Appendix for

Success, Failure, and Information: How Households Respond to Energy Conservation Goals

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Appendix A Team Power Smart Program Overview

A.1 Online Portal and Sign Up

BC Hydro provides households participating in a conservation challenge with an online portal showing their electricity use and progress towards their target. The online portal includes information on monthly electricity use compared to the same month the previous year and a household's 10% conservation target. An example of the portal is shown in Figure A.1a. In addition to monthly electricity use the online portal displays a household's cumulative progress towards their annual 10% conservation target (Figure A.2b.) The way the portal displays information may have changed over the life of the program. It is also possible for households to join Team Power Smart to view their electricity use online without undertaking a conservation challenge. For simplicity, I will use Team Power Smart to refer to those households which undertake a conservation challenge. I do not observe households which registered online without undertaking a conservation challenge. The reward value for challenges studied in this paper is $75 CDN. If households re-enrolled in a subsequent challenge after August 2014 they were subject to the updated Team Power Smart Maintenance Challenge rules. This change in program for re-enrolling households specified that if a household had achieved the 10% reduction target, then they will receive a $25 reward for maintaining last years electricity use (BCH, 2014). This Team Power Smart update replaced the previous goal of an additional 10% reduction upon re-enrolling. I exclude challenges occurring under the new $50 reward value.

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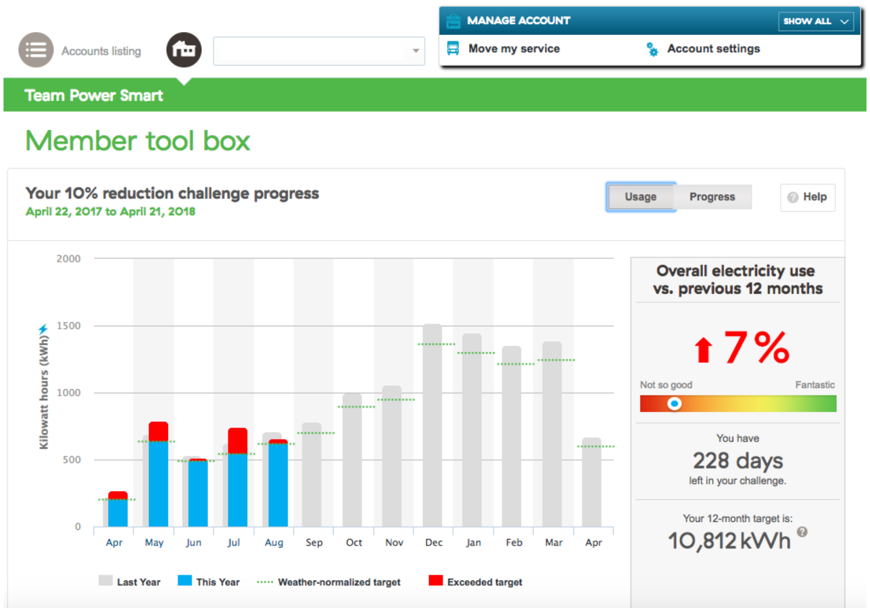
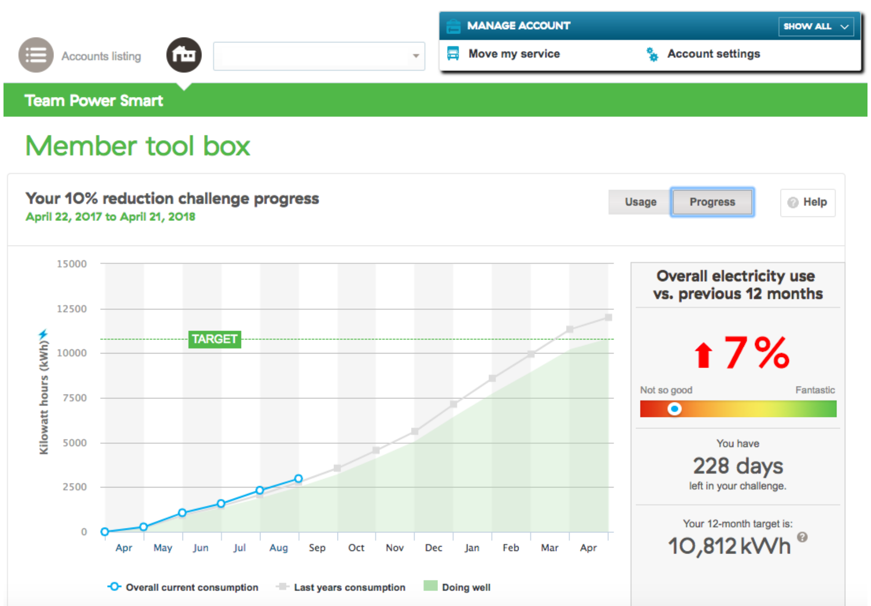
Figure A.1: **BC Hydro's Online *Member Tool Box***

(a) **Monthly Challenge Progress**



(b) **Cumulative Challenge Progress**



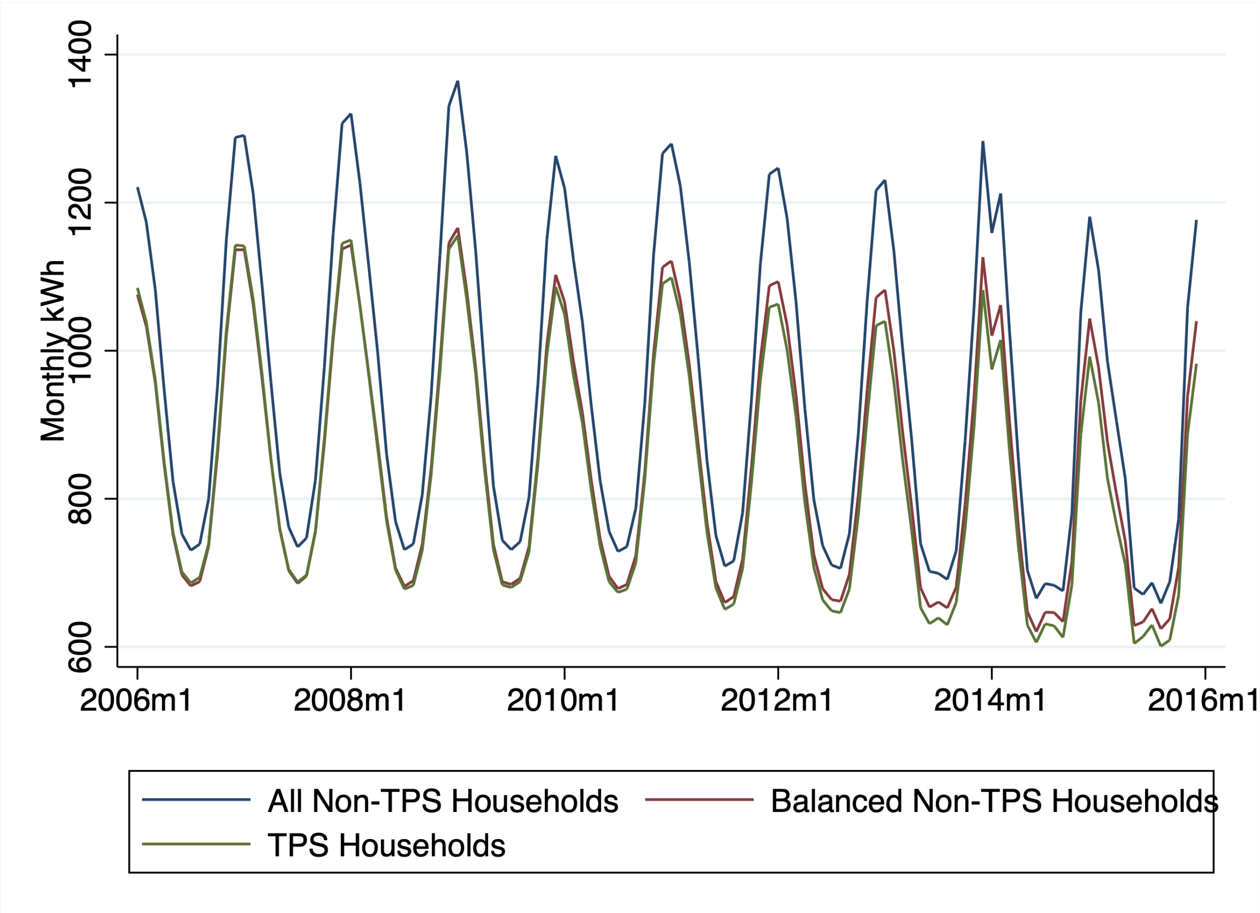
A.2 Data and Household Characteristics

The panel of customers' Team Power Smart program participation history includes the number of conservation challenges, each challenge's start and end date, whether the challenge was successful, and a coarse building and heating type of the household. I separately obtained detailed individual household characteristics including building type, assessed value, floor space, number of bedrooms, and the postal code's Forward Sortation Area from the provincial property assessment corporation, BC Assessment. Removing duplicate accounts, erroneous data, dropping households with electricity use more than 5 standard deviations from the mean left a sample of 9,818 households participating in Team Power Smart. In order to only compare households who re-enroll in a second challenge under the consistent rules of an additional \$75 reward and not the new \$50 "Maintenance Challenge", when necessary I further restrict the sample to the 8,877 participants who begin a first challenge before March 2013. This provides 6 additional months in which households can decide to re-enroll in a second challenge before the program reward changed. Results are robust to varying this restriction on the initial sign up date and the gap allowed between re-enrollment. To ensure a closer comparison to treated households I use a random sub-sample of non-participant households with the same composition of building type and heating characteristics as treated (participant) households. The sample of households provided by BC Hydro was a random sample of stable participant households from the British Columbia Lower Mainland region. This region covers 60% of the province's population (BCStats, 2016). Temperatures range from a summer average of 18°C to winters averaging 4°C (ECCC, 2017). Electricity use in British Columbia peaks in the winter due to the widespread use of electricity for heating and the limited use of air conditioning in the summer, and BC Hydro estimates that 46% of residential electricity use in British Columbia comes from electric heating. BC Hydro classifies households into heating categories based on surveys of residents and information on the building where the meter is installed. Non-Electric are households that heat primarily from sources other than electricity. Electric are households that heat primarily from electricity, and Unknown are unclassified households. BC Hydro does not classify heating type based on observed electricity use. Figure A.2 shows the average electricity use for three groups of households. All Non-TPS households is the full sample of control households. These have significantly higher electricity use compared to the average use among TPS (participant) households. However, this difference in average use is almost entirely a composition difference. Balanced Non-TPS Households in Figure A.2 shows the average use among the random sub-sample of households with the same composition of, separately, heating and building types. Electricity use in the pre-program year of 2006 and in the early years of the program is very similar between non-TPS and TPS households. Average electricity use declines over time among among TPS households, relative to similar non-participants, as expected due to their increasing and potentially repeated participation in the program.

To directly compare electricity use between the full samples of participants and non-participants I estimate the specification

$$y_{it} = \beta_1 TPS_i + X_c + \epsilon_{it} \tag{A.1}$$

Figure A.2: **Time Trends in Electricity Use**



Notes: This figure shows average monthly electricity use for three groups of households. All non-TPS (control) households is the full set of non-participant households. Balanced Non-TPS Households is a random subset of all control households that have the same heating and building type distribution as TPS participant households. TPS Households shows average use among the sample of TPS participants.

Table A.1: **Pre-program electricity use and composition differences**

	(1)		(2)		(3)	
	Dependent variable: Electricity use					
TPS	-87.54***	(-13.43)	9.40*	(1.72)	14.92***	(2.76)
FE: Building Type			Y			
FE: Heating Type			Y			
FE: Building Type X Heating Type					Y	
Observations	29068		29068		29068	

Notes: TPS is an indicator equal to 1 of a household is a participant in Team Power Smart. Building Type and Heating Type are separate fixed effects for each type. Building Type X Heating Type are fixed effects for their interaction. t-statistics are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

where y_i is a household's 2006 average electricity use in kWh, TPS is an indicator for program enrollment, and X_c is a vector of building characteristic fixed effects. Specification (1) in Table A.1 includes no building characteristic fixed effects, (2) includes separate Building Type and Heating fixed effects, and (3) includes building type interacted with heating type. Results in Table A.1 show that once building characteristics are controlled for, the coefficient on TPS is of small magnitude. This indicates that differences in average use between participant and non-participant households are largely due to differences in the composition of household structure and heating types.

Table A.2 expands on the comparisons showing in Table 1. All Residential households are units from the Greater Vancouver Area with characteristics as listed by the property assessment corporation, BC Assessment. Non-participants in the sample from BC Hydro are more likely to live in single family dwellings and less likely to live in apartments or townhouses compared to the average Greater Vancouver household.

Participants tend to have lower electricity use than non-participants when measured within heating and, separately, building type categories. This is in contrast to the comparisons in Table 1 and results from Simpson's Paradox; Apartments and Townhouses are more likely to participate in the program compared to single family dwellings, yet have lower average electricity use. Similarly, participants are also more likely to be non-electric than electric heating households, and non-electric households typically have lower electricity use. As a result, comparing the average electricity use within separate building type or heating type categories reflects differences in the composition of household types in addition to any difference between otherwise identical participant and non-participant households.

A.3 Strategic Sign Up

Households could in theory increase their electricity use (or stop any ongoing efforts to reduce their electricity use) to create a new higher baseline that would make their subsequent conservation challenge easier to achieve. Figure A.3 shows no obvious evidence of this; most households, if they continue to additional challenges, begin their next challenge in the first 3 months immediately after completing their prior challenge and there is no obvious bunching at 12 months. The option to undertake a

Table A.2: **Household Characteristics**

	Participants % of total	Non-Participants % of total	All Residential %	Difference in kWh	t-stat	as %
Building Type						
1 Story SFD	39	46	29	-53.4	-5.3	-5.2
2 Story SFD	28	26	21	-123.0	-9.6	-11.2
1.5 Story SFD	4	5	3	-48.2	-1.5	-4.4
Apartment	14	9	29	6.5	0.6	1.3
Townhouse	12	9	13	23.0	1.4	3.0
Other	3	5	5	-27.2	-0.8	-2.9
Heating Type						
Non-Electric	57	50	-	-2.3	-0.3	-0.3
Electric	29	38	-	-179.4	-12.9	-14.8
Unknown	14	12	-	-4.9	-0.3	-0.5

	Participants Mean	Participants SD	All Non-Participants Mean	All Non-Participants SD	All Residential Mean	All Residential SD
Value ($1,000)	$672	$465	$731	$579	$638	$700
Floor Area (sq. ft)	2025	977	2123	997	1842	1104
Total Households	9,818		19,250			

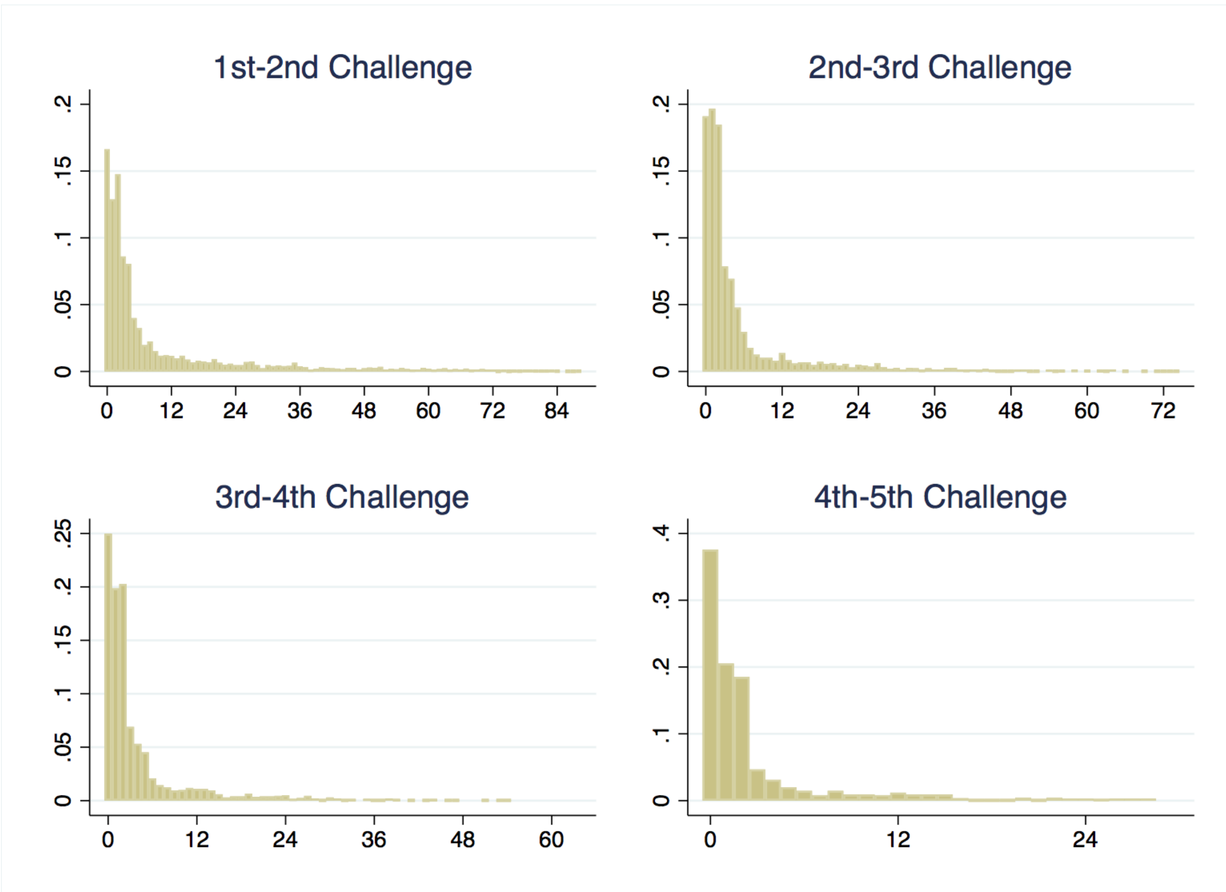
Notes: This table shows the building characteristics and electricity use of participant and non-participant households in the sample, as well as those of all BC Residential units from the same geographic area (Greater Vancouver.) SD = standard deviation.

subsequent challenge does not expire; households can sign up for another challenge immediately or postpone indefinitely. Figure A.4 shows the distribution of start dates for challenges one through four. New households continually enroll in TPS throughout the panel and as time proceeds households that complete challenges continue to subsequent conservation challenges. Several dates show large increases in sign-ups; these are likely due to periods of significant promotion of the TPS program by BC Hydro as they do not coincide with households having previous months of unusually large or small electricity use, or experiencing unusual changes in weather.

A.4 The Weather Adjustment

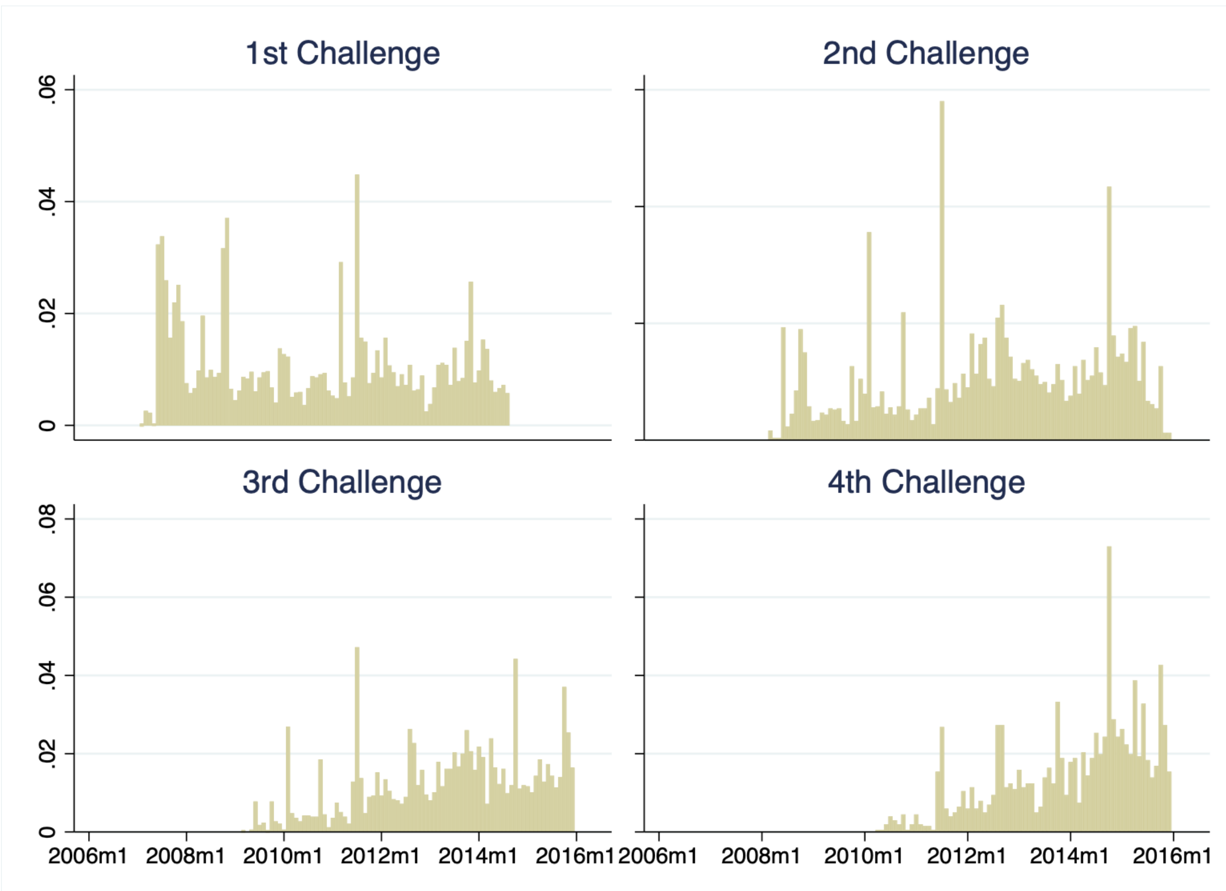
The weather-adjustment algorithm used by BC Hydro resulted in large adjustments to households' electricity conservation beyond those necessary to correct for weather changes. Adjusting for weather is not an exact science. Some households heat with electricity more than others, some households that do not principally heat with electricity—and so are defined as non-electric heat households—still make significant use of electric heat via baseboard heaters, and household-specific characteristics like insulation or the number of residents will drive large differences in the use electricity in response to weather changes. The weather-adjustment algorithm used to calculate credited changes was updated in 2014; I exclude challenges occurring under the updated weather-adjustment algorithm. The weather adjustment was applied to the baseline used to calculate households credited reductions. Because of this, households were not aware of the magnitude of weather adjustment applied to their credited

Figure A.3: **Delay Between Conservation Challenges**



Notes: These histograms show the number of months households wait between conservation challenges. The majority of households which continue to additional challenges do so shortly after completing their prior challenge. The median wait after the 1st challenge is 3 months, 2 months after the 2nd challenge, 2 months after the 3rd challenge, and 1 month after the 4th challenge.

Figure A.4: **Distribution of Challenge Start Dates**



Notes: These histograms show the start date for conservation challenges one through four. Several dates show large increases in the number of households starting a challenge. Periods of increased sign up do not coincide with unusual weather, seasons, or consumption, and are likely due to periods of promotion of Team Power Smart by BC Hydro.

conservation.

