q38
Keywords: energy efficiency, energy incentives, race, ethnicity, energy rebates, energy tax credits, energy subsidies, distributional effects, energy policy

*Post: Economics, School of Public Policy, 300 Bexell Hall, 2251 SW Campus Way, Corvallis, OR 97331, Tel: (541) 737-5371, Email: grant.jacobsen@oregonstate.edu.

1 Introduction

In recent years, concerns about equity and justice have increasingly played a role in debates about the future of the energy sector and energy policy. For example, the Biden Administration launched the Justice40 Initiative in July of 2021, which aims to "ensure that Federal agencies work with states and local communities to make good on President Biden's promise to deliver at least 40 percent of the overall benefits from Federal investments in climate and clean energy to disadvantaged communities (Young et al., 2021)." At the international level, negotiations and assessments have often embedded equity in their procedures. For example, special reports and assessment reports from the International Panel on Climate Change have focused on equity, including both procedural justice, which focuses on decision-making, and distributive justice, which focuses on how the costs and benefits of climate actions are distributed (Allen et al., 2018, Kolstad et al., 2014). Similar trends have emerged at more local levels. The California Public Utilities Commission (CPUC), for example, has formed an Environmental and Social Justice (ESJ) Action Plan, which goals include, "making sure members of ESJ communities participate in CPUC proceedings and decision-making and that investments in clean energy resources, transportation, and communication services benefit all communities (CPUC, 2021)."

Race has played a major role in policies and discourse related to environmental and energy justice. The Environmental Protection Agency (EPA) defines Environmental Justice as "the fair treatment and meaningful involvement of all people regardless of *race*, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies (emphasis added) (EPA, 2021)." Outside

of government agencies, the link between energy and environmental justice and race has often been made even more explicit. For example, the board of *Nature Energy* wrote and published an editorial entitled "Energy Justice Towards Racial Justice," that concluded that "Racial justice considerations must be front and centre as society starts to imagine what the new normal will look like, in the energy sector and beyond (Nature Energy Editorial Board, 2020)." Nonprofit organizations have echoed similar sentiments. The Environmental Defense Fund published a guest blog titled "Energy Justice is Racial Justice," which, among other points, argued that "doing justice is fighting for equal access to affordable investments in energy efficiency (Malcom, 2020)."

Part of the reason for the focus on race within discussions related to energy policy is that there is growing evidence on historical and ongoing racial disparities in the energy sector. For example, Bednar et al. (2017) use data from the U.S. Energy Information Administration and U.S. Census Bureau to show that minority households in Detroit, MI, are more likely to live in less efficient housing. Similarly, Reames (2016) presents evidence from Kansas City, MO, that census block groups with a greater percentage of racial/ethnic minority households have less efficient households and Tong et al. (2021) uses fine scale data from Tallahassee, FL, and St. Paul, MN, to show that large differences in energy use intensity exist across race. With respect to energy costs, Kontokosta et al. (2020) present evidence from the American Housing Survey and Residential Energy Consumption Survey that energy cost burdens (the fraction of income spent on energy) are higher for minority households than non-Hispanic White households. Relatedly, Lyubich (2020) uses data from the American Community Survey to show that Black households have higher energy expenditures than White households in the United States, regardless of whether examining

renters or homeowners, after controlling for income, household size, homeowner status, and city of residence. Drehobl and Ross (2016) find that Black/African American and Latino households pay more for utilities per square foot than the average household.

While differences across race and ethnicity in household energy efficiency, energy intensity, and energy burden have been well documented, a complete understanding for why these differences exist has not been documented in the literature. This paper investigates one potential contributor: differences in the uptake of incentives for energy efficiency improvements. Energy efficiency incentives provide financial support to encourage energy efficiency improvements. Such incentives are sometimes provided directly through federal legislation focused on spurring investment in energy efficiency (e.g., the Energy Policy Act of 2005, the Energy Improvement and Extension Act of 2008, and the American Recovery and Reinvestment Act of 2009). In other cases, incentives are required or encouraged under a variety of state or local policies or regulatory requirements connected to the energy sector that are often focused on energy utilities, including integrated resource planning, demand-side management plans, system benefit charges, public purpose programs, statutory requirements that utilities acquire all cost-effective energy efficiency investments, energy efficiency resource standards, and renewable portfolio standards that include eligibility for energy efficiency.[1]

I use data from the Residential Energy Consumption Survey (RECS) to evaluate how the uptake of incentives for energy efficiency improvements are distributed across households by race and ethnicity. I first show that non-Hispanic White households are more likely than

[1]See Barbose et al. (2013) for a more detailed discussion of the structure and geography of energy efficiency incentives.

any other group recorded in the RECS to receive an incentive, including American Indian or Alaskan Native; Asian; Black or African American; Hispanic White; Native Hawaiian or Other Pacific Islander; or multi-racial households. Next, I examine whether certain types of incentives are distributed more equitably than other by computing concentration indices for each type of incentive recorded in the RECS. I find that incentives for tax credits, utility rebates, and home energy reports are all similarly concentrated across race and ethnicity, whereas incentives for high efficiency light bulbs are the least concentrated and their concentration index is only about one-third the size of the other forms of incentives. Finally, I investigate the mechanism driving the disparities in the uptake of incentives by examining whether the differences across groups change when controlling for other factors, including income, climate, urban/rural location, housing type, homeowner/renter status, who pays the electricity bill, electricity usage, and natural gas usage. I find evidence that the mechanism driving the differences in the uptake of incentives is elevated rates of homeownership among non-Hispanic White households, as regression models that control for homeowner/renter status provide little evidence of differences in uptake across groups of race/ethnicity.