First, BC Hydro classifies households based on information from the homeowner and building structure into households that heat primarily with electricity and those that do not. The weather correction is in principle applied only to those households that heat primarily with electricity, but prior to the 2014 algorithm update it was applied to all households. I encourage readers interested in further details of the weather adjustment algorithm to contact me. The weather correction starts by calculating the percent change in total heating degree days from the baseline year to the conservation challenge year. BC Hydro only considers heating degree days—as opposed to cooling degree days—due to the lack of air conditioner use in British Columbia. This percent change in heating degree days is used as a proxy for the change in demand for electric heat. If heating degree days have increased by 6%, then the weather is colder than the year prior, and the demand for electric heat will have increased by 6%. BC Hydro has measured that 46% of electricity use by electric-heating households is due to heat; as a result, the weather correction adjustment is applied only to 46% of a households electricity use. Importantly, BC Hydro applies this weather correction only to the baseline year's consumption and thus adjusts the level from which a households target and percent reduction is calculated. During the 12 months of a conservation challenge BC Hydro updates and adjusts the target shown to households through their online account. At the completion of a challenge BC Hydro applies the final weather correction and evaluates actual success against a 9.5% target. That is, while households target a 10% reduction any household achieving a weather-adjusted reduction greater than or equal to 9.5% passes their challenge.

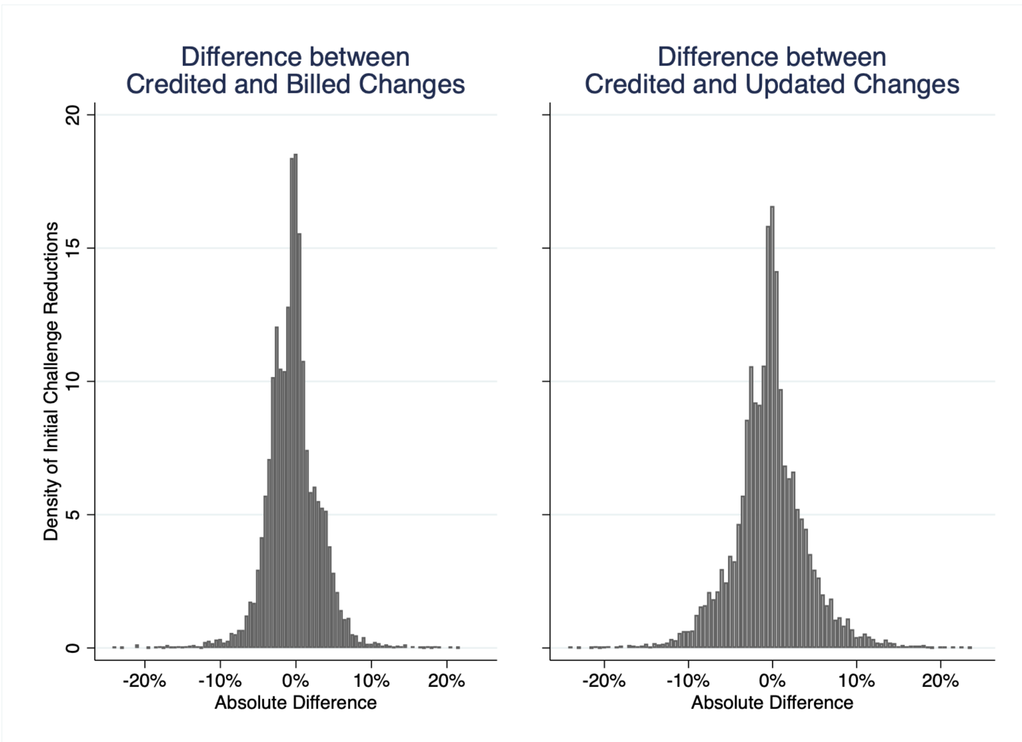
The first panel of Figure A.5 shows a histogram of the difference in absolute percentage points between credited and billed changes in electricity use during a households initial conservation challenge. This is the difference between the reductions in electricity use households were told they achieved and the reductions in physical electricity use that actually occurred. These differences are not small; they have a mean of -0.43% and a standard deviation of 4.2%. In the second panel I show the difference between credited changes used to evaluate a household's success and changes in electricity use using an updated algorithm where the effect of weather on electricity use has been removed as currently recommended by BC Hydro. These have a mean of -0.4% and standard deviation of 5.0%. This shows that the weather adjustment caused many households to receive shocks to their electricity conservation beyond that necessary to adjust for changes in weather and these shocks are comparable in magnitude to half of a households' 10% conservation goal.

Appendix B Event Study Design

B.1 Parallel Trends Assumption & Self Selection

The parallel trends assumption requires that trends in electricity use between treatment and control households would be the same in the absence of treatment. To compare trends in use between control

Figure A.5: **Weather Adjustment Discrepancies**



Notes: The left panel, Credited and Billed changes, is a histogram of the absolute difference between the changes in electricity use credited to a household after applying the initial weather-adjustment algorithm and the changes in their billed electricity use. The right panel, Credited vs Updated Changes, is the histogram of differences between credited changes and changes in billed electricity use after the effect of weather has been removed using the updated weather adjustment algorithm. Differences are in percentage points such that a 10% Absolute Difference is equivalent in magnitude to the 10% conservation target.

Table B.3: **Pre-Program Trends in Electricity Use**

	(1)	(2)	(3)	(4)	(5)
β_1 : Date	-0.00029*	-0.00039***	-0.00040***	-0.00065***	-0.00054***
	(0.00015)	(0.00010)	(0.00008)	(0.00007)	(0.00006)
β_2 : Date×Participants	0.00031	0.00004	0.00004	-0.00004	0.00014
	(0.00021)	(0.00016)	(0.00013)	(0.00012)	(0.00012
Pre-Program Years	2	3	4	5	6
Non-Participant IDs	8877	8877	8877	8877	8877
Participant IDs	6779	5478	4610	3639	2163
Observations	375743	516779	647375	750959	794879

Notes: β_1 : *Date* is the pre-program time trend common to participant and non-participant households. β_2 : *Date* × *Participants* is the additional time trend specific to participant households. Pre-Program Years is the length of time for which time trends are estimated and excludes all households that start a challenge within six months after the given pre-program. The six month period is to avoid pre-treatment trends that could include anticipation effects in the final months pre-treatment. Standard errors in parentheses clustered at the household level. *** p<0.01, ** p<0.05, * p<0.1.

and participant households leading up to their participation I estimate the following specification,

$$y_{it} \quad = \quad \beta_0 + \beta_1 m_t + \beta_2 m_t \times TPS_i + \beta_3 TPS_i + \epsilon_{it} \tag{B.2}$$

where y_{it} is log monthly electricity use, m_t is the month-of-year date, and TPS_i is an indicator equal to one if household i is a Team Power Smart participant household. The only pre-treatment period available to all households is the year 2006. To test trends over multiple years I estimate specification (B.2) for several different time periods and include only participant households that do not begin a conservation challenge until 6 months after the initial pre-treatment years indicated. Table B.3 shows the results where β_1 is the percent change per month for both non-participant and participant households and β_2 is the additional monthly percent change for participant households; participant households do not have a different, at the 1% level, pre-treatment trend from non-participants. The magnitude of diverging time trends is also small. Taking the largest point estimate of different trends, $\hat{\beta}_2 = 0.00031$ and assuming this difference in trend continues would imply a bias in estimated energy conservation of only 0.4% at the end of the first conservation challenge. Note that this comparison does not rule out the potential for short-run anticipation or other self-selection which can bias these estimates.

The statistically significant estimates in the last few months prior to a challenge officially beginning, months $\tau = [-1, 0]$ in Figure 1(a), may be evidence of anticipation or self-selection in which households reduce their use prior to the declared program start. However, this source of bias is unlikely to be large as making an energy efficiency investment would likely result in persistent reductions in electricity use; by contrast, electricity use rebounds as households leave the program. In addition, the pre-program decline can result mechanically from the billing process as BC Hydro did not record electricity bills on a fixed monthly basis. Instead, BC Hydro used a rolling billing period where different houses are billed on different days and with up to two months between electricity meter readings. Electricity use was then calendarized to monthly consumption. As a result, reductions that occur after the start of a conservation goal cannot be separated within a billing cycle from electricity use that occurred prior to the challenge start. This can result in reductions due to a conservation challenge being partially credited to up to the last two months before a household begins its challenge.

To help understand the pre-challenge dip I approximate the bill averaging effect as follows. I assume households start a challenge uniformly within a billing cycle and immediately begin exerting their full conservation effort. I assume a uniform 2 month billing cycle and that a conservation challenge start is recorded at the start of month closest to the sign-up date. For example, signing up on August 10th would be recorded as a August 1st start and August 20th sign up as a September 1st start; this is consistent with what BC Hydro typically did. This means that by the official 'start' at the beginning of a month half the households have already begun exerting effort, while others will not be exerting effort for up to two weeks past their officially recorded start. Combining the uncertain sign-up date with the calendarized 2 month billing cycle results in the first month (t_0) credited to a challenge having 15/16 of the full treatment effect, the first month pre-challenge (t_{-1}) having 1/2 of the full treatment effect, and the second month pre-challenge as being 1/16th of the full treatment effect. Comparing this with the estimates for the two months pre-challenge from Figure 1 indicates that bill averaging could potentially explain most if not all of the pre-challenge dip, though only at the upper end of the confidence interval for the estimated 2nd month pre-challenge.

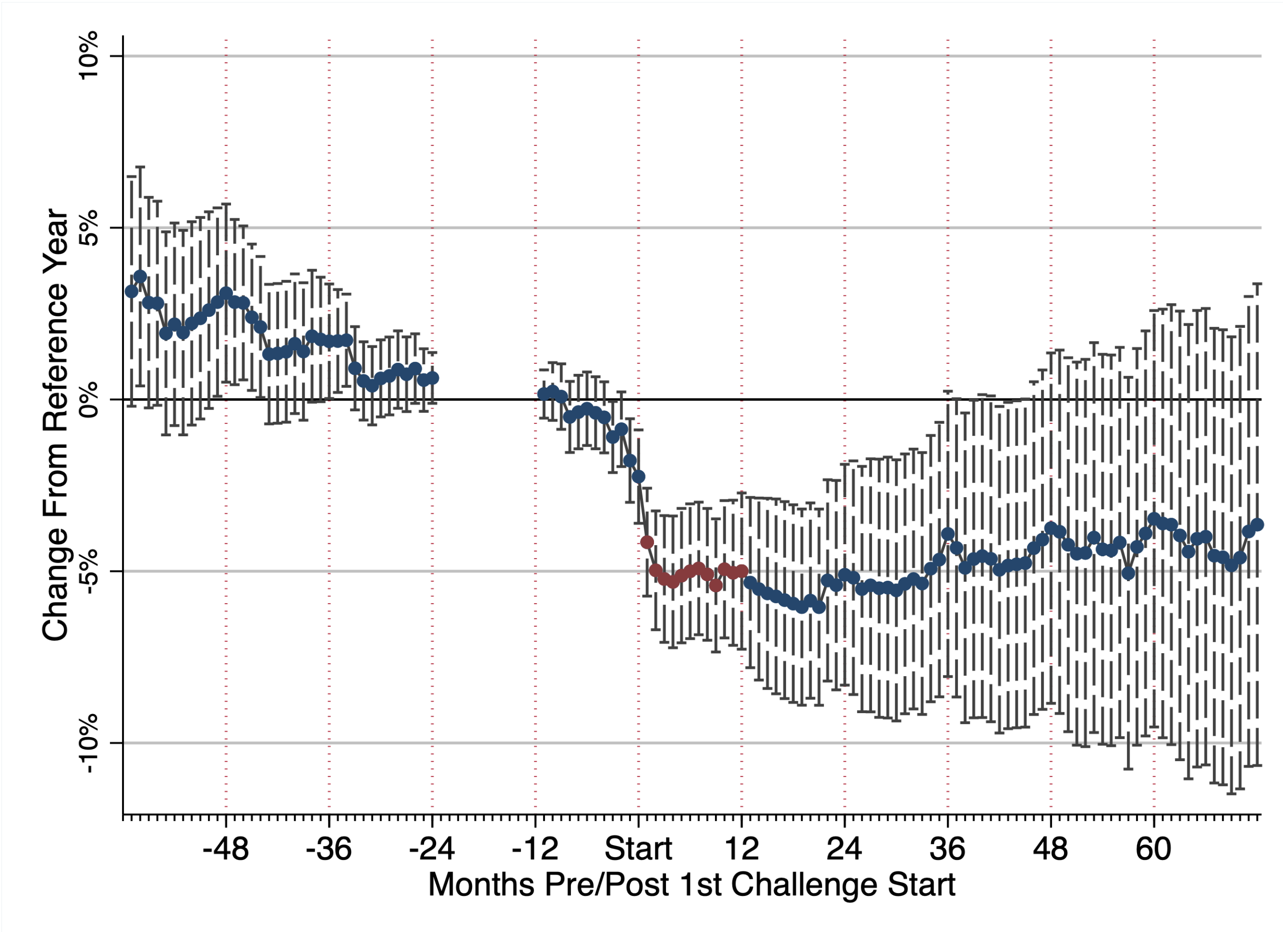
A further concern is that households may begin a conservation challenge in response to a high electricity bill, such as after a cold winter. In this case, reversion to the mean would result in reductions in electricity use being credited to the program. If this self-selection occurs it will manifest as positive pre-treatment effects in the months immediately prior to the initial conservation challenge. However, there is a decline over months $\tau = [-1, 0]$, suggesting that households do not self-select into the program based on past consumption shocks.

B.2 Event Study Robustness Checks

This section presents several event study robustness checks. Figure B.6 plots the event study estimates of equation 1 in the text estimated without non-participant control households. This exploits variation in timing in when a household starts their first conservation challenge; households starting a challenge later in the panel serve as the control population for households that undertake a challenge earlier in the panel. Estimates are highly similar to those presented in Figure 1(a) (but with larger errors), indicating that a violation of parallel trends between participant and non-participant households is unlikely to be the cause of the declining trend in event-study estimates. The pre-treatment decline could reflect heterogenous time trends between single-challenge and re-enrolling participant households that are not fully controlled for by month-of-sample fixed effects, or a violation of the event-study assumption of homogenous treatment effects (Borusyak and Jaravel, 2018).

Figure B.7 plots estimates including the full set of non-participant households, instead of the random sub-sample of non-participant households with the same composition of building type and heating characteristics as participant households. Figure B.8 plots estimates using an alternate baseline period

Figure B.6: **Estimated Treatment Effects For Participant Households Only**



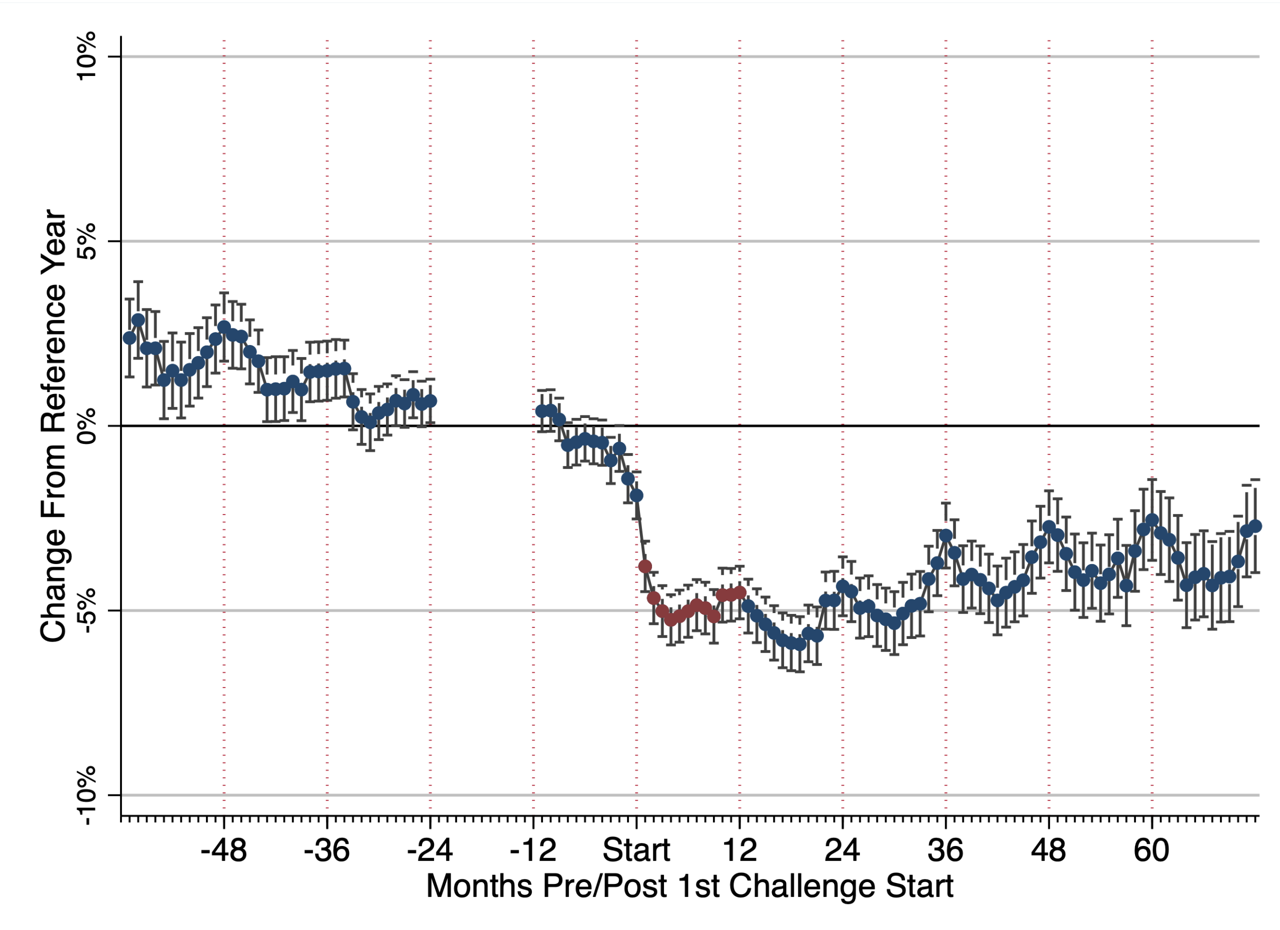
Notes: Estimates of $\hat{\beta}_\tau$ and 95% confidence intervals from equation 1 in the text estimated for participant households only. Estimates $\hat{\beta}_\tau$ are ordered by event-time τ and point estimates in red denote the 12 months of the initial conservation challenge. The gap between -11 and -23 is the excluded reference period.

of the third year prior to the initial conservation challenge, instead of the second pre-program year. In case time trends differ by household type I estimate my main specification of equation 1 in the text modified to include separate time trends. Figure B.9 plots estimates including separate month-of-sample fixed effects by electric and non-electric heating type, and B.10 includes separate month-of-sample fixed effects for each building and heating type. Figure B.11 clusters at both the household and date level.

B.2.1 Event-study estimates for re-enrolling comparisons

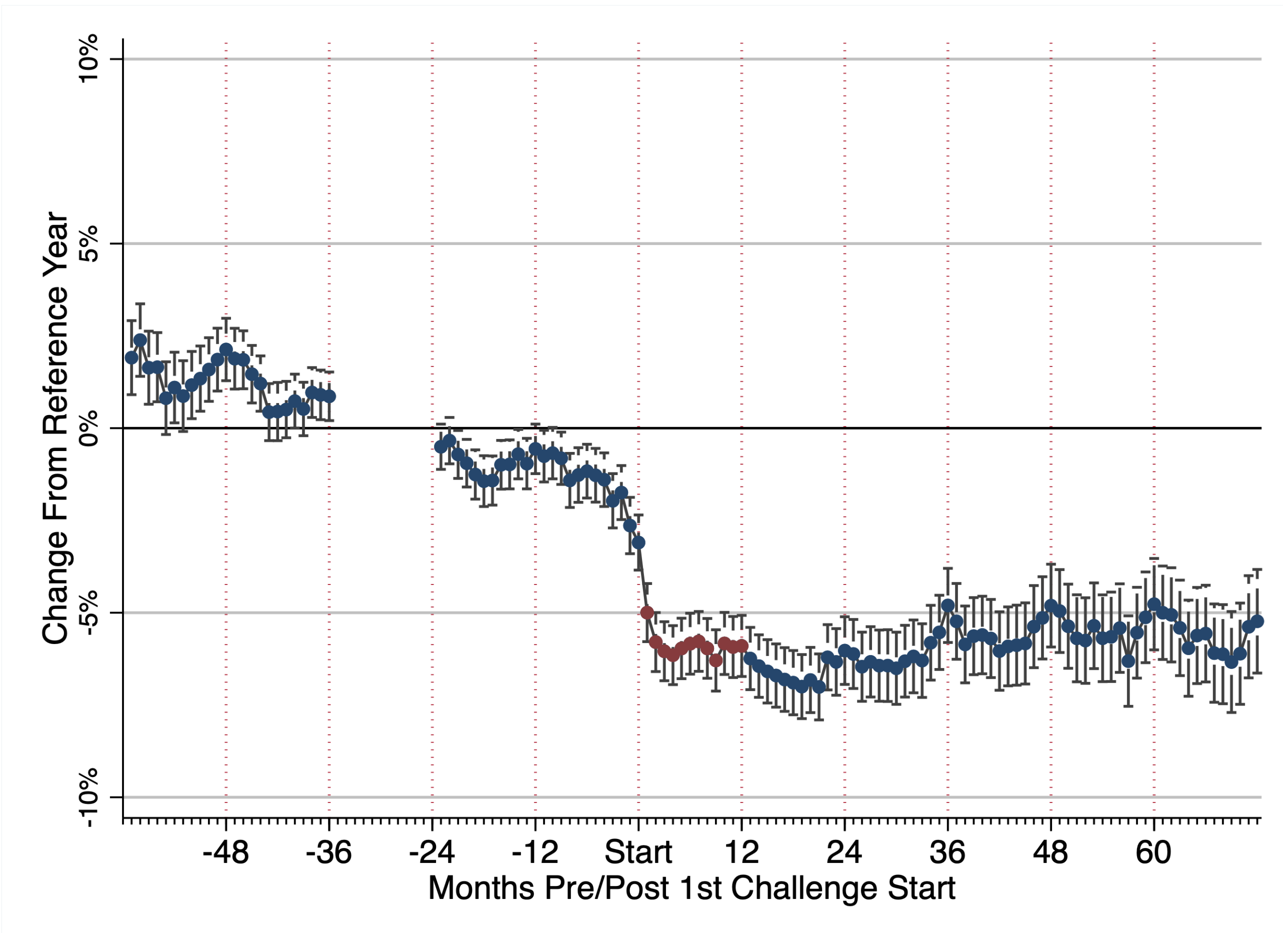
Figure B.12 plots all estimates for households undertaking separate numbers of challenges on the same plot to provide an alternative comparison of their respective trends. Figures B.13 to B.15 present the panels of Figure 1 separately for clarity.

Figure B.7: **Including All Non-participant Households**



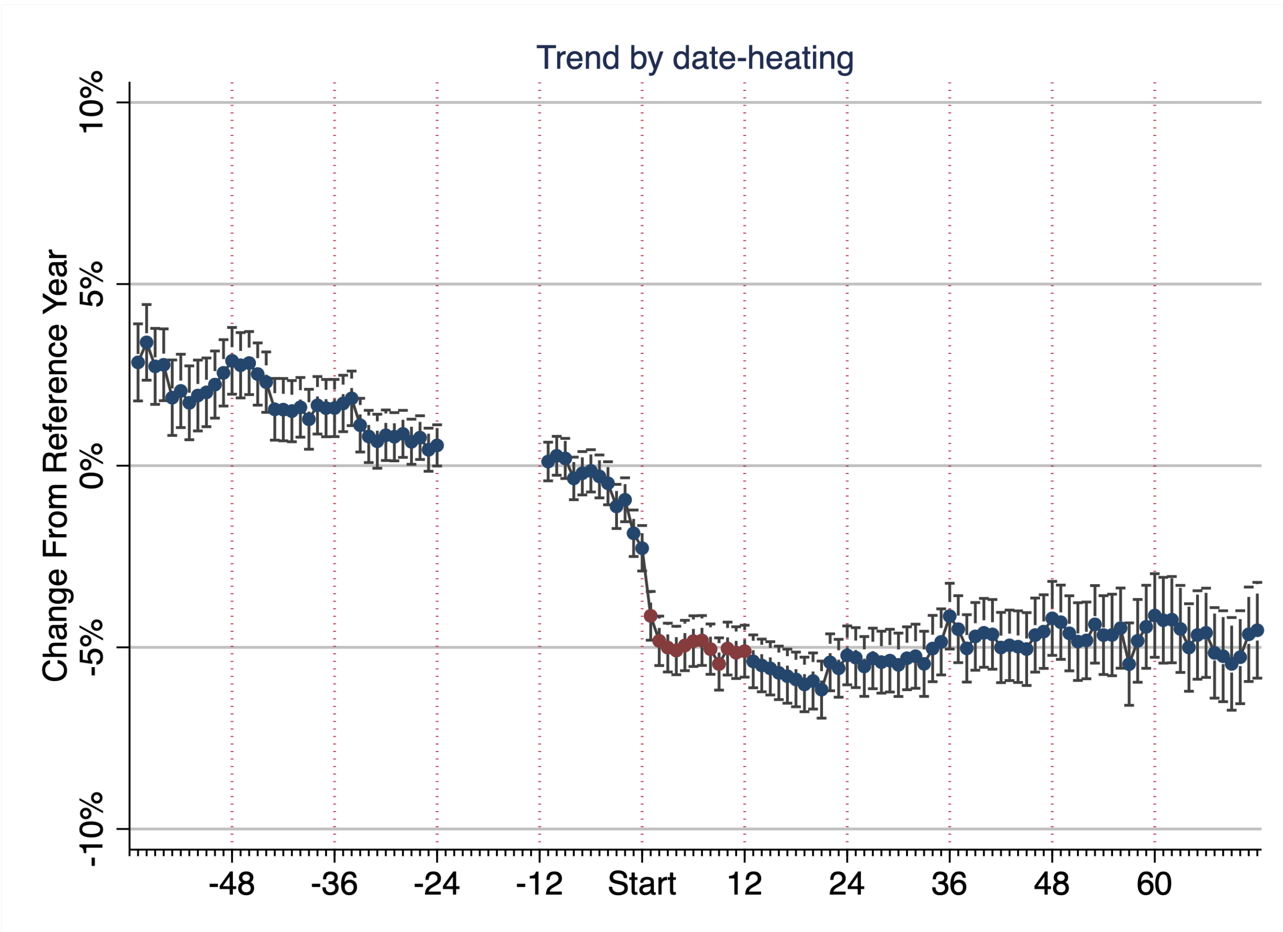
Notes: Estimates including all non-participant households. The additional within-year variation in this figure arises due to the higher share of electric-heating households among the set of non-participant households, compared to program participants. Electric heating households have higher seasonal variation than non-electric households which through common date fixed effects results in a residual seasonal variation.

Figure B.8: **Alternate Reference Year**



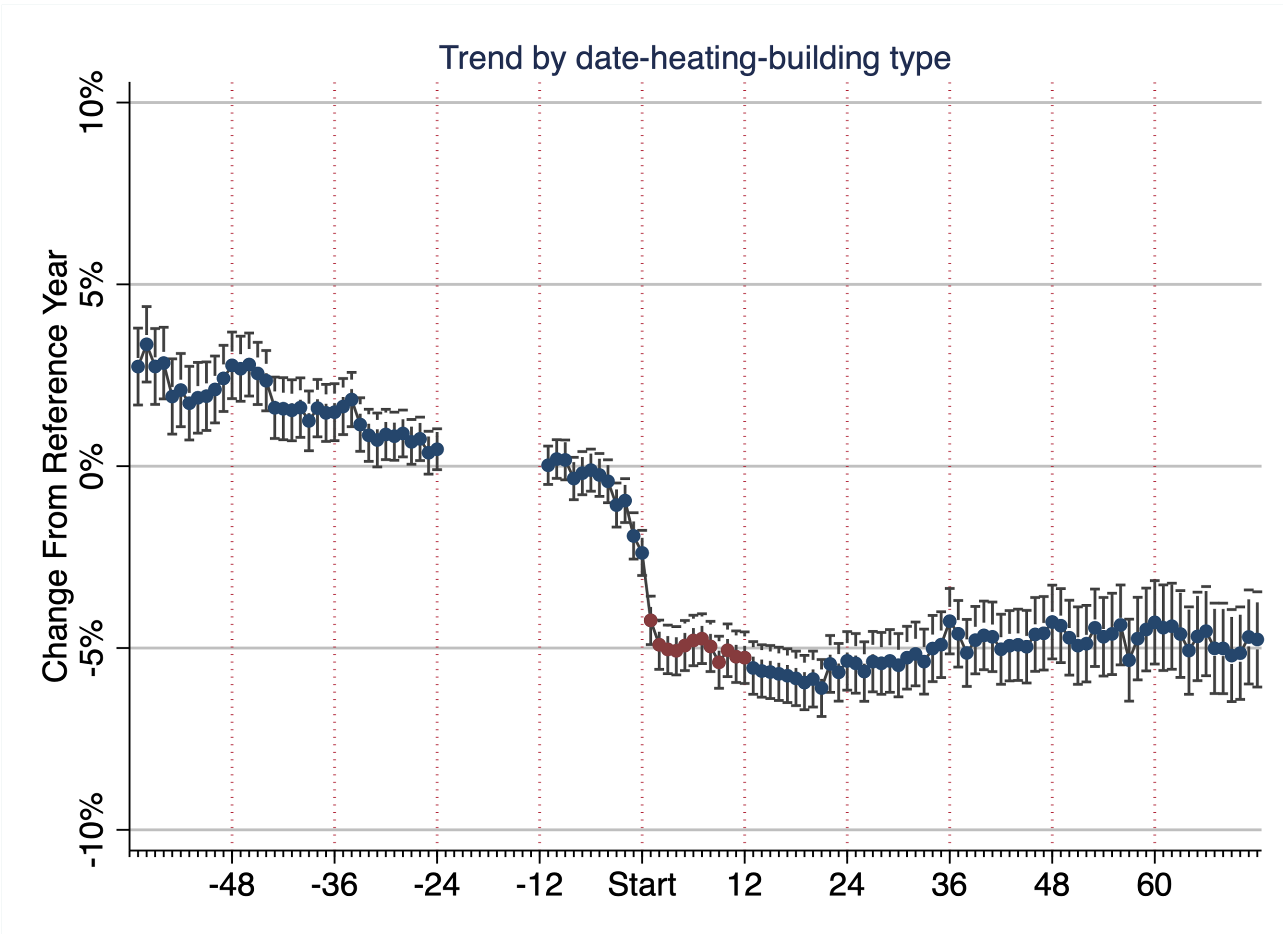
Notes: Alternative reference baseline of the 3rd year pre-treatment: months $\tau = -24$ and $\tau = -36$.

Figure B.9: **Date-heating time trend**



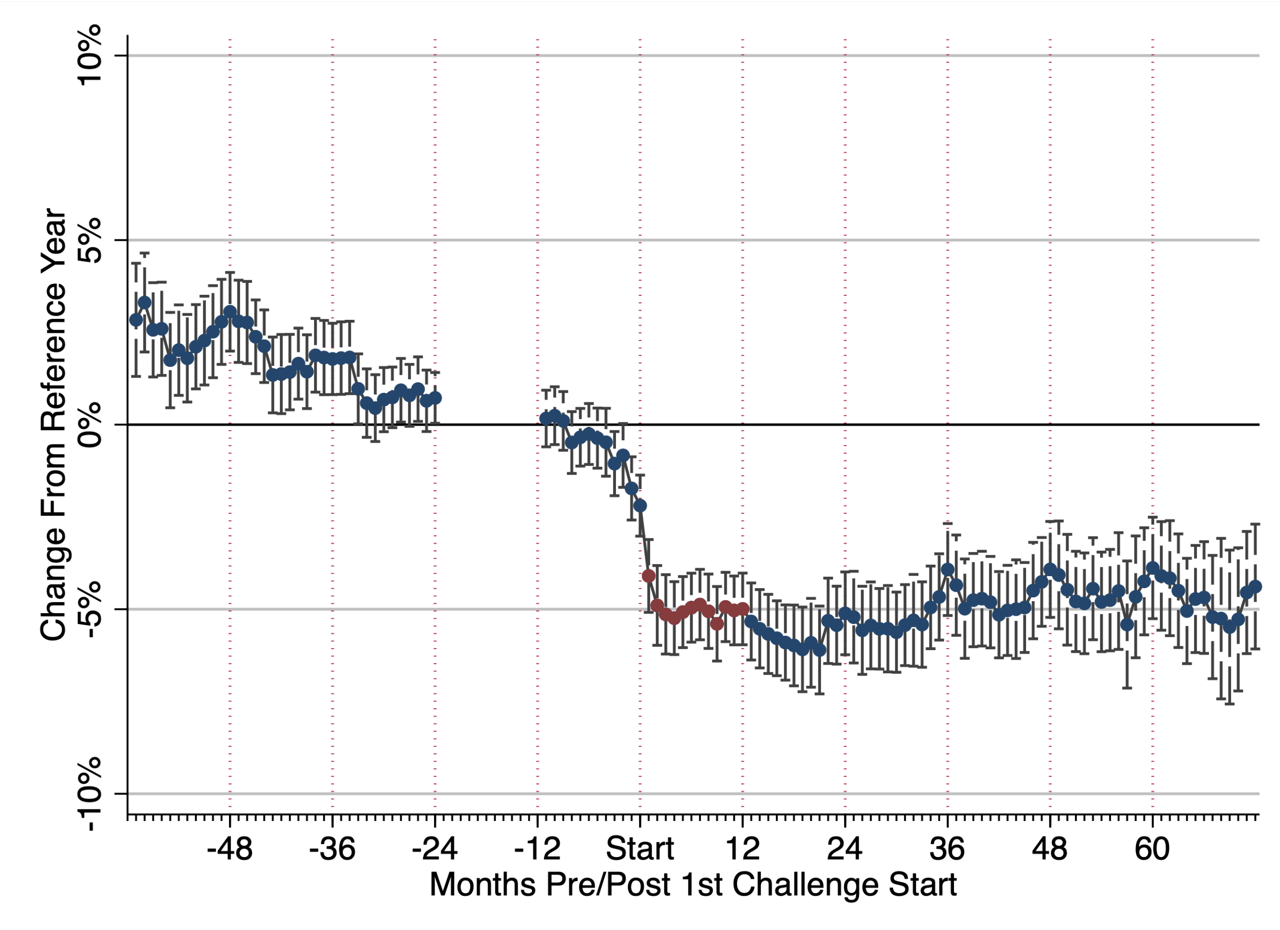
Notes: Estimates include separate month-of-year fixed effects for electric and non-electric heating households.

Figure B.10: **Date-heating-building type time trend**



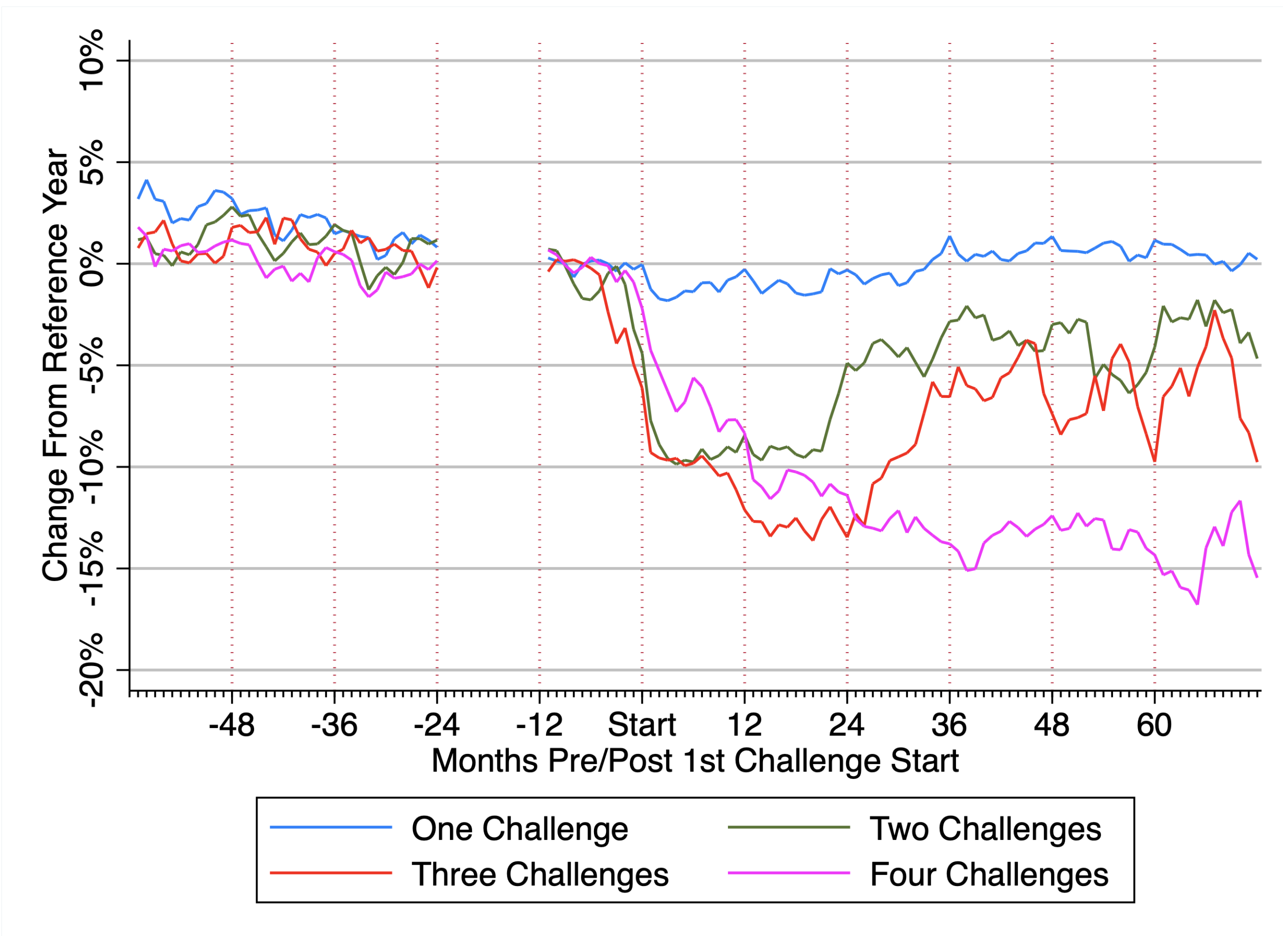
Notes: Estimates include separate month-of-year fixed effects for each building and heating type to allow time trends to differ across these categories.

Figure B.11: **Two-way clustering by date-household**



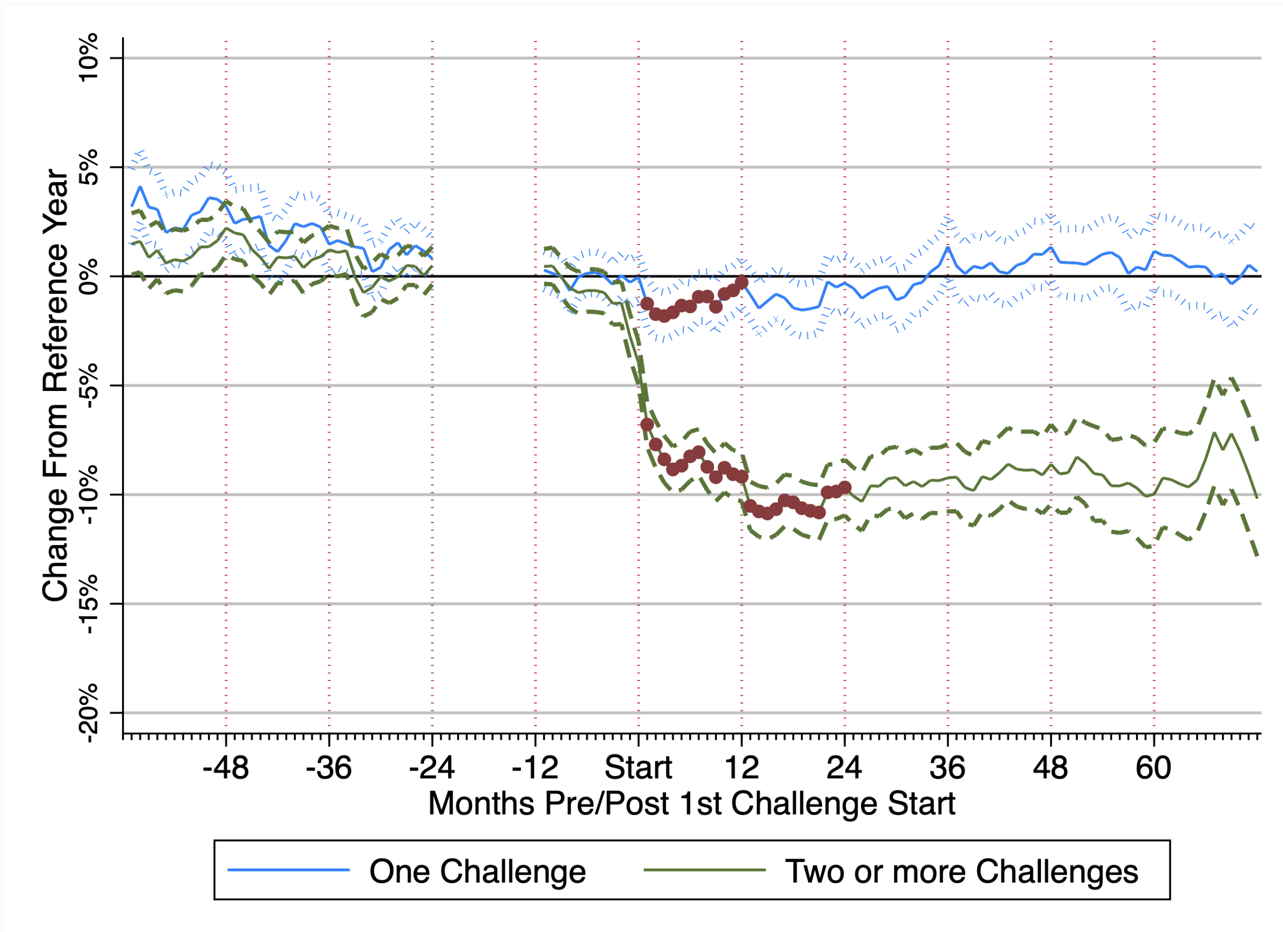
Notes: Estimates with errors clustered by date (month-of-year)-household.

Figure B.12: **Overlapping Challenges**



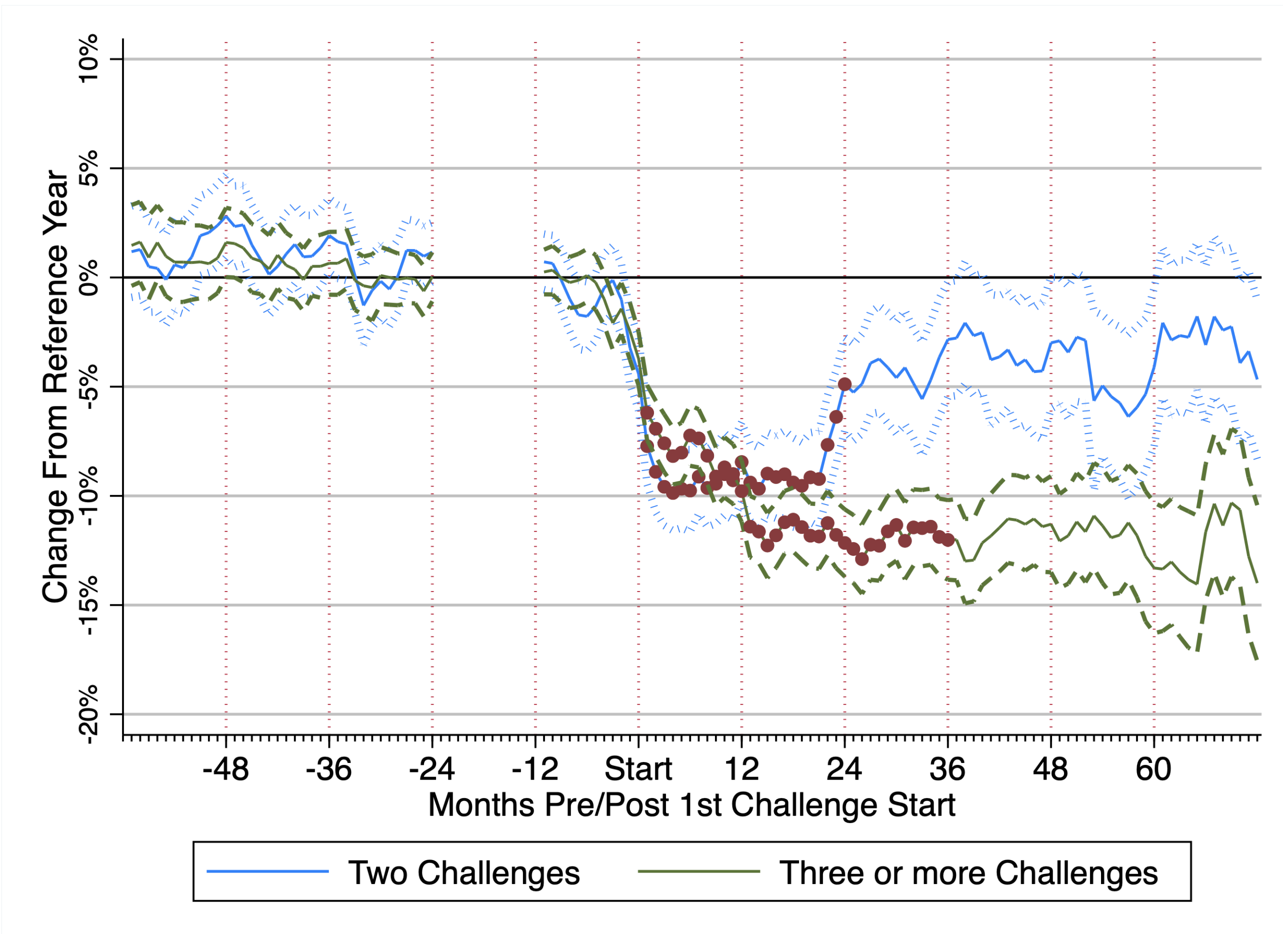
Notes: Estimates of $\hat{\beta}_\tau$ for mutually exclusive groups of participant households depending on how many challenges they undertake. This repeats the estimates in Figure 1 excluding confidence intervals for clarity.