This paper contributes to the literature on the distributional effects of energy policies. Within this literature, several papers have focused on the distribution of energy efficiency incentives, focusing especially on the relationship between incentives and income. In the earliest paper, Sutherland (1994) uses the 1990 RECS to show that higher income households are more likely to receive utility rebates and more likely to participate in load management and energy audit programs. More recently, Neveu and Sherlock (2016) use taxpayer data to show that tax credits for residential energy efficiency are vertically inequitable. Borenstein and Davis (2016) also focus on tax-based incentives, using tax return data to

show that tax expenditures on clean energy investments primarily go to higher income households, with the top quintile of households receiving about 60% of expenditures. Finally, Jacobsen (2019) uses the 2009 RECS to show that energy efficiency incentives are concentrated in higher income households and that tax credits are the most dramatically concentrated form of incentive whereas utility rebates are the least. The present study contributes to this literature by focusing on the distribution of energy efficiency based on race and ethnicity as opposed to income.

More generally, this paper connects to the ongoing literature on the distributional effects of energy policy. For example, see Deryugina et al. (2019) for a discussion of efficiency-equity trade-offs within energy policy and Levinson (2019) for an analysis of the distributional effects of energy efficiency standards versus energy taxes. Grainger and Kolstad (2010), Currie et al. (2023), Grainger (2012), Davis and Knittel (2019), Holland et al. (2019), Bruegge et al. (2019), Hausman and Stolper (2021), Reguant (2019), and Hernandez-Cortes and Meng (2023) provide analyses of the distributional effects of carbon prices, the clean air act, the clean air act amendments, fuel economy standards, electric vehicle adoption, building energy codes, environmental information failures, renewable energy policies, and California's cap-and-trade program, respectively. While economists have often focused on distributional differences across income groups, other researchers have increasingly focused on conceptualizations of inequality that are more likely to explicitly embed race. For example, see Carley and Konisky (2020) for a review of academic work focused on energy justice. Fischer and Jacobsen (2021a, 2021b) and Konisky and Carley (2021) provide a related discussion of how equity and justice has been centered into modern policy debates related to energy policy and policy instrument choice.

2 Data

This study is based on data from the 2015 RECS.[2] The RECS is administered periodically by the U.S. Energy Information Administration and is comprised, when weighted,[3] of a nationally representative sample of housing units in the U.S. The data in the RECS are collected through a multi-phase study in which respondents provide information on the characteristics of their home and their behaviors related to energy use. The 2015 RECS was collected through web and mail forms, as well as in-person interviews, and includes 5,686 households.

The key variables from the RECS used in this study are variables related to energy efficiency incentives, race, and ethnicity. With respect to energy efficiency incentives, the survey asks, in separate questions, whether respondents have received 1) a tax credit for new appliance or equipment; 2) a utility or energy supplier rebate for new appliance or equipment; 3) free or subsidized energy-efficient light bulbs; 4) free or subsidized home energy audit; or 5) some other energy-related benefit or assistance.

The responses to the incentive-related questions available in the RECS include "Yes," "No," "Not Applicable (NA)," "Refused," and "Don't Know." Respondents answering NA were overwhelmingly renters (96% of observations with a value of "NA" for the incentive questions were renter households). Because the goal of the primary analysis is to examine the overall distribution of incentives, regardless of mechanism, I code all the RECS incentive-related variables as binary variables where they take a value of 1 if the respondent answered "yes," and 0 otherwise. An alternative approach would be to drop all renters from the sample, but that approach would prevent racial and ethnic disparities in homeownership from operating

[2]The 2015 RECS is the most recent publicly available version of the RECS.

[3]I employ the survey weights embedded within the RECS throughout all phases of the analysis.

as a mechanism for differences in the receipt of an incentive.[4]

The specific questions in the RECS for each incentive type are provided in Table 1, which also includes the labels that will be used for each question in the subsequent analysis and the fraction of households that reported receiving each type of incentive. Across types of incentives, the fraction of respondents having reported receiving the incentive varies between about 2% and 6%. Relatively more respondents have received incentives through tax credits and subsidized light bulbs, whereas incentives for home energy audits are received least frequently.

With respect to race, the RECS asks one question about respondent race and one question about whether the respondent is Hispanic.[5] The RECS race variable is recorded using the following groups: American Indian or Alaska Native alone (AIAN), Asian alone (ASN), Black or African/American alone (BLKAA), Native Hawaiian or Other Pacific Islander alone (NHOPI), White alone, some other race alone, or two or more races (TWOPLUS). I split respondents selecting White alone into non-Hispanic White alone (NHW) and Hispanic White alone (HW) into categories based on whether they indicated they were Hispanic.

Categories of race and ethnicity, their abbreviations, and the share of respondents are reported in Table 2. About 1% of the sample are AIAN households, 4% are ASN households, 12% are BLKAA households, 12% are HW households, less than 1% are NHOPI households,

[4]Respondents answering "Refused" or "Don't Know" are also coded as zeroes, although the appropriate choice for how to handle these observations is not obvious. However, as I show in Appendix Table A.1, dropping these observations from the analysis does not meaningfully alter the main results.

[5]The classification of race and ethnicity in the RECS follows the classification system used for the U.S. Census and most U.S. government datasets. The system was formulated by the Office of Management and Budget (OMB) and added to the federal register in 1997 standard. The OMB has considered but not enacted revisions to the 1997, focusing on "the use of separate questions measuring race and ethnicity and question phrasing; the classification of a Middle Eastern and North African group and reporting category; the description of the intended use of minimum reporting categories; and terminology used for race and ethnicity classifications (OMB, 2016)."

69% are NHW households, and 2% are multiracial. No observations had a value corresponding to "some other race alone" in the 2015 RECS dataset. Because of the small sample size for AIAN, NHOPI, and multiracial households, some caution should be taken when extrapolating the results based on the RECS for these groups to their broader populations.

3 Analysis and Results

3.1 Graphical Comparison

I begin the analysis by presenting graphs that plot the probability of receiving an incentive for each category of race/ethnicity. The graphs are displayed in Figure 1. In the first plot, 1.a., I pool the data such that there are five observations per household: one for each type of incentive. The graph indicates that NHW households are the most likely to receive energy efficiency incentives. Averaging across all incentive types, they have about a 4% probability of receiving an incentive, whereas the probability for other groups ranges between 1% (NHOPI) and 3% (ASN).

In the other panels in the figure, I reproduce the same graph for each type of incentive. All plots share a common feature: they indicate that NHW households are the most likely to receive an incentive. With respect to tax credits, NHW households have about a 7% probability of receipt and AIAN, TWOPLUS, HW, and ASN households have about a 4% probability. BLKAA households are even lower at 2% and no NHOPI households received an incentive.[6] For utility rebates, both NHW and ASN households have elevated probabilities, at around 4%, no NHOPI households received an incentive, and the remaining four groups

[6]Part of the reason that no NHOPI household reported receiving and incentive is that there are only 22 of them in the sample.

are all slightly below 2%. Incentives for home energy audits are less common in general but still display a similar pattern. More than 2% of NHW household have received an incentive. BLKAA, HW, and ASN households, in contrast, are closer to 1%, and no NHOPI or AIAN households received such an incentive. The extent by which uptake of incentives by NHW households exceeds that of other groups is smaller for efficient light bulbs. About 5% of NHW households received incentives, which is like that of BLKAA, HW, and NHOPI households and only slightly greater than that for TWOPLUS and ASN households. The final plot, other types of benefits of assistance, also has a more equitable distribution with about 2% of BLKAA, HW, and NHW households receiving incentives and AIAN, TWOPLUS, and ASN households receiving them a bit less often.

3.2 Primary Regression Models

I use a regression model to more precisely quantify the differences between groups and to identify which groups have uptake rates that significantly differ from NHW households. Specifically, I use a simple linear probability model where an indicator for receipt of an incentive is the dependent variable and the independent variables include indicators for each group of race/ethnicity except for NHW households. For the initial analysis, I purposefully do not include any control variables in the initial model. Control variables would effectively absorb potential channels through which disparities could arise, which is not desirable when the goal is to evaluate overall levels of inequality. I estimate a pooled model that stacks the responses for all questions into one sample of 28,430 and separate models of 5,686 observations for each type of incentive. For the pooled model, I cluster standard errors by household and, for models for each type of incentive, I compute White-Huber standard errors.

Results are reported in Table 3. Column 1 reports the pooled model and columns 2-6 report incentive-specific models. Focusing on statistically significant differences in uptake, the pooled model, which is the most appropriate model for evaluating aggregate equity across all varieties of energy efficiency incentives, shows that NHW households are significantly more likely to receive incentives than every other category of household. With respect to incentive-specific models, for the three types of incentives where the disparity in uptake is most visually apparent in Figure 1–tax credits, utility rebates, and home energy audits–the models persistently indicate significantly lower uptake in BLKAA, HW, and NHOPI households relative to NHW households. In the tax credit model, the coefficient on TWOPLUS is also negative and significant, indicating a difference in uptake between multiracial and NHW households. For utility rebates, the results indicate AIAN and TWOPLUS households also have significantly lower uptake than NHW households. For home energy audits, the results additionally indicate a significantly lower rate of uptake for AIAN households relative to NHW households. For the incentives where disparities are least visually evident–subsidies for light bulbs and other benefits or assistance–fewer differences are significant. For subsidies for light bulbs, only AIAN households have significantly lower rates of uptake than NHW households. For other forms of benefits or assistance, only NHOPI households have significantly lower rates of uptake than NHW households.