Figure B.13: **Single Challenge vs Two Or More Challenges**



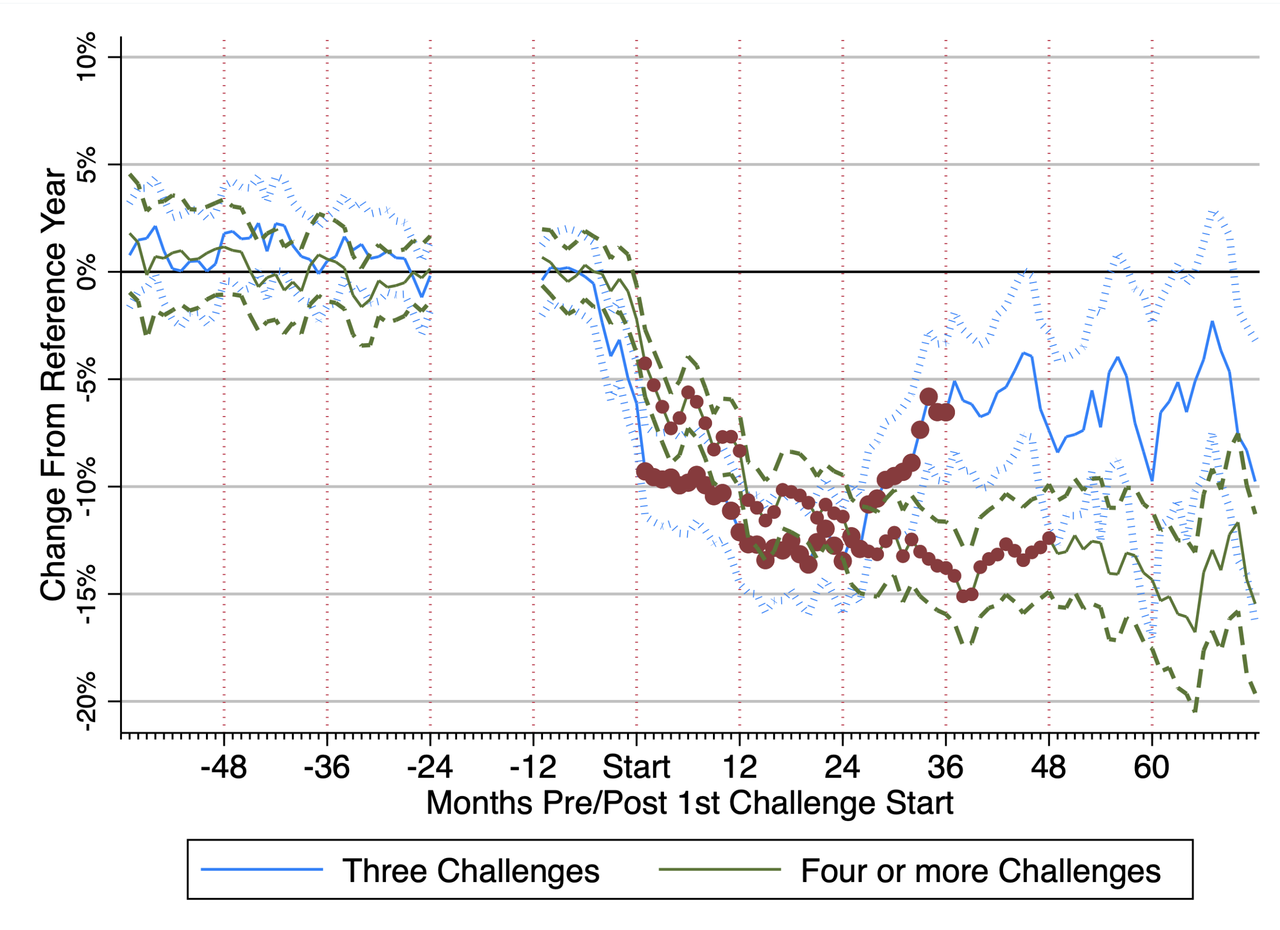
Notes: Estimates $\hat{\beta}_\tau$ and 95% confidence intervals from equation (2) in the text estimated for two mutually exclusive groups of households. Estimates in blue are households that undertake a single challenge prior to September 2014, and then end their program participation. Event study estimates in green are for households that undertake at least two conservation challenges, both prior to September 2014, and continued to their second challenge within 12 months of completing their initial challenge. Not shown are estimates θ_g for electricity use during the gap between the first and second challenges. Months 13-24 are estimates of the average change in electricity use among households in their second conservation challenge independent of any gap between challenges. Estimates include individual and date fixed effects and I cluster standard errors at the household level.

Figure B.14: **Two Challenges vs Three Or More Challenges**



Notes: Estimates $\hat{\beta}_\tau$ and 95% confidence intervals from equation (2) in the text estimated for two mutually exclusive groups of households. Estimates in blue are households that undertook two conservation challenges prior to September 2014, and end their participation after a second conservation challenge. Estimates in green are households that continue to a third conservation challenge, all undertaken prior to September 2014. Estimation sample restricted to households that continue to subsequent challenges within 12 months. Not shown are estimates θ_g for electricity use during the gap between challenges. Estimates include individual and date fixed effects and I cluster standard errors at the household level.

Figure B.15: **Three Challenges vs Four Or More Challenges**



Notes: Estimates $\hat{\beta}_\tau$ and 95% confidence intervals from equation (2) in the text estimated for two mutually exclusive groups of households. Estimates in blue are households that undertook three conservation challenges prior to September 2014, and end their participation after the third conservation challenge. Estimates in green are households that continue to a fourth conservation challenge, with all four challenges undertaken prior to September 2014. Estimation sample restricted to households that continue to subsequent challenges within 12 months. Not shown are estimates θ_g for electricity use during the gap between challenges. Estimates include individual and date fixed effects and I cluster standard errors at the household level.

B.3 Estimates by Heating Type

Electricity conservation may vary by season depending on how households reduce their electricity use. Improved insulation, smart thermostats, or reductions in the household temperature will produce larger energy savings in the winter and among households that heat primarily with electricity. More efficient dryers, lightbulbs, or other changes that affect primarily non-seasonal electricity use will generate energy savings year round for both household heating types. Comparing when during the year that reductions in electricity use occur, and between household heating types, sheds light on how households have responded to the conservation challenge. To explore this I estimate equation (1) in the text separately for each calendar month and household heating type. In Figure B.1 (top panel) I plot estimates from the initial year of a challenge separately for each calendar month. This shows both household heating types have similar reductions in percentage terms in the summer months, while Electric Space Heating households have larger reductions in the winter months. Figure B.1 (lower panel) also plots event-study estimates separately for Electric and non-Electric heating households; this shows they have similar trends in reductions in electricity use over time and with slightly larger reductions among electric heating households.

To estimate the fraction of energy conservation due to heating I use the average reduction in electricity use over the four warmest summer months as a measure of non-heating related conservation. I extrapolate this to all 12 months, and attribute the remaining conservation as heating-related. Multiplying the percent reductions by the monthly average pre-program use I find 23% of conservation among non-electric heating households and 51% of the conservation among electric heating households is related to heating. That non-electric heating households have reductions due to heating is not unexpected; non-electric heating households may still use some electric heat such as after-market baseboard heaters in addition to their non-electric primary heat source.

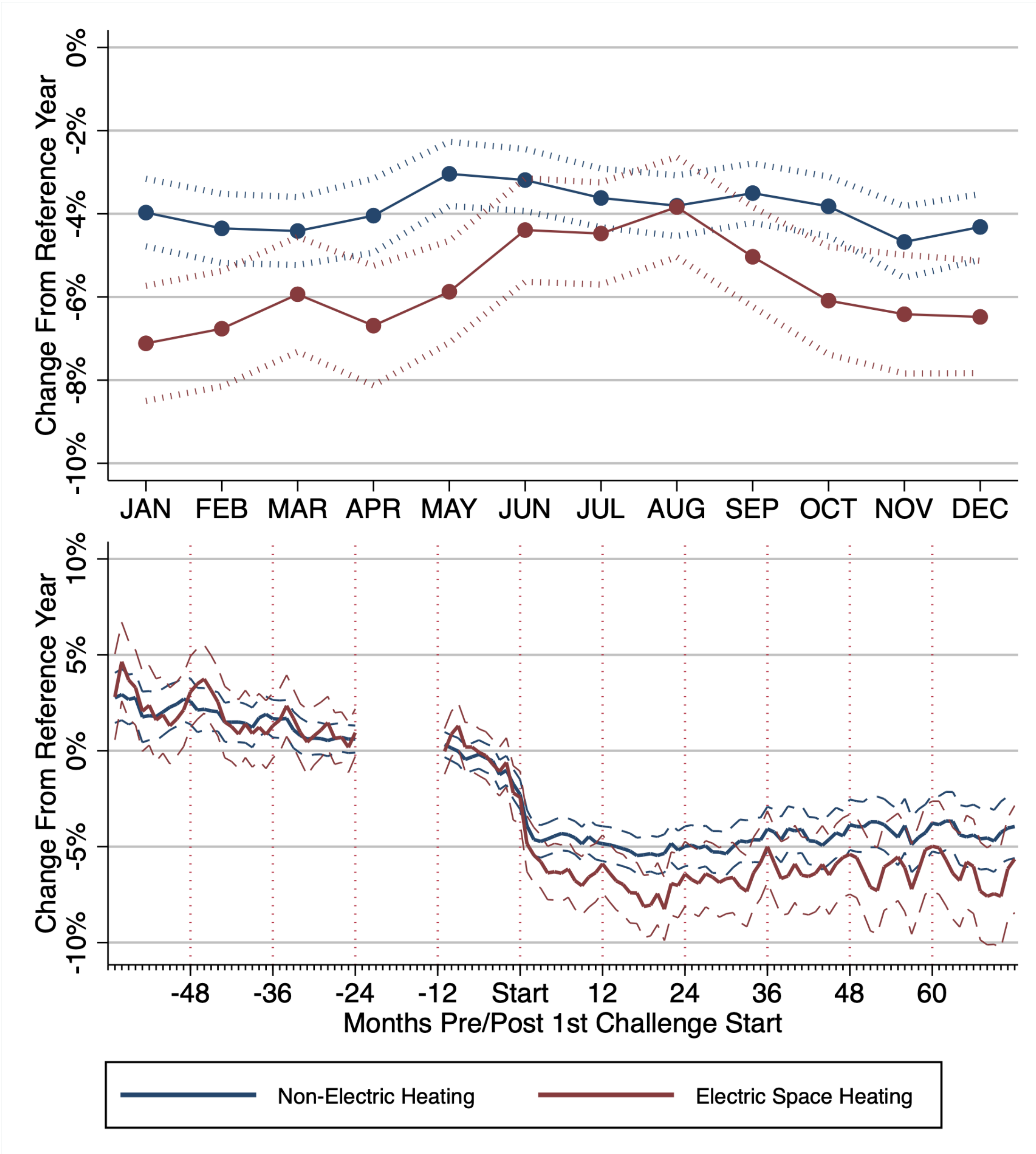
B.4 Estimates by Household Characteristics

The relative stability of the households studied compared to the general population raises questions about external validity. One concern is the difference in building types between participants and the general population in Table A.2. To estimate energy conservation across pre-determined observables I use an annual event study model,

$$y_{it} = \sum_{\varUpsilon=-119}^{108} \theta_{\varUpsilon} D_{it,\varUpsilon} + \alpha_i + d_t + \epsilon_{it} \tag{B.3}$$

where y_{it} is log monthly electricity use for household i at month-of-sample t, and $D_{it,\varUpsilon}$ is an indicator for if household i in monthly date t is in year $\varUpsilon$ pre or post the challenge start date. α_i and d_t are household and month-of-sample fixed effects. I use the last pre-program year as the reference year. In Table B.1 Panel A I compare quartiles of pre-program (2006) electricity use, in Panel B I compare

Figure B.1: **Estimates By Heating Type**



Notes: Top panel: estimated electricity use changes during the initial conservation challenge relative to the same calendar month two years prior. Estimates are from equation (1) in the text estimated separately for each month of the year. 95% confidence intervals shown by the dashed lines. Bottom panel: estimates from equation (1) for all participant and non-participant households separately by heating type.

1 Story and 2 Story Single Family Dwellings, Apartments, and Townhouses, in Panel C I compare quartiles of Assessed Value which is the combined land and structure value, and in Panel D I compare quartiles of the reported floor space of the house. Comparing point estimates I do not find statistically significant differences between them at the 5% level. If higher assessed value in Panel C is taken as a proxy for income, the results imply that households respond similarly across quartiles of wealth.

Re-weighting these estimates by the composition of building types in the general Greater Vancouver population predicts an average reduction of 4.8% relative to the last pre-program year, and compared to the 4.3% estimated among participants. This shows that self-selection into the sample based on observable building characteristics is not a substantial threat to external validity. Unobservable differences between participants and the general population do remain a concern, though the similarity in estimates across different building characteristics and quartiles of pre-program use suggests that estimates are generalizable to a variety of building and household types. Compared to the average electricity consumer, relatively stable households do have a greater incentive to make energy efficiency investments that pay off over time. Similarly, stable participants may have more low-cost ways to reduce electricity use as a result of being more familiar with their home and its energy use. This is a further reason in addition to self-selection that the event-study estimates should be viewed as an upper bound when extrapolating to the average household.

Appendix C Cost Effectiveness

The Team Power Smart program is designed to produce electricity generation capacity savings and reduce the expected future increase in demand for electricity. A full welfare analysis of the TPS program is beyond the scope of this work. Instead, I provide a lower bound on the cost of avoided electricity generation caused by the program. I estimate a lower bound for two reasons. First, because the costs of administering and advertising the Team Power Smart reward program are confidential to BC Hydro, I consider only the cost of the $75 rebates rewarded to households, and leave aside the costs of administering the program.[1] Second, I make the assumption that the estimated electricity conservation from the event study model are fully causal treatment effects; any overestimate of the true treatment effect will bias upward the cost of avoided generation. From the estimated electricity conservation and the average electricity use among participants, Table A.2, I find that the average aggregate reduction in electricity use over the first six years after an initial challenge is 2.7 MWh per household. This is the average across all households and accounts for their decisions whether to re-enroll after each challenge. Taking into account households' average success in their conservation challenges, and the number continuing to additional challenges, the average aggregate rebate payment over the six years

[1] Because the program is administered online, variable costs excluding the rebate are likely to be negligible. Program fixed costs may not be insignificant relative to the cost of the rewarded rebates. One full time equivalent employee compensated at $70,000 per year for managing the program would add approximately $6 per challenge to the program. This is $20 per awarded rebate using the 30% success rate over the initial five challenges households undertake.

Table B.1: **Estimates by Pre-Determined Variables**

Panel A: Quartiles of Pre-Program Electricity Use				
	1st	2nd	3rd	4th
$\theta_1 : Initial\, Challenge$	-0.0601***	-0.0375***	-0.0549***	-0.0452***
	(0.00598)	(0.00527)	(0.00500)	(0.00510)
Avg. Use in 2006 (kWh)	381	645	934	1527
Panel B: Building Type				
	1 Sty SFD	2 Sty SFD	Apartment	Townhouse
$\theta_1 : Initial\, Challenge$	-0.0477***	-0.0473***	-0.0654***	-0.0505***
	(0.00432)	(0.00486)	(0.00837)	(0.00657)
# of participants	3426	2421	1283	1102
Panel C: Quartiles of Assessed Value				
	1st	2nd	3rd	4th
$\theta_1 : Initial\, Challenge$	-0.0536***	-0.0518***	-0.0481***	-0.0452***
	(0.00555)	(0.00496)	(0.00526)	(0.00563)
Avg. Assessed Value ($1,000)	$288	$482	$686	$1,226
Panel D: Quartiles of Floor Area				
	1st	2nd	3rd	4th
$\theta_1 : Initial\, Challenge$	-0.0577***	-0.0549***	-0.0400***	-0.0474***
	(0.00592)	(0.00518)	(0.00535)	(0.00542)
Avg. Floor Area (sq. ft.)	984	1638	2192	3254

Notes: Panel A: Quartiles of pre-program electricity use determined from households' average electricity use in the pre-program year 2006. Quartiles are defined separately for the balanced set of participant and non-participant households. Panel B: Building type includes the four principal housing types of single story single family dwellings, two story single family dwellings, apartments, and town homes. Panel C: quartiles of assessed value are from the 2010 BC Assessment for individual units and include both structure and land value. Panel D: Quartiles of unit floor area. Estimates are the average change in electricity use during the initial challenge relative to the 2nd year pre-program. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

is \$53 per household. This finds an average cost of avoided generation of \$20/MWh. In comparison, participants paid an average retail price of \$96/MWh in 2016, while a large hydroelectric dam under construction in the province is estimated to have a levelized cost of electricity of \$34-\$83/MWh (British Columbia Utilities Commission, 2017). This makes the Team Power Smart program a cost-effective way to reduce the demand for electricity in comparison to the cost of new generation.

What is the cost of avoided carbon emissions due to this energy conservation program? It is important to note that this energy conservation program was not designed to principally reduce carbon emissions and the cost of avoided emissions is not particularly relevant to BC Hydro. British Columbia generates over 90% of its electricity from hydroelectric dams and has a low emissions intensity of 9kgCO2e/MWh (BCH, 2016); \$20 per avoided MWh is a cost of avoided greenhouse gas emissions of \$2,222/tCO2eq. However, BC Hydro engages in large cross-border trade in electricity with the United States, primarily California. Lower electricity use in British Columbia allows BC Hydro to sell relatively low cost and low emissions power to California. Assuming all reductions in B.C. electricity use reduces generation in California finds, using the 2017 California average emissions intensity (EPA, 2017), a cost of emissions abatement of \$71/tCO2. At the 2017 U.S. average emission intensity, this falls to \$45/tCO2 (Schivley, Azevedo, and Samaras, 2018). These abatement costs are within the range of commonly discussed estimates of the SCC (EPA, 2016), and indicate that in some jurisdictions, repeated financial reward programs similar to the one studied in this work may be cost effective relative to the SCC. The results of this paper show that the continued incentive of repeated financial rewards is important for maintaining and causing additional reductions in electricity use. The continued incentive improves the program's cost-effectiveness, compared to a program offering a single annual conservation challenge. This improved cost-effectiveness occurs for two reasons. First, the program administration fixed costs are spread across additional conservation challenges. Second, the repeated incentive causes additional reductions, and keeps electricity use from rebounding back close to pre-program levels.

Appendix D The Re-enrollment Decision

All households that participate in Team Power Smart have the option of re-enrolling in additional conservation challenges. To explore what correlates with households' decisions to re-enroll in a second challenge I estimate Probit models of equation (D.4). C_i is a binary indicator for if a household re-enrolls in a second conservation challenge. X_i is a vector of household characteristics, R_i are changes in electricity use households' received credit for during the first challenge, $1\{R_i \leq \bar{R}\}$ is a dummy variable equal to one if a household was successful in the initial challenge by achieving reductions R_i less than the $\bar{R} = -9.5$ threshold, and P_i is a household's pre-program use measured in standard deviations from the mean of households' 2006 electricity use within heating and building type categories.

$$C_i = \beta \mathbf{X_i} + \theta R_i + \gamma_1 1\{R_i \leq \bar{R}\} + \gamma_2 P_i + \epsilon_i \tag{D.4}$$

Table D.1 shows the marginal effects from estimating equation (D.4) with the indicated covariates. Specification (1) includes households' electric heating category and building type. I use the most common household type, Single Story Single Family Dwellings that heat primarily without electricity, as the reference category; marginal effects show the change in probability of re-enrolling relative to this household type. Specification (1) shows Townhouses are the only household type with a statistically significant, at the 5% level, difference (4.76%) in the probability of re-enrolling. This is consistent with the findings from Subsection B.3 that electricity conservation is higher for Townhomes compared to other household types. Specification (2) shows that the probability of re-enrolling does not materially differ across the number of bedrooms, household value, or size of the house. Specification (3) shows that households with larger electricity conservation are more likely to re-enroll while Specification (4) demonstrates this is through the channel of passing their conservation challenge. The large magnitude of the coefficient on Success highlights its importance in re-enrollment compared to differences across household characteristics. Taking the largest difference in point estimates across household characteristics in Specification (4) finds Townhouses are 8.6% more likely to re-enroll than homes classified Other. In comparison, households that pass their conservation Challenge are 20.2% more likely to re-enroll. Specification (5) includes a household's Pre-Program use measured in standard deviations from the mean of households' 2006 electricity use, measured within heating and building type categories. This shows that households with higher Pre-Program electricity use are more likely to re-enroll; households three standard deviations above the mean 2006 electricity use are 5.9% more likely to re-enroll. However, this magnitude is not large compared to the effect of Success—Specification (6)—or differences between Townhomes and Other.

Figure D.1 plots the probability of continuing to a second conservation challenge against the reductions in billed—not credited— electricity use from that household's first challenge. Larger reductions in billed electricity use are associated with a greater likelihood of continuing to a subsequent challenge. Figure D.1 also shows the fraction of households succeeding in their challenge. From this we can see some households with reductions greater than 9.5% do not pass their challenge, while other households with reductions less than 9.5% do pass. This occurs because success or failure in a challenge is evaluated from changes in weather-adjusted—not billed—electricity use.

Table D.2 shows the marginal effects from estimating equation D.4 for the decision to re-enroll in a third conservation challenge. These results are broadly consistent with those for a second challenge, Table D.1, and differ in two ways. First, households are more likely to re-enroll in a third challenge if they use electric heating whereas townhomes are no-longer more likely to re-enroll. Second, magnitude of passing the second challenge is smaller—12.3% in Specification (4) of Table D.2— compared to the 20.2% magnitude on Success in the initial challenge from Table D.1.