3.3 Concentration Indices

I next compute concentration indices to more fully characterize the level of inequality in the receipt of incentives. A concentration index measures the inequality in one variable over the distribution of another variable. While concentration indices are most commonly used

to study income inequality–in large part because that is where the literature has focused–they can also be used to characterize inequality across race and ethnicity.

Concentration indices can be best understood conceptually by first describing concentration curves. Concentration curves are plotted on a two-axes scale where the y-axis measures the cumulative share of the outcome (in this case, the total share of incentives received in the sample) and the x-axis measures the cumulative share of the sample. The curve is plotted, starting with the origin, and using a point for each of the categories of the variable over which inequality is being measured (in this case, groups of race/ethnicity), where the categories are ordered from left-to-right based on a socioeconomic metric (in this case, each group's likelihood of receiving an incentive). For the present analysis, when separately calculating the index for each type of incentive, the race/ethnicity categories are ordered based on the rate at which the corresponding type of incentive was received by each group. When calculating the concentration index that pools across all types of incentives, the ordering is based on each group's likelihood of receiving an incentive when averaging across all types of incentives. In terms of interpreting a concentration curve, a completely equal distribution would yield a curve that falls exactly on the line of equality (i.e., the 45-degree line), as the cumulative share of the outcome would always be equal to the cumulative share of the sample.

Returning to the concentration index, the concentration index measures the area between the concentration curve and the line of equality, multiplied by 2. A concentration index score of 1 would index absolute inequality (all incentives being received by one group), whereas a concentration index of 0 would indicate absolute equality (equal rates of uptake

across all groups). Mathematically, the concentration index can be expressed as

$$C = 1 - 2\int_0^1 L(p)\,dp,$$

where p is the cumulative share of households (ordered by race/ethnicity based on the propensity of each group to receive an incentive) and $L(p)$ is the concentration curve that plots the cumulative share of all incentives against the cumulative share of the sample as described above (Wagstaff, 2002).[7]

Concentration indices are reported in Table 4. The pooled version of the dataset indicates an overall concentration index of 0.10. Incentives for tax credits, utility rebates, and home audits are the most concentrated ranging from .13 to .16. Incentives for light bulbs and other energy-related benefits or assistance have the lowest concentration indices of 0.05 and 0.04, respectively.

3.4 Investigating Mechanisms

Finally, I return to a regression framework and estimate the original pooled model, with the exception that I control for different covariates. Identifying whether disparities exist after controlling for other factors is helpful for identifying the mechanism driving the differences in the receipt of incentives and policy solutions that might address it. The variables I examine are those that might be expected to be correlated with both race/ethnicity and the uptake of energy efficiency incentives and include income, climate, urban/rural location,

[7]The Gini coefficient, another common measure of inequality, is related to the concentration index. In particular, it represents a special case of the concentration index where inequality is measured in the same variable that is used for ordering the sample. See Maguire and Sheriff (2011) for an overview of various distributional measures.

housing type, homeowner/renter status, who pays the electric bill, electricity usage, and natural gas usage. The first six variables listed above are categorical and enter into regression models using dummy variables for each category other than the omitted category.[8] Electricity usage and gas usage are measured in units of kWhs and cubic feet of natural gas and enter the models as continuous variables. For each variable, I estimate one model the includes that variable as the solitary control, which sheds light on whether it alone is the driving mechanism. I also estimate a model that includes all control variables.

Results from the models that control for other factors are reported in Table 5. The results point to differences in homeowner/rental rates as the main contributor to the differences in the receipt of incentives. In particular, columns 1-4 and 6-8 of Table 5, which do not control for homeowner/rental status, produce very similar results to the initial analysis reported in column 1 of Table 3 and show that most groups of race/ethnicity have a lower uptake of incentives than NHW households. In contrast, the results that control for homeowner/rental status either in isolation (column 5) or in combination with the other variables (column 9), provide almost no evidence of differences in the uptake of incentives across racial and ethnic groups.[9] These results reflect the fact the NHW households have lower rates of renting than other groups,[10] and that households in rental units may not be able to take advantage of

[8]Household income is measured based on seven categories from $0-$140k, where each category spans $20k, and an eighth category indicating greater than $140k. The urban/rural variable reports whether the household lives in an urban area, an urban cluster, or a rural area. The climate variable reports whether the climate is cold/very cold, hot-dry/mixed-dry, hot-humid, mixed-humid, or marine. Housing types include mobile home, single-family detached house, single-family attached house, apartment in a building with 2 to 4 units, or apartment in a building with 5 or more units. Homeowner/renter status is measured using three categories: owned or being bought by someone in your household, rented, or occupied without payment of rent. The "who pays the electricity bill" variable is measured using four categories corresponding to all paid by household, embedded in rental/condo fees, split between paid by household and rental/condo fees, or other.

[9]Estimates with controls for each incentive type are provided in Table A.2 and also show little evidence of differences in uptake across groups of race/ethnicity.

[10]Rental rates for each group are as follows: AIAN (34%), ASN (42%), BLKAA (59%), HW (50%), NHOPI (60%), NHW (28%), multiracial (47%). These rates were computed using the RECS sampling weights.

energy efficiency incentives. In some cases, homeownership may be required to be eligible for incentives. Even absent eligibility restrictions, for most short-term renters, investing in improving the efficiency of a residence may not be sensible because the increase in the value of the structure would go to the landlord, not the tenant.[11,12]

4 Conclusion

Race and inequality have moved to the forefront in many policy debates, including debates about energy policy. This paper presents new evidence that can help inform those debates. In particular, I examine how the likelihood that a household receives an energy efficiency incentive varies by race and ethnicity. The key finding is that, relative to all other groups, non-Hispanic White households are the most likely to benefit from an incentive. This holds across a variety of types of incentives. The primary mechanism for the disparity appears to be elevated rates of homeownership for non-Hispanic white households, as the differences between groups are small and statistically insignificant in most cases in models that control for renter/homeowner status. In that regard, this paper connects to the literature on energy efficiency and the split-incentive problem, which documents that renters are significantly less likely to reside in homes with high-efficiency equipment because landlords do not have sufficient incentives to invest in efficiency improvements (Davis, 2012).[13]

[11]While the results point to the importance of homeowner/renter status in regards to the racial/ethnic differences in the uptake of efficiency incentives, the role of income inequality should perhaps not be completely dismissed considering the coarseness of the RECS income variable.

[12]The evidence of disparities in incentive uptake is also much weaker in models that are restricted to single-family detached (SFDH) homes, although that finding likely also reflects the role of homeowner/renter status, as the SFDH-only sample is comprised of a much smaller share of renters than the full sample (the weighted share of renter households is 14% in the SFDH-only sample, whereas it is 36% across the full sample.)

[13]The split-incentive problem has also described, generally, as a principal-agent problem or, specifically, as "the landlord-tenant" problem (Gillingham et al., 2009; Davis, 2012).

The results suggest that relying on energy efficiency incentives, or other policies that either intentionally or accidentally target homeowners, to bolster efficiency is likely to exacerbate underlying energy-related inequities. In that regard, other policies that increase energy efficiency–especially for rental properties–may have desirable distributional features. For example, with respect to policies specifically targeting rental properties, the United States' Department of Energy (USDOE) has provided support for "green lease" programs that provide information regarding how landlords can craft lease agreements with tenants to share the costs and benefits of efficiency improvements, thereby increasing the willingness of landlords to invest in energy efficiency (USDOE, 2021). Other policies that would be expected to reach rental households include more stringent energy codes and more stringent appliance standards, because compliance with these programs is mandatory regardless of whether the housing unit is rented or owner-occupied. More broadly, the results support the notion that inequality in homeownership can have spillover effects on other forms of inequality (Kurz and Blossfeld, 2004) and that public policies that increase housing equality would have a wide range of benefits.[14]

As with most research, this paper has a variety of limitations. For one, examining uptake only provides a partial evaluation of the overall distributional effects of energy efficiency incentives. For example, I do not observe the size of the incentive that was received. Borenstein and Davis (2019) present evidence that households that are more likely to receive energy-related tax credits are also more likely to receive larger tax credits conditional on receiving one. If that pattern also held for the set of incentives captures in the RECS, then

[14]Public policies, such as discriminatory zoning and red-lining, have contributed to existing racial disparities in homeownership and contributed more broadly to social inequality (Aaronson et al. 2021; Banzhaf et al. 2019; Rothstein, 2017).

my estimates of the degree of concentration might be conservative relative to an evaluation based on the dollar amount of the incentive.

I also do not have complete data on how the incentives captured in the RECS responses are funded, which would be useful for evaluating distributional differences in how the costs of incentive programs are borne. In practice, many incentives–especially those that are operated through utilities–are funded through elevated charges to ratepayers. Funding programs through ratepayer charges is often regressive because energy expenditures vary less greatly across households than does household income, but a detailed examination of how the costs of incentive programs are distributed across households is beyond the scope of this paper and would be a valuable area for additional study. Given that homeowners are the ones most likely to benefit from incentives, there is an equity-based case that funding for incentives should be collected by charges that are primarily borne by homeowners, although whether an incentive program could be structured in such a manner in practice is unclear.

This research also does not represent a complete welfare analysis and focuses specifically on incentive uptake. Especially over the longer run, other dimensions of energy efficiency incentives are likely to be important, both overall and in terms of distributional effects, including whether they spur further innovation, how they affect energy prices, and how they affect generation patterns and associated levels of pollution. Regardless, given the recent policy focus on race and ethnicity within energy policy, the findings here are hopefully informative with respect to certain dimensions of economic research and policy debates. I look forward to future work that further explores the features and consequences of policies connected to energy efficiency and the distributional aspect of those policies across different segments of society.