Appendix E Fuzzy Regression Discontinuity Identifying Assumptions

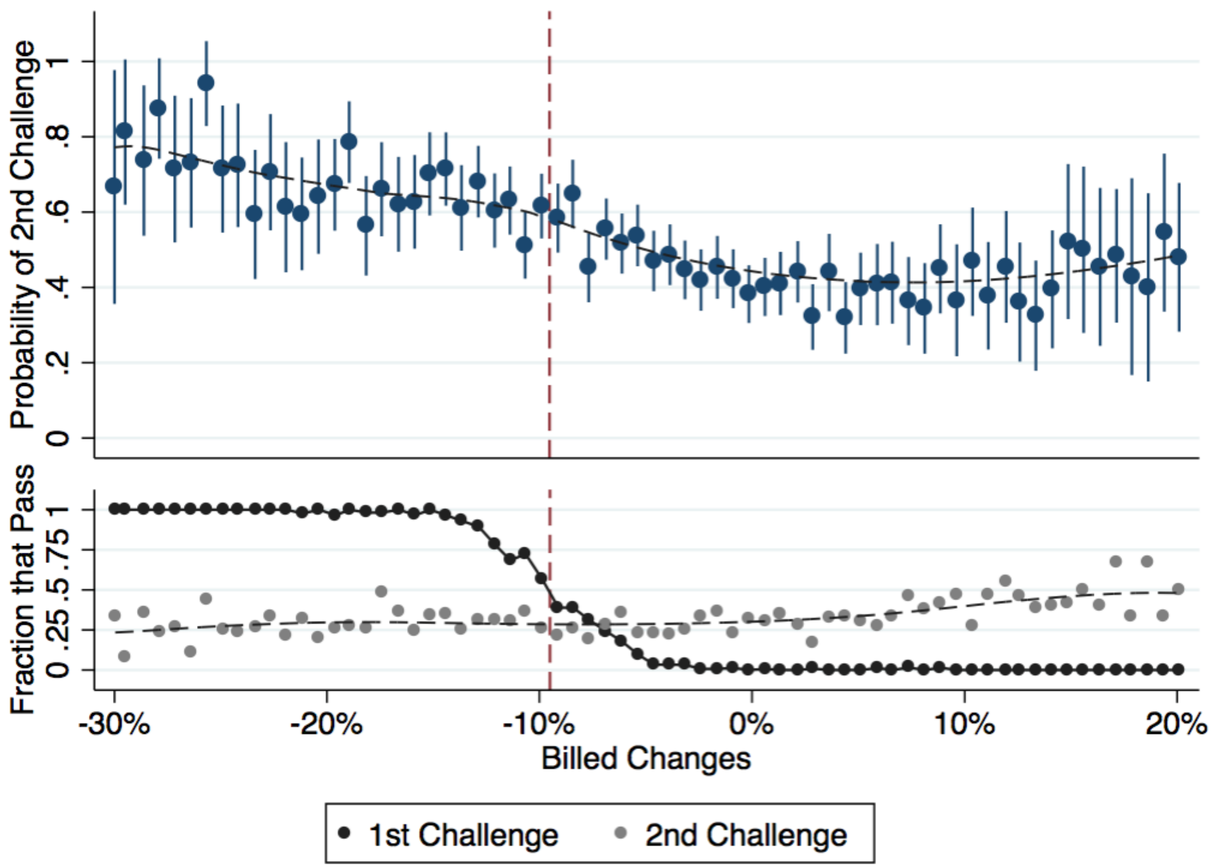
A regression discontinuity strategy requires that units on one side of the threshold that defines treatment are a suitable counterfactual for units on the other (Lee and Lemieux, 2010). This assumption

Table D.1: **Probit Model: Re-Enrolling in a Second Challenge**

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Re-enrollment in a second conservation challenge						
Non-Electric Heat	-	-	-	-	-	-
Electric Heat	0.00339	0.000862	0.00618	-0.00700	0.00307	-0.00716
	(0.0148)	(0.0152)	(0.0130)	(0.0150)	(0.0149)	(0.0151)
Heating Unknown	-0.0140	-0.00329	-0.0179	-0.00725	-0.0133	-0.00645
	(0.0178)	(0.0185)	(0.0156)	(0.0178)	(0.0178)	(0.0178)
2 Story Sfd	-0.00917	0.00850	-0.00523	-0.00684	-0.00938	-0.00710
	(0.0147)	(0.0160)	(0.0128)	(0.0149)	(0.0147)	(0.0149)
1 Story Sfd	-	-	-	-	-	-
1.5 Story Sfd	-0.0160	0.000639	0.00412	-0.0191	-0.0161	-0.0194
	(0.0294)	(0.0301)	(0.0261)	(0.0297)	(0.0294)	(0.0298)
Apartment	0.00729	-0.0434*	0.00968	0.00845	0.00815	0.00920
	(0.0199)	(0.0263)	(0.0176)	(0.0201)	(0.0200)	(0.0202)
Townhouse	0.0476**	0.0217	0.0484***	0.0570***	0.0477**	0.0573***
	(0.0187)	(0.0206)	(0.0166)	(0.0187)	(0.0187)	(0.0187)
Other (home type)	-0.0361	-0.0500	0.00270	-0.0294	-0.0362	-0.0294
	(0.0350)	(0.0360)	(0.0302)	(0.0350)	(0.0351)	(0.0350)
Bedrooms		-0.0117				
		(0.00739)				
Value		-0.0195				
		(0.0132)				
Floor Area		-0.0257				
		(0.0239)				
Cred. Changes: R_i			-0.270***	0.0221		
			(0.0420)	(0.0357)		
Success: $1\{R_i \leq \bar{R}\}$				0.203***		0.200***
				(0.0138)		(0.0114)
Pre-Program Use: P_i					-0.0194***	-0.0235***
					(0.00567)	(0.00570)
Households	7181	6879	9818	7181	7180	7180
Pseudo R^2	0.001	0.003	0.009	0.030	0.003	0.031
χ^2	12.915	23.406	58.206	274.263	24.541	288.702

Notes: This table shows how differences in household characteristics are correlated with the probability of re-enrolling in a second conservation challenge. These are estimated using a Probit model with dependent variable an indicator $C_i = 1$ if household i re-enrolls, $C_i = 0$ if household i does not re-enroll. Estimates are relative to the reference category of One Story Single Family Dwellings that are primarily non-electric heating. Value and Floor area are natural logs, Credited Changes is the percent change in Challenge 1 electricity conservation credited to households, and Success an indicator equal to 1 if a household achieves their Challenge 1 conservation target. Pre-program use is the number of standard deviations between a household's electricity use in 2006 and the average electricity use among households within the same building and heating type category. All coefficients are marginal effects at the covariate means. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Figure D.1: **Probability of Continuing to a Second Challenge: Billed Electricity Use**



Notes: Billed changes are the percent change in billed electricity consumption from the pre-program year to the year of the first conservation challenge. The -9.5% level is shown by the vertical dashed line - note this is not the threshold for success as success was defined from credited - not billed - changes. Point estimates in the top bottom panel are the average probability of continuing to a second conservation challenge within 0.75%-wide bins of billed changes from the first conservation challenge. The dashed line in the top panel shows separate 1st order polynomial fits to households with billed changes above and below the indicated -9.5% threshold.

The bottom panel shows the corresponding fraction who pass their initial reduction challenge (dark connected line) and subsequent challenge (light grey scatter plot.) The dashed grey line in the bottom panel is a 3rd order kernel-weighted local polynomial fit to the fraction of households that pass their second conservation challenge.

Table D.2: **Probit Model: Re-Enrolling in a Third Challenge**

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Re-enrollment in a third conservation challenge						
Non-ElectricHeat	-	-	-	-	-	-
Electric Heat	0.0545***	0.0423**	0.0279	0.0449**	0.0545***	0.0446**
	(0.0179)	(0.0185)	(0.0170)	(0.0181)	(0.0179)	(0.0181)
Heating Unknown	0.0326	0.0409*	0.0265	0.0347	0.0325	0.0345
	(0.0218)	(0.0225)	(0.0207)	(0.0217)	(0.0219)	(0.0217)
1 Story Sfd	-	-	-	-	-	-
2 Story Sfd	-0.0120	0.00136	-0.0169	-0.0134	-0.0119	-0.0132
	(0.0181)	(0.0195)	(0.0170)	(0.0182)	(0.0181)	(0.0181)
1.5 Story Sfd	0.00146	0.0174	0.00157	-0.00220	0.00175	-0.00219
	(0.0357)	(0.0359)	(0.0342)	(0.0361)	(0.0357)	(0.0361)
Apartment	-0.0134	-0.0608*	-0.0171	-0.0157	-0.0133	-0.0161
	(0.0248)	(0.0331)	(0.0232)	(0.0250)	(0.0248)	(0.0250)
Townhouse	0.00196	-0.0217	0.0172	0.00556	0.00209	0.00584
	(0.0227)	(0.0251)	(0.0213)	(0.0226)	(0.0227)	(0.0225)
Other (home type)	0.0714*	0.0579	0.00951	0.0760*	0.0717*	0.0770*
	(0.0401)	(0.0419)	(0.0396)	(0.0394)	(0.0399)	(0.0393)
Bedrooms		-0.00281				
		(0.00913)				
Value		-0.0212				
		(0.0162)				
Floor Area		-0.0462				
		(0.0294)				
Cred. Changes: R_i			-0.296***	-0.0517		
			(0.0446)	(0.0467)		
Success: $1\{R_i \leq \bar{R}\}$				0.123***		0.135***
				(0.0173)		(0.0142)
Pre-Program Use: P_i					-0.00586	-0.00976
					(0.00692)	(0.00693)
Households	4489	4311	5638	4489	4489	4489
PseudoR^2	0.003	0.004	0.008	0.017	0.003	0.018
χ^2	14.943	22.165	50.910	95.478	15.844	96.236

Notes: This table shows how differences in household characteristics are correlated with the probability of re-enrolling in a third conservation challenge. Estimates are relative to the reference category of One Story Single Family Dwellings that are primarily non-electric heating. Value and Floor area are in natural logs, Credited Changes is the percent change in Challenge 2 electricity conservation credited to households, and Success an indicator equal to 1 if a household achieves their second challenge conservation target. Pre-program use is the number of standard deviations between a household's electricity use in 2006 and the average electricity use among households within the same building and heating type category. All coefficients are marginal effects at the covariate means. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

would be violated if households can precisely manipulate their assignment into treatment, and such manipulation results in households sorting at the discontinuity in any way that affects average potential outcomes. Such sorting is a concern in this setup as households are explicitly trying to achieve the 10% conservation target. Sorting could occur if, for example, households are heterogenous in their attention to their progress and high-information type households exert additional effort in the last months of a conservation challenge and self-select into passing their challenge. Fortunately, the separation of the 9.5% threshold (and resulting discontinuity in re-enrollment) for Challenge success from the 10% reduction target allows me to show that this RD strategy remains valid despite households manipulating the running variable of electricity conservation such that they exhibit bunching at the 10% reduction target. As Lee and Lemieux (2010) note, manipulation of the assignment value in itself does not invalidate RD designs. It is discontinuous potential outcomes, caused by households sorting across the assignment value defining treatment and therefore being co-incident with treatment, that can bias RD estimates.

As in standard regression discontinuity models, evidence on whether sorting is likely to have occurred or not can be obtained from understanding the ability of agents to manipulate their assignment, the continuity of observables, and the density of observations across the discontinuity. Sorting discontinuously at the 9.5% threshold for success is unlikely for several reasons. Most importantly, households were not aware that their success or failure would be evaluated against a 9.5% threshold instead of the advertised 10% target. In addition, the weather adjustment mechanically randomizes households near the threshold into and out of treatment based on the weather change that occurred. The cumulative nature of the challenge also makes precise manipulation of success difficult. For example, a household at a 9% cumulative reduction entering the last month of their challenge would have to double their previous monthly reductions and reduce their use in the last month by 21% to achieve their aggregate 10% target. To test for discontinuities I estimate equation 3 in the text for several bandwidths and find no statistically significant discontinuity in observables at the 9.5% threshold—Table E.1 and Figure E.3. The lack of sorting is further supported by a McCrary (2008) density test shown in Figure E.4, which fails to reject the null hypothesis (one sided p-value 0.117) of no discontinuity in the density of the running variable at the 9.5% threshold.

However, a lack of sorting at the 9.5% threshold would not remove the potential problem of sorting across the 10% target. This is because in practice the estimation bandwidth around the 9.5% discontinuity needs to also span the 10% target to obtain a suitably large sample size. Applying the McCrary (2008) density test in Figure E.5 at the 10% target—not the 9.5% threshold—rejects that there is no discontinuity in the density (one sided p-value 0.0017.) This suggests households can manipulate their assignment around the 10% target, despite the difficulty of precise manipulation discussed above.

Such manipulation only invalidates the RD strategy if it causes discontinuous potential outcomes. I find no statistically significant discontinuity in observables at the 10% target, suggesting that sorting correlated with observables is not occurring. The typical concern would be that sorting at the 10% target on unobservables, which affect outcomes, could still occur. However, BC Hydro's separation of the 10% target from the 9.5% threshold allows the continuity of the outcome variables—and the under-

Table E.1: **Discontinuity tests of covariates at the 9.5% discontinuity**

Dependent Variable:	Window Size				
	3	4	5	6	7
Heating	0.089	0.036	0.022	0.004	0.037
	(0.076)	(0.065)	(0.058)	(0.053)	(0.049)
Floor Area	-168.672	-118.697	-110.062	-61.026	-27.826
	(129.915)	(111.300)	(99.744)	(91.517)	(85.809)
Pre-Program kWh	1155.694	1126.179	673.470	71.468	198.537
	(853.864)	(720.725)	(663.070)	(589.560)	(552.341)
Pre-Program HDD	-23.74	-18.97	-6.499	-4.555	-2.678
	(23.32)	(19.74)	(17.53)	(15.82)	(14.67)
Property Value	-48.510	-30.153	5.379	34.891	54.255
	(68.793)	(62.081)	(54.773)	(51.611)	(47.112)
Share SFD	-0.065	-0.022	-0.042	-0.052	-0.012
	(0.078)	(0.067)	(0.060)	(0.054)	(0.050)

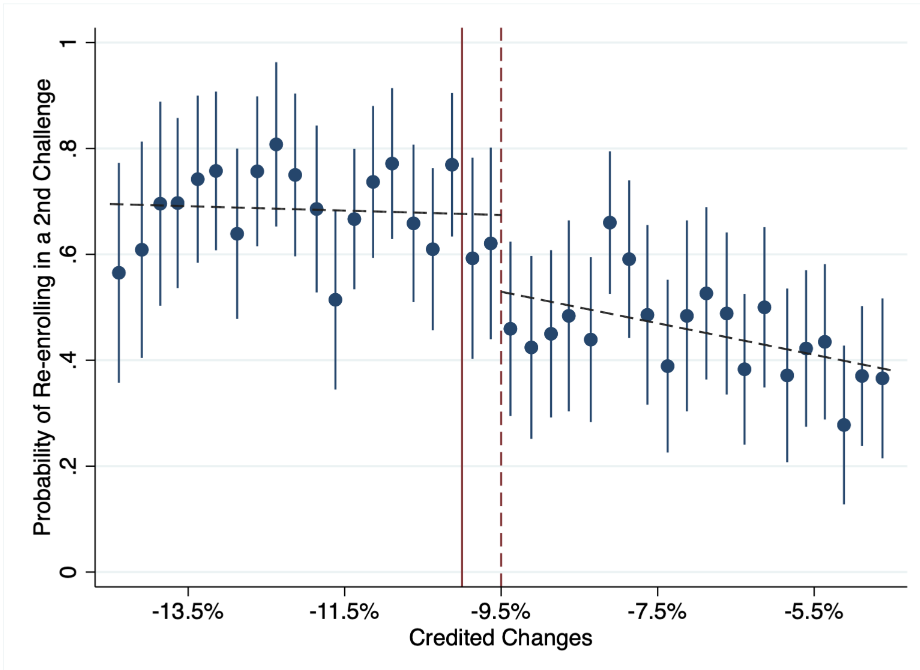
Notes: The table shows regression discontinuity estimates of γ_1 estimated using equation 3 for the listed dependent variables at the 9.5% threshold. The lack of statistically significant differences in covariates at the discontinuity supports that treatment is as good as randomly assigned at the discontinuity. Estimates included separate linear trends billed reductions and are not shown for conciseness. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1 are listed for completeness but no coefficients are significant at a 10% level.

lying continuity of unobservables—at the 10% target to be directly tested. If households were sorting around the 10% target in a way that affects potential outcomes, this would appear as a discontinuity at the 10% threshold in either the probability of continuing in the program or in subsequent electricity conservation. Figure E.1 (a) plots the probability that households re-enroll in a second conservation challenge by their credited changes in the first challenge; corresponding to the preferred 5% bandwidths estimated in Table 3. The solid vertical line shows the 10% target, and the dashed vertical shows the 9.5% threshold for success or failure. Importantly, the discontinuity in the probability of re-enrolling occurs at the 9.5% threshold for determining success or failure, and not at the 10% target that households are trying to achieve. Figure E.1 (b) plots y_i from equation 5 in the text against the same bins of credited changes during a households' first conservation challenge. The discontinuity occurs again at the 9.5% threshold, not 10% conservation target. That these outcomes change discontinuously only at the 9.5% threshold— and not the 10% target—shows that households are not sorting in a manner that affects potential outcomes. The same discontinuities using a 9% bandwidth are shown in Figure E.2.

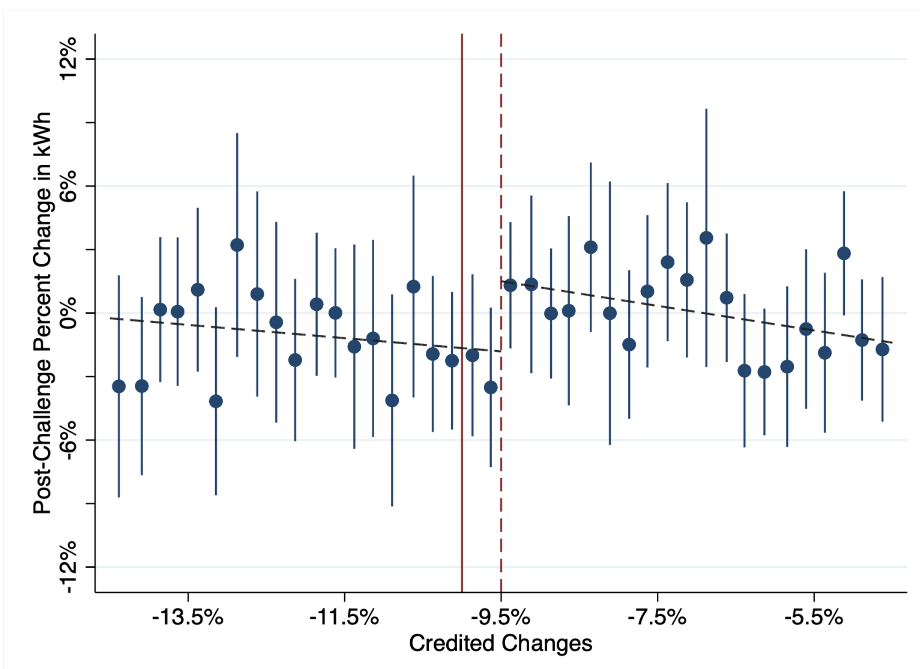
Along with the continuity of observables, the continuity of outcomes suggests that households are not sorting at the 10% target despite bunching. As a result, I conclude the discontinuity in Figure 2 is due to households succeeding in their conservation challenge and deciding to re-enroll, and is not due to manipulation of their electricity conservation that results in sorting around the 9.5% threshold or 10% target. In addition, the lack of sorting around the 10% target correlated with observables or correlated with unobservables that affect the outcome allows RD estimation bandwidths be used that span the 10% target.

Figure E.1: Re-enrollment in a second challenge: first stage and reduced form discontinuities

(a) First stage - ±5% Bandwidth



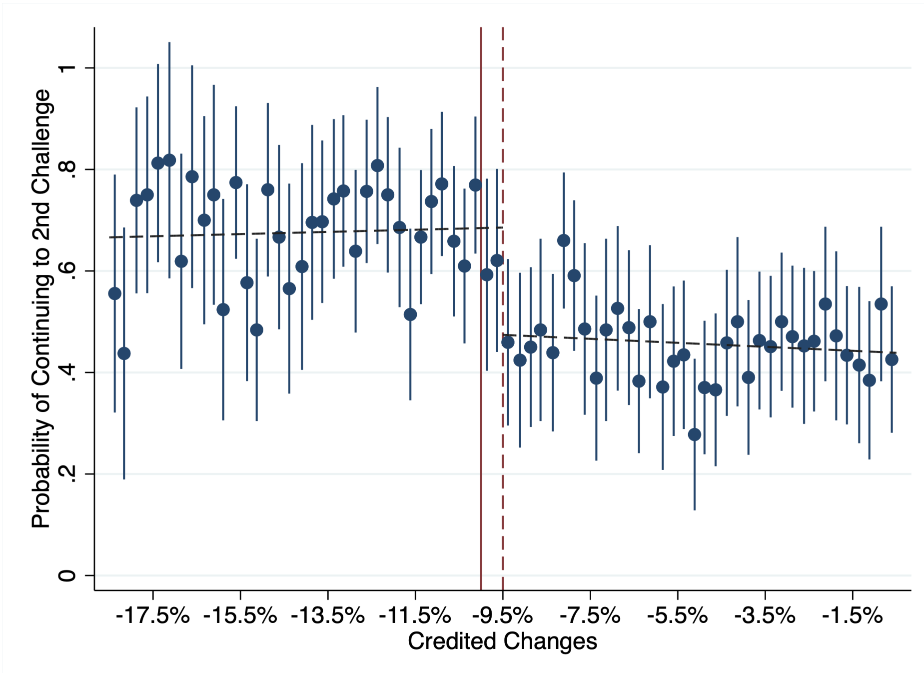
(b) Reduced form - ±5% Bandwidth



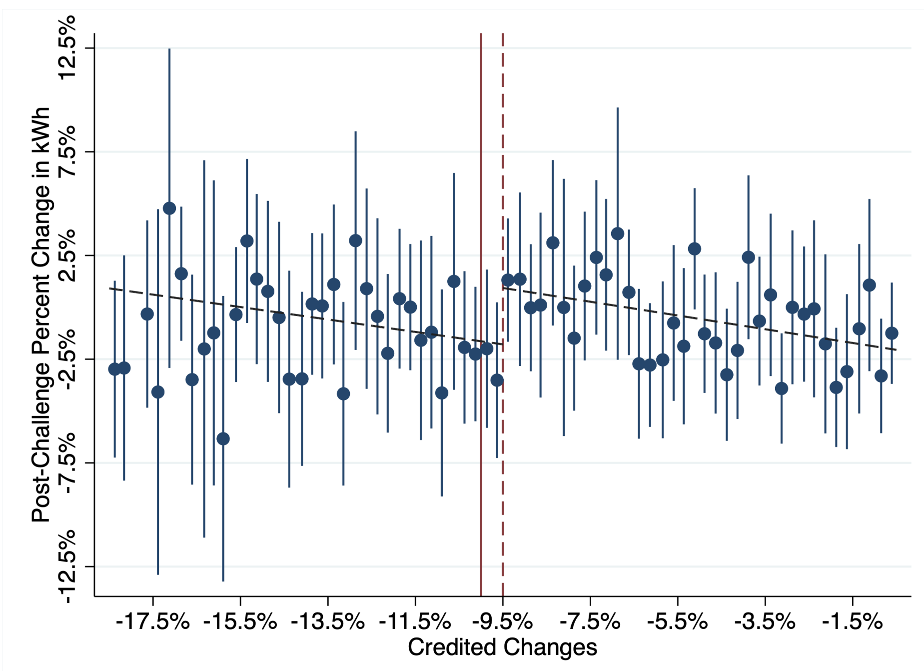
Notes: The sold vertical line is at the 10% conservation target and the dashed vertical line denotes the 9.5% threshold for success in a Challenge. Panel (a) shows the Probability of Re-enrolling as defined in Figure 2. In panel (b) the Post-Challenge Percent Change in kWh denotes the percentage annual change in electricity use from the year of the conservation to the post-challenge year.

Figure E.2: **First Stage and Reduced Form Discontinuities**

(a) First Stage - ±9% Bandwidth

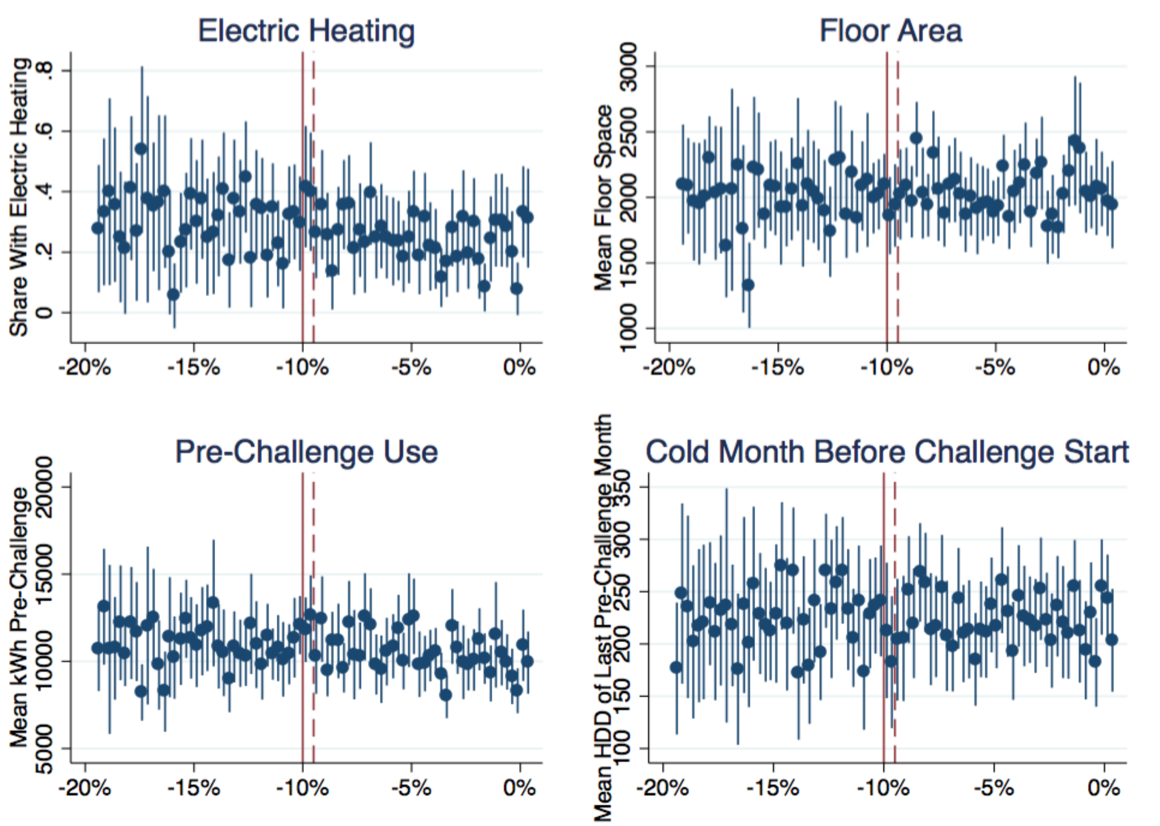


(b) Reduced Form - ±9% Bandwidth



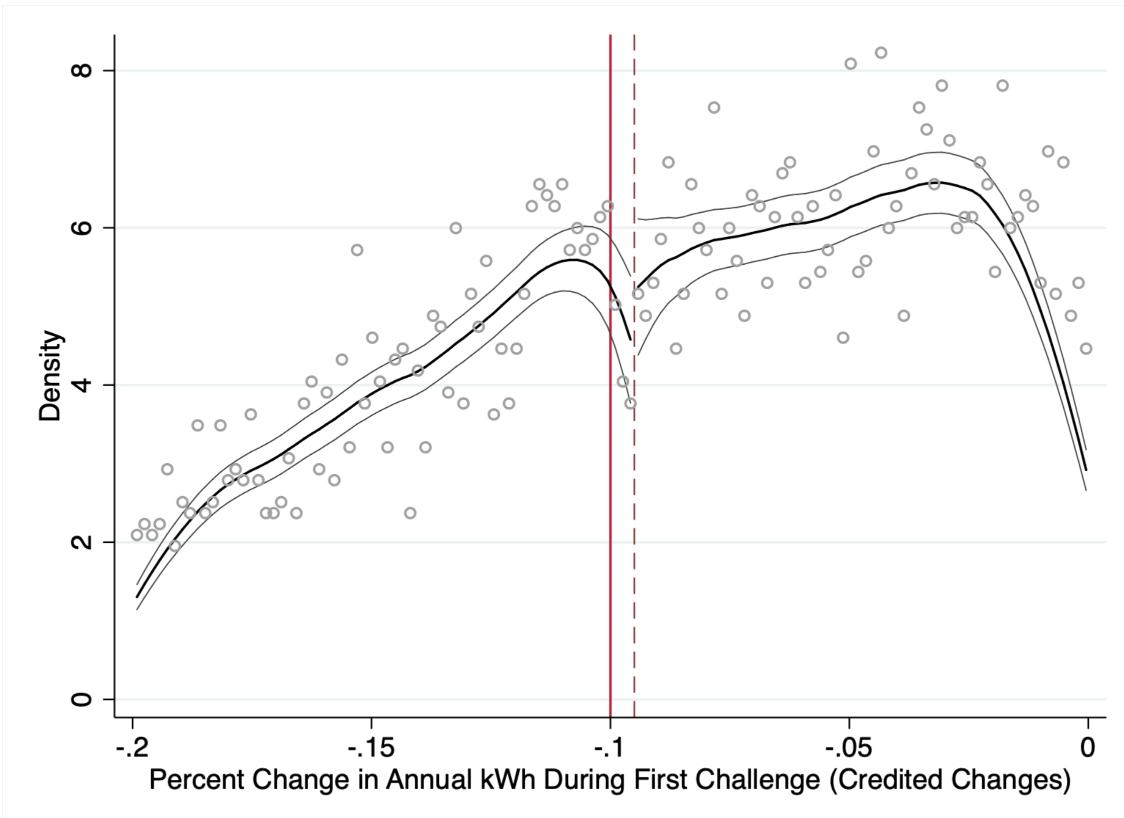
Notes: This figure plots the first stage and reduced form discontinuities for a 9% bandwidth around the 9.5% reduction threshold in credited changes. Individual point estimates are the average of the outcome variable within 0.25% width bins in credited changes.

Figure E.3: **Continuity of Covariates at The Discontinuity**



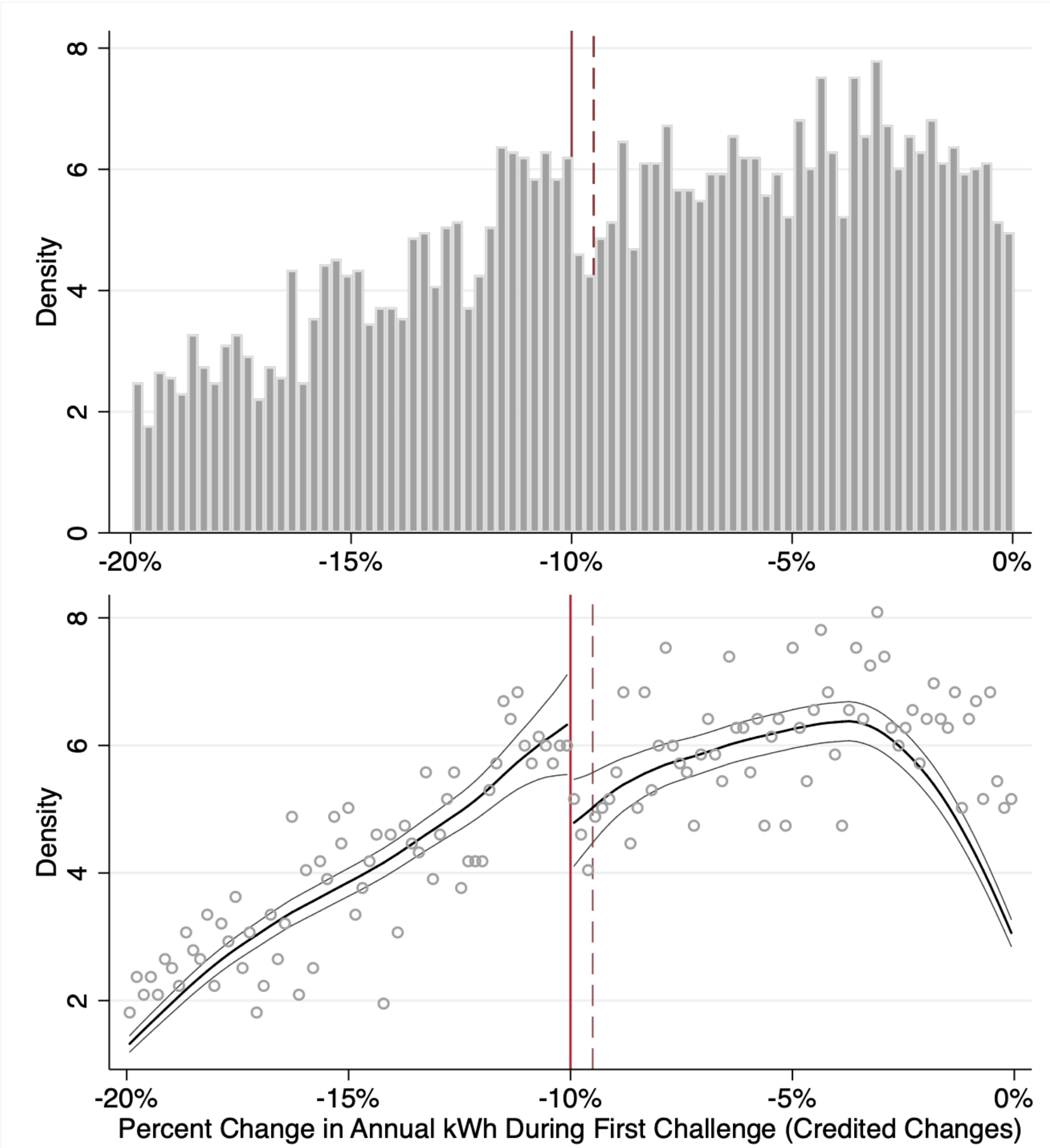
Notes: Averages of four example covariates in the vicinity of the discontinuity by 0.25% wide binds of credited changes. *Electric Heating* is the share of households with electric space heating. *Floor Area* is the average floor space of a household. *Pre-Challenge Use* is the average electricity use in the year before a household begins its first challenge. *Cold Month Before Challenge Start* is the average heating degree days in the last month prior to the initial challenge. This is a measure of the last weather shock prior to the initial participation decision. The x-axis shows reductions in credited use with the dashed red vertical line denoting the 9.5% threshold for success and the solid red vertical line denoting the 10% conservation target.

Figure E.4: **Density Test of the Running Variable - 9.5% Threshold**



Notes: McCrary (2008) density test of the percent change in electricity use from a household's initial conservation challenge. The dark line is a smoothed local linear fit to the density of changes in electricity use, with 95% confidence intervals indicated by the light grey line. Point estimates of the density are grey circles. The dashed red line is the 9.5% reduction threshold, and the sold line is the 10% reduction target.

Figure E.5: **Density Test of the Running Variable**



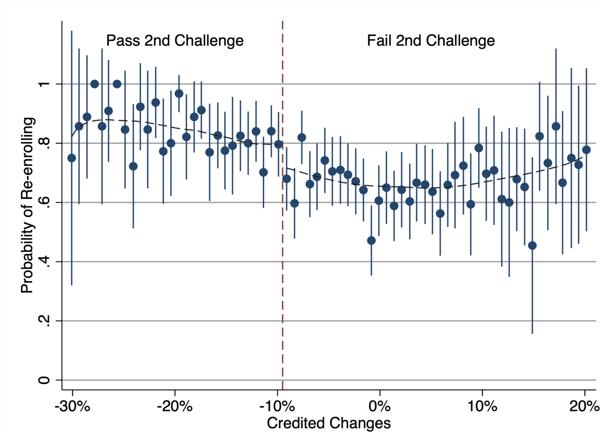
Notes: The dashed red line is the 9.5% reduction threshold, and the sold line is the 10% reduction target. Histogram of households' credited changes during their initial conservation challenge. The increase in mass to the left of the vertical line demonstrates the potential for bunching at the 10% target. McCrary (2008) density test of the percent change in electricity use from a household's initial conservation challenge. The dark line is a smoothed local linear fit to the density of changes in electricity use, with 95% confidence intervals indicated by the light grey line. Point estimates of the density are grey circles.

Appendix F Discontinuities for Challenges 2 and 3

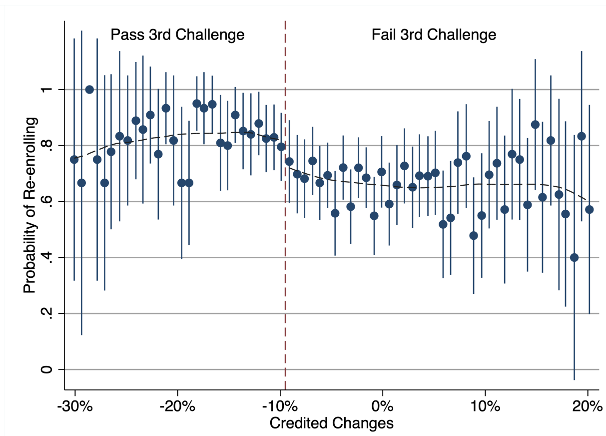
Figure F.1 shows the discontinuities in re-enrolling after a 2nd and 3rd challenge and the potential discontinuity in post-challenge electricity use. Post-challenge electricity use is calculated as the percentage change in electricity use from a households 2nd (3rd) conservation challenge to the following 12 months if a household does not re-enroll, and to the following 12 months of a challenge if a house does re-enroll.

Figure F.1: **Discontinuities for the 2nd and 3rd challenges**

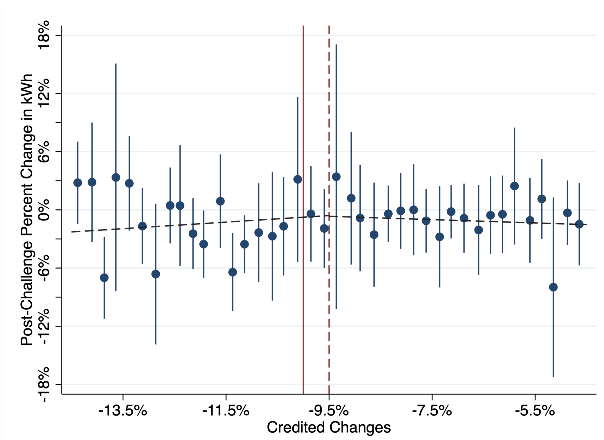
(a) **Discontinuity continuing after 2nd challenge**



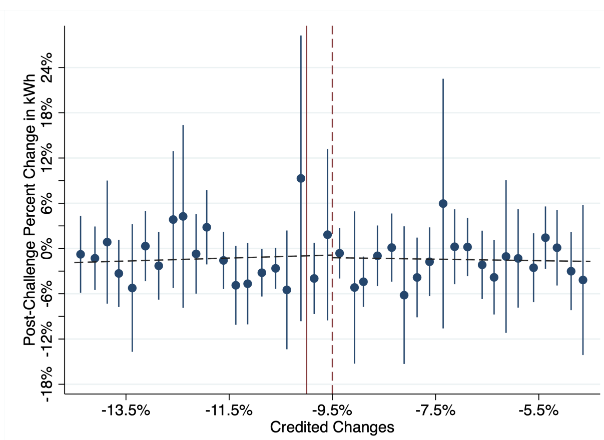
(b) **Discontinuity continuing after 3rd challenge**



(c) **Post-challenge use after 2nd challenge**



(d) **Post-challenge use after 3rd challenge**



Notes: Credited changes are weather-adjusted changes in electricity use as displayed to households. The vertical dashed line indicates the 9.5% threshold defining success; households to the left of the dashed line pass their conservation challenge while those to the right fail. Panel (a) and (b) point estimates are the mean probability of re-enrolling with 95% confidence intervals among households within 0.75% width bins in credited changes. The dashed line is a first order local polynomial fit; this is to clarify the local trends and is not the fuzzy RD fit. Panels (c) and (d) show point estimates and 95% confidence intervals of the mean change in billed electricity use in the first year after the initial conservation goal estimated for 0.75% width bins.

Appendix G Fuzzy-Regression Discontinuity Robustness Checks

An identifying assumption of a fuzzy RD estimation strategy is that households just on either side of the discontinuity are as good as randomly assigned. Evidence that this assumption does not hold would be if the IV estimates were sensitive to the inclusion of additional covariates. Table G.1 shows IV estimates controlling for detailed household characteristics and changes in heating degree days. I control for the percent change in heating degree days between both the pre-program and first conservation challenge years ($HDD_{0,1}$) and between the first conservation challenge and post-challenge year ($HDD_{1,2}$). Increases in heating degree days during the post-challenge period are positively correlated with post-challenge changes in electricity use. This is consistent with colder weather increasing the demand for electricity. The inclusion of these additional covariates has only a small effect on the estimated effect of a second conservation challenge and supports the identifying assumption that households are as good as randomly assigned at the discontinuity.

A potential concern with the weather adjustment is if households with the same credited changes differ substantially in billed changes in the vicinity of the discontinuity. If billed reductions affect the post-program outcomes, for example if households were to exhibit a strong reversion to the mean, then outliers in the weather adjustment could cause a violation of the good-as-randomly assigned assumption. Evidence that this is not a problem is gained by further restricting the estimation sample to households that had billed changes within ±5% of 9.5% in billed reductions. This excludes those households receiving large weather adjustments to their billed electricity use, in addition to the estimation bandwidth in credited reductions. Estimates, Table G.2, are robust to this restriction.

A potential concern with RD estimates is that the using observations away from the threshold increases the risk of biased estimates (Calonico, Cattaneo, and Titiunik, 2014). In Table G.3 and Table G.4 I present bias-corrected estimates using 1st and 2nd order polynomial fits and the method of Calonico, Cattaneo, and Titiunik (2014). Specification (8) presents the optimal bandwidth of 10% determined from the variance-bias tradeoff.

Table G.5 uses an alternate limit to the gap between challenges, limiting the estimation sample to households that re-enroll within 6 months of completing their initial challenge.

G.1 Robustness Checks - Log monthly electricity use

An alternative to defining the outcome in the fuzzy-RD approach as the post-program percent changes in electricity use, equation (5) in the text, is using log monthly electricity use. This has the benefit of not requiring aggregation to annual changes at the cost of a less transparent estimation; I find using log monthly electricity use results in similar estimates for the causal effect of re-enrolling as the primary fuzzy RD estimates of equation (5).

The first stage relationship is

$$C_i = \alpha_i + \gamma_0 D_{it,1} + \gamma_1 1\{R_i \leq \bar{R}\} \times D_{it,1} + \gamma_2 R_i \times D_{it,1} + \gamma_3 1\{R_i \leq \bar{R}\} \times R_i \times D_{it,1} + \eta_{it} \quad \text{(G.5)}$$

Table G.1: **Fuzzy Regression Discontinuity Estimates: Additional Covariates**

	(2)	(3)	(4)	(5)	(6)
	Panel A − First Stage				
Dependent variable: Continue to a Second Challenge C_i					
Window	±7 %	±6 %	±5 %	±4 %	±3 %
γ_1: Success Ind.	0.199***	0.187***	0.135***	0.130**	0.151**
	(0.0432)	(0.0468)	(0.0516)	(0.0571)	(0.0676)
γ_2: Cred. Reduc.	-0.0921	-0.969	-2.199*	-0.274	2.316
	(0.849)	(1.037)	(1.297)	(1.817)	(2.777)
γ_3 : Success×	1.141	2.443*	2.525	-1.094	-3.451
Cred. Reduc.	(1.107)	(1.385)	(1.803)	(2.428)	(3.878)
γ_4 : Billed Reduc.	-0.745	-0.778	-0.892*	-1.202**	-1.514**
	(0.457)	(0.485)	(0.510)	(0.533)	(0.699)
HD$D_{0,1}$	-0.287	-0.260	-0.594**	-0.642**	-0.725**
	(0.229)	(0.244)	(0.265)	(0.284)	(0.349)
γ_0 : Constant	0.463***	0.476***	0.505***	0.480***	0.465***
	(0.0340)	(0.0370)	(0.0405)	(0.0454)	(0.0529)
F-statistic	21.18	15.87	6.889	5.146	4.969
	Panel B − Second Stage				
Dependent variable: Percent change in post-challenge electricity use					
	Instrumental Variable Estimates				
Window	±7 %	±6 %	±5 %	±4 %	±3 %
β_1 : Re-Enroll	-0.127**	-0.181**	-0.248*	-0.341*	-0.209
	(0.0620)	(0.0755)	(0.129)	(0.179)	(0.137)
β_2: Cred. Reduc.	-0.389	-0.581*	-1.028	-0.807	0.882
	(0.245)	(0.347)	(0.626)	(0.767)	(0.690)
β_3 : Success×	0.344	0.417	0.932	-0.286	-1.724
Cred. Reduc.	(0.313)	(0.431)	(0.654)	(1.028)	(1.300)
β_4 : Billed Reduc.	-0.101	-0.205	-0.358*	-0.552*	-0.439
	(0.142)	(0.161)	(0.206)	(0.314)	(0.316)
HD$D_{0,1}$	-0.0434	-0.0663	-0.189	-0.239	-0.154
	(0.0699)	(0.0804)	(0.123)	(0.171)	(0.161)
β_0 : Constant	0.0786**	0.108**	0.151**	0.196**	0.118
	(0.0353)	(0.0437)	(0.0744)	(0.0984)	(0.0744)
N	2049	1763	1475	1196	888

Notes: This table reports fuzzy-RD estimates corresponding to equations (3) and (4). All specifications include building type and heating category fixed effects. $HDD_{0,1}$ and $HDD_{1,2}$ are, respectively, the percent change in heating degree days from the pre-program year to the initial challenge, and initial challenge to the post-program year. Estimation sample restricted to households that either start their next challenge within 12 months or do not undertake an additional challenge. Estimation window is restricted to ± the listed percent around the 9.5% threshold in credited changes. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table G.2: **Fuzzy Regression Discontinuity Estimates: Restricted Billing**

	(3)	(4)	(5)	(6)	(7)
	Panel A – First Stage				
Dependent variable: Continue to a Second Challenge C_i					
Window	±7 %	±6 %	±5 %	±4 %	±3 %
γ_1: Success Ind.	0.184***	0.181***	0.121**	0.121**	0.172**
	(0.0485)	(0.0516)	(0.0561)	(0.0614)	(0.0721)
γ_2: Cred. Reduc.	0.0618	-0.0825	-2.105	-1.072	3.004
	(1.018)	(1.205)	(1.476)	(2.003)	(3.073)
γ_3 : Success×	-0.633	-0.292	0.0330	-1.981	-5.156
Cred. Reduc.	(1.414)	(1.679)	(2.104)	(2.740)	(4.291)
γ_4 : Billed Reduc.	0.173	0.0615	0.215	0.283	-0.163
	(0.612)	(0.625)	(0.643)	(0.691)	(0.762)
γ_0 : Constant	0.477***	0.482***	0.515***	0.500***	0.458***
	(0.0349)	(0.0371)	(0.0401)	(0.0444)	(0.0511)
F-stat	14.36	12.34	4.649	3.889	5.665
	Panel B – Second Stage				
Dependent variable: Percent change in post-challenge electricity use					
	Instrumental Variable Estimates				
Window	±7 %	±6 %	±5 %	±4 %	±3 %
β_1 : Re-Enroll	-0.174**	-0.191**	-0.269*	-0.307	-0.118
	(0.0791)	(0.0848)	(0.159)	(0.188)	(0.103)
β_2: Cred. Reduc.	-0.531*	-0.638*	-1.240*	-1.118	0.953
	(0.312)	(0.355)	(0.733)	(0.876)	(0.631)
β_3 : Success×	-0.133	-0.00562	0.319	-0.386	-1.527
Cred. Reduc.	(0.442)	(0.487)	(0.719)	(1.132)	(1.204)
β_4 : Billed Reduc.	0.282	0.203	0.238	0.252	0.0407
	(0.191)	(0.194)	(0.238)	(0.279)	(0.212)
β_0 : Constant	0.0902**	0.102**	0.150	0.166	0.0524
	(0.0454)	(0.0490)	(0.0916)	(0.106)	(0.0564)
N	1393	1291	1147	982	763

Notes: Sample restricted to households with billed changes within ±5% of the 9.5% conservation target along with restricting households to those within the listed estimation window around the 9.5% threshold in credited reductions. Estimation sample restricted to households that either start their next challenge within 12 months or do not undertake an additional challenge.