5 References

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Table 1: Energy Efficiency Variables

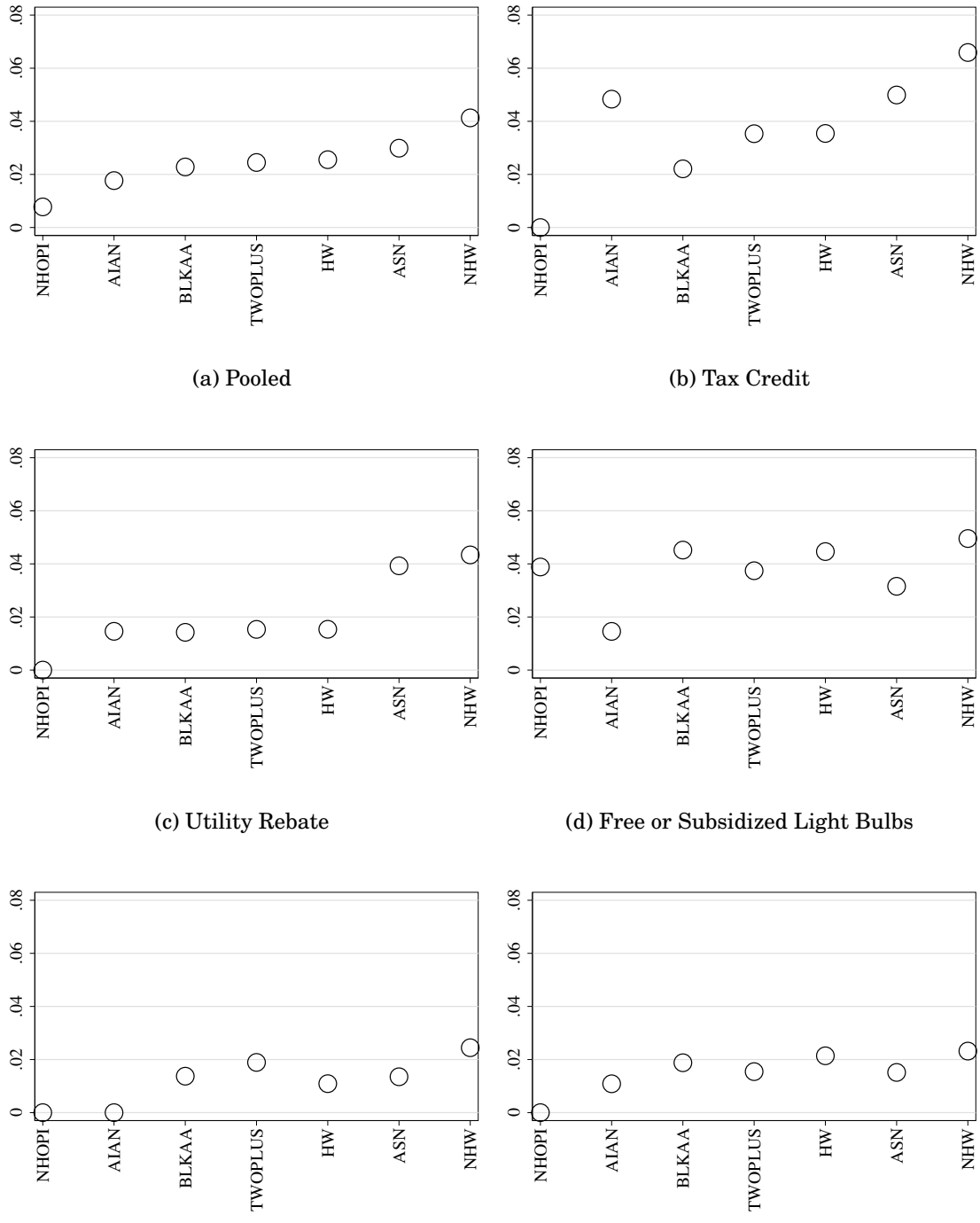
Survey Question	Label	% Yes
Received a tax credit for new appliance or equipment?	Tax Credit	5.56%
Received a utility or energy supplier rebate for new appliance or equipment?	Utility Rebate	3.55%
Received free or subsidize energy-efficient light bulbs?	Free or Subsidized Lights	4.70%
Received free or subsidized home energy audit?	Free or Subsidized Home Energy Audit	2.07%
Received some other energy-related benefit or assistance?	Other Benefit or Assistance	2.18%

Notes: Data are from the 2015 Residential Energy Consumption Survey. Each observation weighted using the survey weights embedded within the RECS.