Table G.3: **1st Order Bias-Corrected Fuzzy Regression Discontinuity Estimates**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Conventional	-0.188*	-0.235**	-0.259**	-0.236**	-0.199**	-0.171**	-0.163**	-0.150**
	(0.105)	(0.118)	(0.127)	(0.107)	(0.0853)	(0.0723)	(0.0665)	(0.0613)
Bias-corrected	-0.283***	-0.175	-0.192	-0.263**	-0.295***	-0.289***	-0.254***	-0.169***
	(0.105)	(0.118)	(0.127)	(0.107)	(0.0853)	(0.0724)	(0.0665)	(0.0613)
Robust	-0.283*	-0.175	-0.192	-0.263*	-0.295**	-0.289***	-0.254***	-0.169**
	(0.158)	(0.176)	(0.187)	(0.155)	(0.121)	(0.102)	(0.0931)	(0.0707)
Observations	888	1196	1475	1763	2050	2296	2543	2538
Order Poly. (p)	1	1	1	1	1	1	1	1
Order Bias (q)	2	2	2	2	2	2	2	2
BW Poly. (h)	3%	4%	5%	6%	7%	8%	9%	10%
BW Bias (b)	3%	4%	5%	6%	7%	8%	9%	18%

Notes: This table reports fuzzy-RD estimates using the method of (Calonico, Cattaneo, and Titiunik, 2014). All specifications use 1st order local polynomial regressions using a triangular kernel and restricted to households that either start their next challenge within 12 months or do not undertake an additional challenge. Specifications (1) through (7) are for bandwidths BW Poly. (h) around the threshold. Specification (8) determines the optimal polynomial and bias-correction bandwidths to be 10% and 18%, respectively. The bias correction is 2nd order, local polynomial. Standard errors in parentheses. Conventional and Bias-corrected have conventional standard errors, Robust estimates use robust standard errors. *** p<0.01, ** p<0.05, * p<0.1.

Table G.4: **2nd Order Bias-Corrected Fuzzy Regression Discontinuity Estimates**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Conventional	-0.281	-0.189	-0.211*	-0.264*	-0.319*	-0.331*	-0.281*	-0.181**
	(0.199)	(0.125)	(0.123)	(0.156)	(0.192)	(0.193)	(0.153)	(0.0794)
Bias-corrected	-0.421**	-0.315**	-0.207*	-0.149	-0.133	-0.216	-0.323**	-0.196**
	(0.199)	(0.125)	(0.123)	(0.156)	(0.192)	(0.193)	(0.153)	(0.0794)
Robust	-0.421	-0.315*	-0.207	-0.149	-0.133	-0.216	-0.323	-0.196**
	(0.264)	(0.168)	(0.166)	(0.210)	(0.259)	(0.257)	(0.201)	(0.0848)
Observations	888	1196	1475	1763	2050	2296	2543	4160
OrderPoly.(p)	2	2	2	2	2	2	2	2
OrderBias(q)	3	3	3	3	3	3	3	3
BWPoly.(h)	3%	4%	5%	6%	7%	8%	9%	18%
BWBias(b)	3%	4%	5%	6%	7%	8%	9%	33%

Notes: All specifications are a 2nd order polynomial estimated with a triangular kernel and restricted to households that either start their next challenge within 12 months or do not undertake an additional challenge. Specifications (1) through (7) are for ± the listed bandwidths around the threshold. Specification (8) determines the optimal polynomial and bias-correction bandwidths to be 18% and 33%, respectively. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table G.5: **Fuzzy Regression Discontinuity Estimates: 6 Month Gap**

	(3)	(4)	(5)	(6)	(7)
Panel A – First Stage					
Dependent variable: Continue to a Second Challenge C_i					
Window	±7 %	±6 %	±5 %	±4 %	±3 %
γ_1: Success	0.202***	0.195***	0.161***	0.163***	0.170**
Indicator	(0.0468)	(0.0505)	(0.0556)	(0.0622)	(0.0727)
γ_2: Cred. Reduc.	-0.825	-1.480	-2.573**	-0.510	1.794
	(0.822)	(1.016)	(1.282)	(1.818)	(2.876)
γ_3 : Success×	1.897	3.156**	2.909	-0.527	-3.965
Cred. Reduc.	(1.204)	(1.491)	(1.959)	(2.689)	(4.183)
γ_4 : Billed Reduc.	-0.568*	-0.678*	-0.367	-0.649	-0.867*
	(0.344)	(0.367)	(0.391)	(0.433)	(0.520)
γ_0 : Constant	0.436***	0.453***	0.466***	0.440***	0.419***
	(0.0317)	(0.0344)	(0.0377)	(0.0424)	(0.0495)
F-stat	18.62	14.85	8.374	6.872	5.452
Panel B – Second Stage					
Dependent variable: Percent change in post-challenge electricity use					
	Instrumental Variable Estimates				
Window	±7 %	±6 %	±5 %	±4 %	±3 %
β_1 : Re-Enroll	-0.144**	-0.165**	-0.190*	-0.241*	-0.162
	(0.0655)	(0.0739)	(0.102)	(0.124)	(0.114)
β_2: Cred. Reduc.	-0.496*	-0.580	-0.864	-0.607	0.940
	(0.275)	(0.363)	(0.570)	(0.642)	(0.675)
β_3 : Success×	0.437	0.544	0.827	-0.126	-1.758
Cred. Reduc.	(0.339)	(0.446)	(0.596)	(0.905)	(1.246)
β_4 : Billed Reduc.	-0.118	-0.197*	-0.198	-0.325**	-0.333*
	(0.101)	(0.112)	(0.122)	(0.162)	(0.173)
β_0 : Constant	0.0755**	0.0879**	0.104*	0.124*	0.0731
	(0.0350)	(0.0407)	(0.0554)	(0.0646)	(0.0571)
N	1778	1535	1287	1039	775

Notes: Fuzzy-RD estimates corresponding to equations (3) and (4). Estimation sample restricted to households that either start their next challenge within 6 months or do not undertake an additional challenge. Estimation window is restricted to ± the listed percent around the 9.5% threshold in credited changes. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

where C_i is a binary indicator for whether a household continues to a second challenge, R_i are households' credited changes in electricity use from the first challenge, R_d is the threshold for success in the challenge and is -9.5%, $1\{R_i \leq \bar{R}\}$ is the dummy variable for success in the initial challenge, and the instrument excluded from the second stage is $1\{R_i \leq \bar{R}\}$. $D_{it,1}$ is an indicator for if household i in month $t$is within the 12 months prior to their second challenge if they re-enroll, or is in the 12 months following their initial challenge if they do not re-enroll. These are not necessarily the same months when households delay re-enrolling in a second challenge. $D_{it,1}$ then defines the effect of continuing relative to the average electricity use over the 12 months following the initial challenge for those households that do not re-enroll. I restrict the sample to households undertaking their first conservation challenge or in their first post-program year of a second challenge, or first 12 months after deciding not to re-enroll.

The second-stage relationship is

$$y_{it} = \lambda_i + \beta_0 D_{it,1} + \beta_1 C_i + \beta_2 R_i \times D_{it,1} + \beta_3 1\{R_i \leq \bar{R}\} \times R_i \times D_{it,1} + \epsilon_i \quad \text{(G.6)}$$

where y_{it} is log monthly electricity use. IV estimates are shown in Tables G.7 and G.6.

Table G.6: **Fuzzy Regression Discontinuity Estimates: Log Monthly Electricity Use and 12 Month Gap**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Panel A – First Stage				
Dependent variable: Continue to a Second Challenge C_i							
Window			$\pm 7\,\%$	$\pm 6\,\%$	$\pm 5\,\%$	$\pm 4\,\%$	$\pm 3\,\%$
γ_1: Success$_i$			0.197***	0.186***	0.139***	0.139**	0.179***
			(0.0431)	(0.0467)	(0.0514)	(0.0573)	(0.0678)
γ_0: $D_{it,1}$			0.472***	0.474***	0.503***	0.516***	0.499***
			(0.0249)	(0.0268)	(0.0295)	(0.0322)	(0.0378)
γ_2: $R_i \times D_{it,1}$			-0.708	-1.030	-2.173**	-2.202*	-0.153
			(0.564)	(0.703)	(0.926)	(1.256)	(2.001)
$\gamma_3 : 1\{R_i \geq \bar{R}\}$			2.291***	2.771***	1.933*	2.052	-0.0147
$\times R_i \times D_{it,1}$			(0.690)	(0.879)	(1.132)	(1.476)	(2.326)
F-stat			20.97	15.88	7.333	5.882	6.994
			Panel B – Second Stage				
Dependent variable: Log monthly electricity use							
	OLS		Instrumental Variable Estimates				
Window		$\pm 5\,\%$	$\pm 7\,\%$	$\pm 6\,\%$	$\pm 5\,\%$	$\pm 4\,\%$	$\pm 3\,\%$
β_1: Success$_i$	-0.0222***	-0.0281***	-0.141**	-0.180**	-0.223*	-0.290*	-0.139
	(0.00462)	(0.00768)	(0.0678)	(0.0808)	(0.126)	(0.158)	(0.107)
β_0: $D_{it,1}$	-0.0156***	-0.00267	0.0620	0.0847*	0.110	0.154*	0.0686
	(0.00302)	(0.00539)	(0.0387)	(0.0459)	(0.0723)	(0.0927)	(0.0631)
β_2: $R_i \times D_{it,1}$			-0.399*	-0.618**	-0.940*	-1.488*	-0.302
			(0.211)	(0.290)	(0.555)	(0.805)	(0.578)
$\beta_3 : 1\{R_i \geq \bar{R}\}$			0.681**	0.861**	1.392***	2.182***	2.361***
$\times R_i \times D_{it,1}$			(0.278)	(0.348)	(0.433)	(0.586)	(0.815)
N	130368	35400	49200	42312	35400	28704	21312
Households			2050	1763	1475	1196	888

Notes: Estimates restricted to households re-enrolling within 12 months of their initial challenge. *** p<0.01, ** p<0.05, * p<0.1.

Table G.7: **Fuzzy Regression Discontinuity Estimates: Log Monthly Electricity Use and 6 Month Gap**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Panel A – First Stage				
Dependent variable: Continue to a Second Challenge C_i							
Window			$\pm 7\,\%$	$\pm 6\,\%$	$\pm 5\,\%$	$\pm 4\,\%$	$\pm 3\,\%$
γ_1: Success$_i$			0.194***	0.188***	0.153***	0.164***	0.177**
			(0.0464)	(0.0502)	(0.0551)	(0.0617)	(0.0724)
γ_0: $D_{it,1}$			0.409***	0.410***	0.435***	0.444***	0.442***
			(0.0266)	(0.0285)	(0.0315)	(0.0347)	(0.0399)
γ_2: $R_i \times D_{it,1}$			-0.928	-1.051	-1.912*	-1.686	-0.894
			(0.600)	(0.746)	(0.981)	(1.357)	(2.124)
$\gamma_3 : 1\{R_i \geq R_d\}$			2.368***	2.342**	1.427	2.326	0.955
$\times R_i \times D_{it,1}$			(0.870)	(1.124)	(1.417)	(1.868)	(2.905)
F-stat			17.42	14.00	7.675	7.068	5.991
			Panel B – Second Stage				
Dependent variable: Log monthly electricity use							
	OLS		Instrumental Variable Estimates				
Window		$\pm 5\,\%$	$\pm 7\,\%$	$\pm 6\,\%$	$\pm 5\,\%$	$\pm 4\,\%$	$\pm 3\,\%$
β_1: Success$_i$	-0.0222***	-0.0281***	-0.171**	-0.170**	-0.192*	-0.228*	-0.125
	(0.00462)	(0.00768)	(0.0757)	(0.0833)	(0.115)	(0.127)	(0.112)
β_0: $D_{it,1}$	-0.0156***	-0.00267	0.0690*	0.0689*	0.0821	0.104	0.0534
	(0.00302)	(0.00539)	(0.0382)	(0.0418)	(0.0587)	(0.0668)	(0.0593)
β_2: $R_i \times D_{it,1}$			-0.523**	-0.538*	-0.743	-1.100*	-0.266
			(0.246)	(0.299)	(0.500)	(0.660)	(0.668)
$\beta_3 : 1\{R_i \geq R_d\}$			0.708**	0.860**	1.355***	2.182***	2.563***
$\times R_i \times D_{it,1}$			(0.286)	(0.340)	(0.414)	(0.592)	(0.900)
N	115416	30888	42672	36840	30888	24936	18600
Households			1778	1535	1287	1039	775

Notes: Estimates restricted to households re-enrolling within 6 months of their initial challenge. *** p<0.01, ** p<0.05, * p<0.1.

Appendix H Event Study Estimates For All Households

This section presents the individual monthly point estimates plotted in Figure 1 and B.1.

Table H.8: Event-Study Point Estimates

	(1)	(2)	(3)	(4)
	Main	All Non-Part.	Non-Elec. Heat	Elec. Heat
Dependent Variable: Ln monthly electricity use				
M-119	0	0	0	0
	(.)	(.)	(.)	(.)
M-118	0	0	0	0
	(.)	(.)	(.)	(.)
M-117	0	0	0	0
	(.)	(.)	(.)	(.)
M-116	0	0	0	0
	(.)	(.)	(.)	(.)
M-115	0	0	0	0
	(.)	(.)	(.)	(.)
M-114	0	0	0	0
	(.)	(.)	(.)	(.)
M-113	0	0	0	0
	(.)	(.)	(.)	(.)
M-112	0	0	0	0
	(.)	(.)	(.)	(.)
M-111	0	0	0	0
	(.)	(.)	(.)	(.)
M-110	0	0	0	0
	(.)	(.)	(.)	(.)
M-109	0	0	0	0
	(.)	(.)	(.)	(.)
M-108	0	0	0	0
	(.)	(.)	(.)	(.)
M-107	0	0	0	0
	(.)	(.)	(.)	(.)
M-106	0	0	0	0
	(.)	(.)	(.)	(.)
M-105	0	0	0	0

Table H.8: Event-Study Point Estimates

	(1)	(2)	(3)	(4)
	Main	All Non-Part.	Non-Elec. Heat	Elec. Heat
Dependent Variable: Ln monthly electricity use				
	(.)	(.)	(.)	(.)
M-104	0	0	0	0
	(.)	(.)	(.)	(.)
M-103	0	0	0	0
	(.)	(.)	(.)	(.)
M-102	-0.0966	-0.114	-0.0968	-0.172
	(0.0782)	(0.0780)	(0.117)	(0.113)
M-101	-0.0142	-0.0322	0.0137	-0.0842
	(0.0428)	(0.0426)	(0.0691)	(0.0619)
M-100	-0.0395	-0.0572	-0.00537	-0.126*
	(0.0315)	(0.0313)	(0.0443)	(0.0581)
M-99	-0.0178	-0.0340	0.00173	-0.0684
	(0.0261)	(0.0259)	(0.0339)	(0.0507)
M-98	0.00579	-0.00746	0.0162	-0.0190
	(0.0197)	(0.0194)	(0.0245)	(0.0375)
M-97	-0.00313	-0.0138	-0.00935	0.00697
	(0.0196)	(0.0194)	(0.0279)	(0.0296)
M-96	0.0157	0.00671	0.00735	0.0305
	(0.0153)	(0.0149)	(0.0203)	(0.0252)
M-95	0.0112	0.00409	0.0139	0.0278
	(0.0140)	(0.0137)	(0.0179)	(0.0230)
M-94	0.0267*	0.0213	0.0300	0.0479*
	(0.0133)	(0.0130)	(0.0170)	(0.0219)
M-93	0.0238*	0.0179	0.0229	0.0249
	(0.0117)	(0.0114)	(0.0155)	(0.0208)
M-92	0.0299**	0.0242*	0.0205	0.0372*
	(0.0107)	(0.0104)	(0.0143)	(0.0187)
M-91	0.0201	0.0151	0.0224	0.00979
	(0.0112)	(0.0109)	(0.0134)	(0.0232)
M-90	0.0225*	0.0182	0.0186	0.0201
	(0.0113)	(0.0110)	(0.0131)	(0.0231)
M-89	0.0176	0.0135	0.0132	0.0145
	(0.0108)	(0.0105)	(0.0129)	(0.0221)
M-88	0.0126	0.00866	0.0157	-0.00574
	(0.0111)	(0.0108)	(0.0128)	(0.0237)
M-87	0.0222*	0.0178	0.0231	0.0135

Table H.8: Event-Study Point Estimates

	(1)	(2)	(3)	(4)
	Main	All Non-Part.	Non-Elec. Heat	Elec. Heat
Dependent Variable: Ln monthly electricity use				
	(0.0103)	(0.0100)	(0.0124)	(0.0199)
M-86	0.0267**	0.0219*	0.0217	0.0253
	(0.00954)	(0.00925)	(0.0121)	(0.0181)
M-85	0.0287**	0.0233**	0.0259*	0.0261
	(0.00890)	(0.00859)	(0.0112)	(0.0168)
M-84	0.0247**	0.0189*	0.0292**	0.0223
	(0.00883)	(0.00853)	(0.0109)	(0.0171)
M-83	0.0253**	0.0196*	0.0273*	0.0310
	(0.00882)	(0.00852)	(0.0110)	(0.0170)
M-82	0.0319***	0.0269**	0.0313**	0.0478**
	(0.00858)	(0.00829)	(0.0110)	(0.0159)
M-81	0.0221*	0.0174*	0.0234*	0.0357*
	(0.00878)	(0.00852)	(0.0107)	(0.0163)
M-80	0.0273***	0.0226**	0.0210*	0.0371*
	(0.00826)	(0.00800)	(0.0101)	(0.0159)
M-79	0.0233**	0.0187*	0.0243*	0.0102
	(0.00835)	(0.00811)	(0.00974)	(0.0174)
M-78	0.0239**	0.0186*	0.0165	0.0238
	(0.00804)	(0.00780)	(0.00934)	(0.0162)
M-77	0.0210**	0.0153*	0.0102	0.0264
	(0.00783)	(0.00760)	(0.00938)	(0.0155)
M-76	0.0182*	0.0120	0.0119	0.0162
	(0.00773)	(0.00750)	(0.00936)	(0.0153)
M-75	0.0228**	0.0167*	0.0119	0.0305*
	(0.00777)	(0.00755)	(0.00944)	(0.0154)
M-74	0.0190*	0.0130	0.0106	0.0211
	(0.00755)	(0.00732)	(0.00914)	(0.0150)
M-73	0.00612	-0.000135	0.00459	0.0129
	(0.00811)	(0.00790)	(0.00991)	(0.0146)
M-72	0.0145	0.00798	0.0109	0.0231
	(0.00745)	(0.00722)	(0.00963)	(0.0136)
M-71	0.0184**	0.0121	0.0154	0.0307*
	(0.00713)	(0.00691)	(0.00917)	(0.0132)
M-70	0.0239***	0.0176**	0.0220*	0.0369**
	(0.00689)	(0.00667)	(0.00887)	(0.0129)
M-69	0.0197**	0.0138*	0.0181*	0.0318*

Table H.8: Event-Study Point Estimates

	(1)	(2)	(3)	(4)
	Main	All Non-Part.	Non-Elec. Heat	Elec. Heat
Dependent Variable: Ln monthly electricity use				
	(0.00677)	(0.00655)	(0.00871)	(0.0125)
M-68	0.0250***	0.0197**	0.0270***	0.0254
	(0.00651)	(0.00631)	(0.00792)	(0.0131)
M-67	0.0119	0.00662	0.0111	0.00537
	(0.00678)	(0.00660)	(0.00857)	(0.0130)
M-66	0.0161*	0.0104	0.0136	0.0100
	(0.00649)	(0.00632)	(0.00810)	(0.0126)
M-65	0.0255***	0.0188**	0.0238**	0.0240
	(0.00630)	(0.00612)	(0.00772)	(0.0126)
M-64	0.0249***	0.0179**	0.0239***	0.0204
	(0.00599)	(0.00581)	(0.00716)	(0.0123)
M-63	0.0256***	0.0188**	0.0255***	0.0199
	(0.00604)	(0.00586)	(0.00726)	(0.0123)
M-62	0.0270***	0.0208***	0.0248***	0.0245*
	(0.00583)	(0.00566)	(0.00707)	(0.0121)
M-61	0.0263***	0.0207***	0.0265***	0.0150
	(0.00571)	(0.00554)	(0.00684)	(0.0119)
M-60	0.0251***	0.0201***	0.0243***	0.0193
	(0.00581)	(0.00565)	(0.00714)	(0.0114)
M-59	0.0284***	0.0238***	0.0276***	0.0281*
	(0.00553)	(0.00538)	(0.00666)	(0.0114)
M-58	0.0331***	0.0287***	0.0293***	0.0465***
	(0.00545)	(0.00529)	(0.00681)	(0.0105)
M-57	0.0257***	0.0210***	0.0267***	0.0369***
	(0.00549)	(0.00535)	(0.00664)	(0.0103)
M-56	0.0260***	0.0210***	0.0277***	0.0330***
	(0.00521)	(0.00507)	(0.00642)	(0.00999)
M-55	0.0175**	0.0124*	0.0176**	0.0206
	(0.00546)	(0.00534)	(0.00676)	(0.0106)
M-54	0.0202***	0.0150**	0.0183**	0.0237*
	(0.00532)	(0.00521)	(0.00651)	(0.0106)
M-53	0.0180***	0.0124*	0.0178**	0.0160
	(0.00535)	(0.00524)	(0.00642)	(0.0110)
M-52	0.0211***	0.0152**	0.0202**	0.0188
	(0.00512)	(0.00501)	(0.00623)	(0.0102)
M-51	0.0228***	0.0171***	0.0227***	0.0130