Table 2: Descriptions of Household Categories by Race/Ethnicity

Category	Abbreviation	% of Sample
American Indian or Alaska Native alone	AIAN	1.10%
Asian alone	ASN	4.18%
Black or African American alone	BLKAA	11.51%
Hispanic White alone	HW	11.64%
Native Hawaiian or Other Pacific Islander alone	NHOPI	0.37%
Non-Hispanic White alone	NHW	69.07%
Two or more races	TWOPLUS	2.13%

Notes: There are 5,686 households in the data. Each observation weighted using the survey weights embedded within the RECS.



(a) Pooled

(b) Tax Credit

(c) Utility Rebate

(d) Free or Subsidized Light Bulbs

(e) Free or Subsidized Home Energy Audit

(f) Other Benefit or Assistance

Figure 1: **Likelihood of Receiving of an Energy Efficiency Incentive by Race/Ethnicity**. Each observation weighted using the survey weights embedded within the RECS.

Table 3: Regressions of Receiving of an Incentive on Race/Ethnicity by Type of Incentive

	Pooled	Tax Credit	Utility Rebate	Free or Sub. Lights	Free or Sub. Audit	Other Benefit or Asst.
	(1)	(2)	(3)	(4)	(5)	(6)
NHOPI	-0.034***	-0.066***	-0.043***	-0.011	-0.024***	-0.023***
	(0.006)	(0.004)	(0.003)	(0.028)	(0.003)	(0.002)
AIAN	-0.024***	-0.018	-0.029*	-0.035**	-0.024***	-0.012
	(0.008)	(0.034)	(0.015)	(0.015)	(0.003)	(0.011)
BLKAA	-0.018***	-0.044***	-0.029***	-0.004	-0.011*	-0.004
	(0.003)	(0.008)	(0.006)	(0.009)	(0.006)	(0.006)
TWOPLUS	-0.017***	-0.031*	-0.028***	-0.012	-0.006	-0.008
	(0.006)	(0.017)	(0.009)	(0.017)	(0.014)	(0.011)
HW	-0.016***	-0.030***	-0.028***	-0.005	-0.014***	-0.002
	(0.004)	(0.008)	(0.006)	(0.009)	(0.005)	(0.006)
ASN	-0.011*	-0.016	-0.004	-0.018	-0.011	-0.008
	(0.006)	(0.014)	(0.014)	(0.012)	(0.008)	(0.009)
Constant	0.041***	0.066***	0.043***	0.050***	0.024***	0.023***
	(0.002)	(0.004)	(0.003)	(0.004)	(0.003)	(0.002)
R-Squared	0.002	0.005	0.005	0.001	0.002	0.000
Observations	28,430	5,686	5,686	5,686	5,686	5,686

Notes: The dependent variable is an indicator for whether a household received an incentive of the corresponding type, as indicated by the column headings. The pooled column is based on a sample that pools all types of incentives (there are five types of incentives, so there are five observations per household in the pooled sample). All models are linear probability models. The omitted category of race/ethnicity is NHW. The unit of observation is a household. Standard errors are clustered by household in the pooled model and are White-Huber standard errors in the remaining models. One, two, and three stars indicate 10%, 5%, and 1% significance, respectively. Each observation weighted using the survey weights embedded within the RECS.

Table 4: Concentration Indices by Incentive Type

Incentive	Conc. Index
Pooled	0.10
Tax Credit	0.14
Utility Rebate	0.16
Free or Subsidized Light Bulbs	0.04
Free or Subsidized Home Energy Audit	0.13
Other Energy-Related Benefit or Assistance	0.05

Notes: See section 3.3 for a description of how concentration indices are computed. The pooled index is based on a sample that pools all types of incentives (there are five types of incentives, so there are five observations per household in the pooled sample). Each observation weighted using the survey weights embedded within the RECS.

Table 5: Regressions of Receiving of an Incentive on Race/Ethnicity and Control Variables - Investigating Mechanisms

Controls	Income	Climate	Urban/ Rural	Housing Type	Home-owner/ Renter	Who Pays Bill	Elec. Usage	Nat. Gas Usage	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
NHOPI	-0.028***	-0.033***	-0.033***	-0.023***	-0.011	-0.034***	-0.032***	-0.029***	-0.010
	(0.006)	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.008)
AIAN	-0.019**	-0.025***	-0.026***	-0.025***	-0.019**	-0.022***	-0.024***	-0.023***	-0.018**
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
BLKAA	-0.011***	-0.015***	-0.018***	-0.006*	-0.001	-0.017***	-0.018***	-0.017***	0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
TWOPLUS	-0.013**	-0.016**	-0.016**	-0.006	-0.005	-0.015**	-0.016**	-0.015**	-0.004
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
HW	-0.012***	-0.013***	-0.015***	-0.008**	-0.003	-0.014***	-0.014***	-0.015***	-0.001
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)
ASN	-0.015**	-0.012**	-0.010*	-0.001	-0.004	-0.010*	-0.008	-0.012**	-0.006
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Constant	0.023***	0.048***	0.034***	0.022***	0.058***	0.043***	0.034***	0.035***	0.049***
	(0.003)	(0.003)	(0.004)	(0.005)	(0.002)	(0.002)	(0.002)	(0.002)	(0.007)
R-Squared	0.006	0.004	0.002	0.014	0.022	0.004	0.002	0.003	0.027
Observations	28,430	28,430	28,430	28,430	28,430	28,430	28,430	28,430	28,430

Notes: This first eight models include a single control variable, as indicated by the column headings. The ninth model includes all of the controls listed in the previous columns. All models are based on a sample that pools all types of incentives (there are five types of incentives, so there are five observations per household in the pooled sample). The dependent variable is an indicator for whether a household received an incentive. All models are linear probability models. The omitted category of race/ethnicity is NHW. The unit of observation is a household. Standard errors are clustered by household. One, two, and three stars indicate 10%, 5%, and 1% significance, respectively. Each observation weighted using the survey weights embedded within the RECS.

A Appendix

Table A.1: Regressions of Receiving of an Incentive on Race/Ethnicity - Different Subsamples Based on Non-Responses

Sample:	Full Sample	Drop Refused	Drop Don't Know	Drop Refused and Don't Know
	(1)	(2)	(3)	(4)
NHOPI	-0.034***	-0.034***	-0.034***	-0.034***
	(0.006)	(0.006)	(0.006)	(0.006)
AIAN	-0.024***	-0.024***	-0.027***	-0.027***
	(0.008)	(0.008)	(0.008)	(0.008)
BLKAA	-0.018***	-0.019***	-0.020***	-0.021***
	(0.003)	(0.003)	(0.003)	(0.003)
TWOPLUS	-0.017***	-0.017**	-0.016**	-0.016**
	(0.006)	(0.007)	(0.007)	(0.007)
HW	-0.016***	-0.016***	-0.016***	-0.016***
	(0.004)	(0.004)	(0.004)	(0.004)
ASN	-0.011*	-0.012**	-0.012*	-0.012**
	(0.006)	(0.006)	(0.006)	(0.006)
Constant	0.041***	0.042***	0.042***	0.042***
	(0.002)	(0.002)	(0.002)	(0.002)
R-Squared	0.002	0.002	0.002	0.002
Observations	28,430	28,095	27,805	27,470

Notes: As indicated in the column headings, samples differ across columns based on how observations with a value of "refused" or "don't know" for the RECS questions about incentives are handled. All models are based on a sample that pools all types of incentives. The dependent variable is an indicator for whether a household received an incentive. All models are linear probability models. The omitted category of race/ethnicity is NHW. The unit of observation is a household. Standard errors are clustered by household. One, two, and three stars indicate 10%, 5%, and 1% significance, respectively. Each observation weighted using the survey weights embedded within the RECS.

Table A.2: Regressions of Receiving of an Incentive on Race/Ethnicity and Control Variables by Type of Incentive

	Pooled	Tax Credit	Utility Rebate	Free or Sub. Lights	Free or Sub. Audit	Other Benefit or Asst.
	(1)	(2)	(3)	(4)	(5)	(6)
NHOPI	-0.010	-0.027**	-0.026***	0.021	-0.009**	-0.010*
	(0.008)	(0.013)	(0.009)	(0.028)	(0.005)	(0.006)
AIAN	-0.018**	-0.002	-0.026*	-0.034**	-0.022***	-0.008
	(0.008)	(0.031)	(0.015)	(0.016)	(0.004)	(0.011)
BLKAA	0.005	-0.004	-0.008	0.024***	0.002	0.009
	(0.003)	(0.008)	(0.006)	(0.009)	(0.006)	(0.006)
TWOPLUS	-0.004	-0.010	-0.018*	0.006	0.003	-0.001
	(0.006)	(0.016)	(0.010)	(0.017)	(0.014)	(0.011)
HW	-0.001	-0.005	-0.018***	0.017**	-0.005	0.005
	(0.003)	(0.008)	(0.006)	(0.009)	(0.005)	(0.006)
ASN	-0.006	-0.015	-0.005	-0.003	-0.001	-0.005
	(0.006)	(0.014)	(0.014)	(0.012)	(0.009)	(0.009)
Constant	0.049***	0.032**	0.021*	0.104***	0.046***	0.040***
	(0.007)	(0.014)	(0.012)	(0.017)	(0.013)	(0.009)
Controls?	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.027	0.056	0.031	0.043	0.019	0.019
Observations	28,430	5,686	5,686	5,686	5,686	5,686

Notes: All models include controls for income, climate, urban vs. rural location, housing type, home-owner/renter status, who pays the electricity bill, electricity usage, and natural gas usage. The dependent variable is an indicator for whether a household received an incentive of the corresponding type, as indicated by the column headings. The pooled column is based on a sample that pools all types of incentives (there are five types of incentives, so there are five observations per household in the pooled sample). All models are linear probability models. The omitted category of race/ethnicity is NHW. The unit of observation is a household. Standard errors are clustered by household in the pooled model and are White-Huber standard errors in the remaining models. One, two, and three stars indicate 10%, 5%, and 1% significance, respectively. Each observation weighted using the survey weights embedded within the RECS.