Table H.8: Event-Study Point Estimates

	(1)	(2)	(3)	(4)
	Main	All Non-Part.	Non-Elec. Heat	Elec. Heat
Dependent Variable: Ln monthly electricity use				
	(0.00496)	(0.00486)	(0.00609)	(0.0101)
M-50	0.0252***	0.0200***	0.0243***	0.0165
	(0.00485)	(0.00476)	(0.00590)	(0.00988)
M-49	0.0279***	0.0235***	0.0269***	0.0212*
	(0.00480)	(0.00471)	(0.00589)	(0.00976)
M-48	0.0306***	0.0268***	0.0258***	0.0307**
	(0.00480)	(0.00472)	(0.00611)	(0.00948)
M-47	0.0280***	0.0246***	0.0213***	0.0349***
	(0.00469)	(0.00461)	(0.00589)	(0.00944)
M-46	0.0277***	0.0242***	0.0217***	0.0374***
	(0.00454)	(0.00446)	(0.00561)	(0.00908)
M-45	0.0238***	0.0200***	0.0208***	0.0316***
	(0.00450)	(0.00442)	(0.00542)	(0.00922)
M-44	0.0213***	0.0175***	0.0204***	0.0254**
	(0.00438)	(0.00431)	(0.00521)	(0.00905)
M-43	0.0135**	0.00982*	0.0149**	0.0150
	(0.00448)	(0.00442)	(0.00519)	(0.00950)
M-42	0.0137**	0.00995*	0.0149**	0.0126
	(0.00453)	(0.00448)	(0.00546)	(0.00927)
M-41	0.0142**	0.0101*	0.0150**	0.00865
	(0.00446)	(0.00441)	(0.00535)	(0.00916)
M-40	0.0165***	0.0120**	0.0143**	0.0140
	(0.00433)	(0.00429)	(0.00516)	(0.00894)
M-39	0.0144***	0.00984*	0.0121*	0.00898
	(0.00433)	(0.00429)	(0.00530)	(0.00894)
M-38	0.0188***	0.0146***	0.0172***	0.0123
	(0.00415)	(0.00411)	(0.00492)	(0.00892)
M-37	0.0182***	0.0147***	0.0190***	0.00844
	(0.00413)	(0.00409)	(0.00473)	(0.00904)
M-36	0.0178***	0.0149***	0.0167***	0.0131
	(0.00412)	(0.00409)	(0.00498)	(0.00863)
M-35	0.0180***	0.0154***	0.0164***	0.0160
	(0.00408)	(0.00405)	(0.00498)	(0.00843)
M-34	0.0182***	0.0155***	0.0169***	0.0235**
	(0.00396)	(0.00393)	(0.00485)	(0.00817)
M-33	0.00970*	0.00654	0.0109*	0.0169*

Table H.8: Event-Study Point Estimates

	(1)	(2)	(3)	(4)
	Main	All Non-Part.	Non-Elec. Heat	Elec. Heat
Dependent Variable: Ln monthly electricity use				
	(0.00390)	(0.00388)	(0.00486)	(0.00770)
M-32	0.00584	0.00242	0.00793	0.00950
	(0.00381)	(0.00378)	(0.00469)	(0.00762)
M-31	0.00449	0.000985	0.00615	0.00449
	(0.00394)	(0.00392)	(0.00450)	(0.00877)
M-30	0.00678	0.00348	0.00660	0.00780
	(0.00369)	(0.00368)	(0.00438)	(0.00778)
M-29	0.00740*	0.00444	0.00634	0.0108
	(0.00355)	(0.00353)	(0.00418)	(0.00741)
M-28	0.00932**	0.00682*	0.00533	0.0147*
	(0.00345)	(0.00344)	(0.00418)	(0.00698)
M-27	0.00794*	0.00606	0.00637	0.00641
	(0.00329)	(0.00329)	(0.00393)	(0.00686)
M-26	0.00963**	0.00843**	0.00697	0.00709
	(0.00319)	(0.00319)	(0.00380)	(0.00671)
M-25	0.00647*	0.00594	0.00606	0.00181
	(0.00315)	(0.00315)	(0.00371)	(0.00672)
M-24	0.00726*	0.00676*	0.00610	0.00943
	(0.00300)	(0.00300)	(0.00360)	(0.00631)
M-23				
M-22				
M-21				
M-20				
M-19				
M-18				
M-17				
M-16				
M-15				

Table H.8: Event-Study Point Estimates

	(1)	(2)	(3)	(4)
	Main	All Non-Part.	Non-Elec. Heat	Elec. Heat
Dependent Variable: Ln monthly electricity use				
M-14				
M-13				
M-12				
M-11	0.00167	0.00401	0.00321	-0.000322
	(0.00285)	(0.00285)	(0.00335)	(0.00607)
M-10	0.00243	0.00416	0.00139	0.00869
	(0.00288)	(0.00287)	(0.00338)	(0.00606)
M-9	0.00102	0.00173	-0.000283	0.0130*
	(0.00296)	(0.00294)	(0.00352)	(0.00602)
M-8	-0.00484	-0.00520	-0.00453	0.00196
	(0.00311)	(0.00309)	(0.00368)	(0.00653)
M-7	-0.00341	-0.00441	-0.00319	0.00191
	(0.00317)	(0.00315)	(0.00368)	(0.00651)
M-6	-0.00253	-0.00350	-0.00188	-0.000811
	(0.00309)	(0.00307)	(0.00379)	(0.00623)
M-5	-0.00364	-0.00417	-0.00372	-0.00254
	(0.00313)	(0.00311)	(0.00382)	(0.00637)
M-4	-0.00476	-0.00454	-0.00525	-0.00701
	(0.00315)	(0.00313)	(0.00375)	(0.00659)
M-3	-0.0106**	-0.00936**	-0.0125**	-0.0108
	(0.00322)	(0.00319)	(0.00394)	(0.00649)
M-2	-0.00833**	-0.00612	-0.0102**	-0.00604
	(0.00319)	(0.00317)	(0.00386)	(0.00652)
M-1	-0.0173***	-0.0143***	-0.0174***	-0.0220**
	(0.00337)	(0.00334)	(0.00397)	(0.00721)
M0	-0.0219***	-0.0188***	-0.0228***	-0.0243***
	(0.00328)	(0.00325)	(0.00396)	(0.00693)
M1	-0.0410***	-0.0380***	-0.0392***	-0.0486***
	(0.00352)	(0.00348)	(0.00421)	(0.00742)
M2	-0.0490***	-0.0466***	-0.0463***	-0.0545***
	(0.00359)	(0.00355)	(0.00431)	(0.00738)
M3	-0.0514***	-0.0501***	-0.0473***	-0.0578***

Table H.8: Event-Study Point Estimates

	(1)	(2)	(3)	(4)
	Main	All Non-Part.	Non-Elec. Heat	Elec. Heat
Dependent Variable: Ln monthly electricity use				
	(0.00357)	(0.00352)	(0.00433)	(0.00707)
M4	-0.0524***	-0.0525***	-0.0460***	-0.0637***
	(0.00353)	(0.00347)	(0.00429)	(0.00709)
M5	-0.0508***	-0.0515***	-0.0445***	-0.0631***
	(0.00366)	(0.00360)	(0.00437)	(0.00753)
M6	-0.0496***	-0.0502***	-0.0432***	-0.0639***
	(0.00367)	(0.00360)	(0.00448)	(0.00756)
M7	-0.0487***	-0.0485***	-0.0438***	-0.0616***
	(0.00360)	(0.00353)	(0.00433)	(0.00752)
M8	-0.0506***	-0.0493***	-0.0454***	-0.0678***
	(0.00364)	(0.00357)	(0.00441)	(0.00756)
M9	-0.0539***	-0.0516***	-0.0486***	-0.0704***
	(0.00377)	(0.00370)	(0.00451)	(0.00774)
M10	-0.0494***	-0.0458***	-0.0448***	-0.0659***
	(0.00380)	(0.00373)	(0.00461)	(0.00803)
M11	-0.0503***	-0.0457***	-0.0477***	-0.0635***
	(0.00371)	(0.00363)	(0.00456)	(0.00775)
M12	-0.0499***	-0.0451***	-0.0485***	-0.0590***
	(0.00372)	(0.00363)	(0.00463)	(0.00769)
M13	-0.0533***	-0.0488***	-0.0490***	-0.0636***
	(0.00381)	(0.00372)	(0.00472)	(0.00768)
M14	-0.0553***	-0.0514***	-0.0500***	-0.0679***
	(0.00382)	(0.00372)	(0.00469)	(0.00772)
M15	-0.0567***	-0.0537***	-0.0511***	-0.0697***
	(0.00387)	(0.00376)	(0.00467)	(0.00799)
M16	-0.0579***	-0.0560***	-0.0523***	-0.0740***
	(0.00387)	(0.00376)	(0.00469)	(0.00805)
M17	-0.0590***	-0.0581***	-0.0546***	-0.0742***
	(0.00391)	(0.00379)	(0.00474)	(0.00813)
M18	-0.0598***	-0.0588***	-0.0542***	-0.0812***
	(0.00395)	(0.00382)	(0.00477)	(0.00829)
M19	-0.0609***	-0.0591***	-0.0537***	-0.0805***
	(0.00394)	(0.00381)	(0.00474)	(0.00814)
M20	-0.0591***	-0.0562***	-0.0546***	-0.0745***
	(0.00404)	(0.00391)	(0.00494)	(0.00825)
M21	-0.0610***	-0.0568***	-0.0535***	-0.0826***

Table H.8: Event-Study Point Estimates

	(1)	(2)	(3)	(4)
	Main	All Non-Part.	Non-Elec. Heat	Elec. Heat
Dependent Variable: Ln monthly electricity use				
	(0.00411)	(0.00397)	(0.00507)	(0.00836)
M22	-0.0531***	-0.0473***	-0.0483***	-0.0692***
	(0.00408)	(0.00395)	(0.00504)	(0.00838)
M23	-0.0543***	-0.0472***	-0.0518***	-0.0702***
	(0.00415)	(0.00401)	(0.00513)	(0.00859)
M24	-0.0511***	-0.0434***	-0.0498***	-0.0642***
	(0.00421)	(0.00407)	(0.00530)	(0.00865)
M25	-0.0521***	-0.0449***	-0.0492***	-0.0672***
	(0.00431)	(0.00416)	(0.00536)	(0.00879)
M26	-0.0557***	-0.0493***	-0.0507***	-0.0691***
	(0.00431)	(0.00415)	(0.00533)	(0.00882)
M27	-0.0544***	-0.0488***	-0.0496***	-0.0642***
	(0.00437)	(0.00420)	(0.00542)	(0.00880)
M28	-0.0553***	-0.0513***	-0.0528***	-0.0658***
	(0.00445)	(0.00427)	(0.00557)	(0.00900)
M29	-0.0553***	-0.0524***	-0.0528***	-0.0687***
	(0.00449)	(0.00431)	(0.00559)	(0.00923)
M30	-0.0562***	-0.0534***	-0.0537***	-0.0667***
	(0.00453)	(0.00434)	(0.00565)	(0.00935)
M31	-0.0543***	-0.0508***	-0.0500***	-0.0661***
	(0.00451)	(0.00431)	(0.00555)	(0.00933)
M32	-0.0530***	-0.0487***	-0.0470***	-0.0709***
	(0.00459)	(0.00438)	(0.00567)	(0.00949)
M33	-0.0542***	-0.0482***	-0.0476***	-0.0733***
	(0.00466)	(0.00445)	(0.00576)	(0.00942)
M34	-0.0495***	-0.0415***	-0.0464***	-0.0636***
	(0.00474)	(0.00453)	(0.00591)	(0.00950)
M35	-0.0467***	-0.0371***	-0.0465***	-0.0584***
	(0.00472)	(0.00451)	(0.00594)	(0.00954)
M36	-0.0392***	-0.0297***	-0.0408***	-0.0500***
	(0.00471)	(0.00448)	(0.00591)	(0.00949)
M37	-0.0435***	-0.0344***	-0.0424***	-0.0584***
	(0.00480)	(0.00457)	(0.00603)	(0.00959)
M38	-0.0498***	-0.0415***	-0.0464***	-0.0666***
	(0.00485)	(0.00461)	(0.00607)	(0.00977)
M39	-0.0475***	-0.0403***	-0.0407***	-0.0653***

Table H.8: Event-Study Point Estimates

	(1)	(2)	(3)	(4)
	Main	All Non-Part.	Non-Elec. Heat	Elec. Heat
Dependent Variable: Ln monthly electricity use				
	(0.00487)	(0.00462)	(0.00600)	(0.0101)
M40	-0.0471***	-0.0417***	-0.0418***	-0.0590***
	(0.00494)	(0.00468)	(0.00611)	(0.0103)
M41	-0.0481***	-0.0440***	-0.0410***	-0.0649***
	(0.00499)	(0.00472)	(0.00625)	(0.0102)
M42	-0.0515***	-0.0473***	-0.0469***	-0.0655***
	(0.00502)	(0.00475)	(0.00630)	(0.0102)
M43	-0.0503***	-0.0452***	-0.0473***	-0.0639***
	(0.00504)	(0.00477)	(0.00632)	(0.0102)
M44	-0.0500***	-0.0436***	-0.0493***	-0.0592***
	(0.00512)	(0.00483)	(0.00646)	(0.0103)
M45	-0.0495***	-0.0418***	-0.0462***	-0.0648***
	(0.00522)	(0.00493)	(0.00658)	(0.0105)
M46	-0.0449***	-0.0355***	-0.0428***	-0.0590***
	(0.00529)	(0.00500)	(0.00668)	(0.0106)
M47	-0.0426***	-0.0315***	-0.0443***	-0.0557***
	(0.00525)	(0.00496)	(0.00667)	(0.0106)
M48	-0.0392***	-0.0273***	-0.0385***	-0.0540***
	(0.00528)	(0.00498)	(0.00673)	(0.0106)
M49	-0.0407***	-0.0296***	-0.0395***	-0.0558***
	(0.00532)	(0.00501)	(0.00673)	(0.0107)
M50	-0.0447***	-0.0346***	-0.0397***	-0.0632***
	(0.00539)	(0.00508)	(0.00670)	(0.0110)
M51	-0.0479***	-0.0396***	-0.0370***	-0.0711***
	(0.00559)	(0.00526)	(0.00680)	(0.0117)
M52	-0.0484***	-0.0418***	-0.0371***	-0.0729***
	(0.00549)	(0.00516)	(0.00675)	(0.0114)
M53	-0.0444***	-0.0392***	-0.0386***	-0.0606***
	(0.00553)	(0.00519)	(0.00687)	(0.0115)
M54	-0.0480***	-0.0426***	-0.0418***	-0.0583***
	(0.00562)	(0.00527)	(0.00695)	(0.0117)
M55	-0.0475***	-0.0402***	-0.0451***	-0.0553***
	(0.00582)	(0.00547)	(0.00747)	(0.0116)
M56	-0.0451***	-0.0358***	-0.0390***	-0.0610***
	(0.00576)	(0.00540)	(0.00715)	(0.0117)
M57	-0.0541***	-0.0432***	-0.0489***	-0.0722***

Table H.8: Event-Study Point Estimates

	(1)	(2)	(3)	(4)
	Main	All Non-Part.	Non-Elec. Heat	Elec. Heat
Dependent Variable: Ln monthly electricity use				
	(0.00590)	(0.00555)	(0.00736)	(0.0120)
M58	-0.0467***	-0.0339***	-0.0452***	-0.0622***
	(0.00593)	(0.00556)	(0.00749)	(0.0119)
M59	-0.0424***	-0.0280***	-0.0427***	-0.0516***
	(0.00593)	(0.00555)	(0.00752)	(0.0118)
M60	-0.0388***	-0.0255***	-0.0377***	-0.0498***
	(0.00597)	(0.00558)	(0.00752)	(0.0120)
M61	-0.0410***	-0.0290***	-0.0385***	-0.0506***
	(0.00612)	(0.00573)	(0.00760)	(0.0124)
M62	-0.0416***	-0.0308***	-0.0366***	-0.0568***
	(0.00617)	(0.00578)	(0.00773)	(0.0122)
M63	-0.0450***	-0.0357***	-0.0368***	-0.0639***
	(0.00625)	(0.00585)	(0.00781)	(0.0122)
M64	-0.0505***	-0.0431***	-0.0439***	-0.0677***
	(0.00629)	(0.00587)	(0.00794)	(0.0124)
M65	-0.0472***	-0.0410***	-0.0449***	-0.0580***
	(0.00633)	(0.00591)	(0.00808)	(0.0124)
M66	-0.0468***	-0.0400***	-0.0440***	-0.0603***
	(0.00637)	(0.00594)	(0.00811)	(0.0125)
M67	-0.0521***	-0.0432***	-0.0460***	-0.0732***
	(0.00649)	(0.00605)	(0.00815)	(0.0130)
M68	-0.0525***	-0.0411***	-0.0455***	-0.0759***
	(0.00655)	(0.00611)	(0.00824)	(0.0129)
M69	-0.0548***	-0.0408***	-0.0471***	-0.0745***
	(0.00668)	(0.00623)	(0.00824)	(0.0135)
M70	-0.0527***	-0.0367***	-0.0425***	-0.0759***
	(0.00669)	(0.00625)	(0.00820)	(0.0136)
M71	-0.0455***	-0.0285***	-0.0403***	-0.0616***
	(0.00677)	(0.00633)	(0.00843)	(0.0136)
M72	-0.0439***	-0.0271***	-0.0395***	-0.0565***
	(0.00687)	(0.00642)	(0.00840)	(0.0142)
M73	-0.0432***	-0.0279***	-0.0366***	-0.0638***
	(0.00695)	(0.00649)	(0.00857)	(0.0141)
M74	-0.0482***	-0.0344***	-0.0407***	-0.0644***
	(0.00703)	(0.00656)	(0.00878)	(0.0139)
M75	-0.0458***	-0.0347***	-0.0395***	-0.0617***

Table H.8: Event-Study Point Estimates

	(1)	(2)	(3)	(4)
	Main	All Non-Part.	Non-Elec. Heat	Elec. Heat
Dependent Variable: Ln monthly electricity use				
	(0.00710)	(0.00663)	(0.00883)	(0.0142)
M76	-0.0537***	-0.0457***	-0.0464***	-0.0694***
	(0.00728)	(0.00681)	(0.00898)	(0.0149)
M77	-0.0510***	-0.0454***	-0.0432***	-0.0679***
	(0.00735)	(0.00688)	(0.00917)	(0.0152)
M78	-0.0532***	-0.0476***	-0.0424***	-0.0771***
	(0.00733)	(0.00683)	(0.00917)	(0.0151)
M79	-0.0530***	-0.0451***	-0.0399***	-0.0838***
	(0.00742)	(0.00692)	(0.00919)	(0.0151)
M80	-0.0570***	-0.0454***	-0.0417***	-0.0912***
	(0.00761)	(0.00710)	(0.00924)	(0.0155)
M81	-0.0539***	-0.0385***	-0.0409***	-0.0888***
	(0.00772)	(0.00721)	(0.00937)	(0.0157)
M82	-0.0546***	-0.0356***	-0.0440***	-0.0783***
	(0.00786)	(0.00736)	(0.00957)	(0.0161)
M83	-0.0511***	-0.0304***	-0.0492***	-0.0597***
	(0.00759)	(0.00706)	(0.00936)	(0.0154)
M84	-0.0445***	-0.0244***	-0.0411***	-0.0503***
	(0.00752)	(0.00696)	(0.00942)	(0.0147)
M85	-0.0468***	-0.0291***	-0.0361***	-0.0556***
	(0.00774)	(0.00719)	(0.00951)	(0.0156)
M86	-0.0502***	-0.0349***	-0.0376***	-0.0620***
	(0.00788)	(0.00734)	(0.00968)	(0.0160)
M87	-0.0419***	-0.0272***	-0.0209*	-0.0721***
	(0.00820)	(0.00768)	(0.0101)	(0.0167)
M88	-0.0448***	-0.0326***	-0.0314**	-0.0673***
	(0.00847)	(0.00795)	(0.0102)	(0.0177)
M89	-0.0408***	-0.0334***	-0.0413***	-0.0475**
	(0.00861)	(0.00807)	(0.0106)	(0.0177)
M90	-0.0499***	-0.0443***	-0.0438***	-0.0714***
	(0.00875)	(0.00820)	(0.0109)	(0.0177)
M91	-0.0641***	-0.0570***	-0.0477***	-0.101***
	(0.00922)	(0.00866)	(0.0110)	(0.0191)
M92	-0.0707***	-0.0606***	-0.0553***	-0.105***
	(0.00963)	(0.00906)	(0.0116)	(0.0197)
M93	-0.0597***	-0.0452***	-0.0391***	-0.0956***

Table H.8: Event-Study Point Estimates

	(1)	(2)	(3)	(4)
	Main	All Non-Part.	Non-Elec. Heat	Elec. Heat
Dependent Variable: Ln monthly electricity use				
	(0.00963)	(0.00905)	(0.0117)	(0.0193)
M94	-0.0584***	-0.0402***	-0.0498***	-0.0706***
	(0.00963)	(0.00905)	(0.0118)	(0.0194)
M95	-0.0600***	-0.0383***	-0.0545***	-0.0621**
	(0.00994)	(0.00936)	(0.0125)	(0.0195)
M96	-0.0466***	-0.0229*	-0.0400***	-0.0552*
	(0.0104)	(0.00987)	(0.0121)	(0.0223)
M97	-0.0342**	-0.0114	-0.0360**	-0.0207
	(0.0107)	(0.0101)	(0.0129)	(0.0218)
M98	-0.0499***	-0.0293**	-0.0458***	-0.0416
	(0.0110)	(0.0105)	(0.0134)	(0.0229)
M99	-0.0491***	-0.0313**	-0.0490***	-0.0513*
	(0.0111)	(0.0106)	(0.0137)	(0.0226)
M100	-0.0525***	-0.0413***	-0.0453**	-0.0753**
	(0.0122)	(0.0117)	(0.0143)	(0.0268)
M101	-0.0421***	-0.0380**	-0.0512***	-0.0271
	(0.0127)	(0.0122)	(0.0152)	(0.0257)
M102	-0.0521***	-0.0541***	-0.0514**	-0.0807*
	(0.0145)	(0.0140)	(0.0167)	(0.0320)
M103	-0.0385*	-0.0409*	-0.0219	-0.0832*
	(0.0191)	(0.0187)	(0.0228)	(0.0398)
M104	0.0224	0.0284	0.0323	0.0372
	(0.0418)	(0.0418)	(0.0507)	(0.160)
M105	0.0422	0.0382	0.111*	-0.114
	(0.0430)	(0.0428)	(0.0459)	(0.204)
M106	0.0797	0.0740	0.174*	-0.0752
	(0.0642)	(0.0641)	(0.0801)	(0.231)
M107	0.464***	0.458***	0.512***	0
	(0.00609)	(0.00483)	(0.00790)	(.)
M108	0	0	0	0
	(.)	(.)	(.)	(.)
_cons	6.775***	6.863***	6.678***	6.945***
	(0.00331)	(0.00250)	(0.00425)	(0.00667)
N	2130468	3375167	1214158	626390

All specifications include individual and date fixed effects. Specification (1) estimated including both participant and non-participant households. (2) estimated for participant households only. Standard errors are clustered at the household level. *** p<0.01, ** p<0.05, * p<0.1 denote significance levels where 0 is defined as the second year pre-treatment and consists of months M-12 to M-23.

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All	One	Two+	Two	Three+	Three	Four+
Dependent Variable: Ln monthly electricity use							
M-119	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-118	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-117	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-116	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-115	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-114	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-113	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-112	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-111	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-110	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-109	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-108	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-107	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-106	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-105	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All	One	Two+	Two	Three+	Three	Four+
Dependent Variable: Ln monthly electricity use							
M-104	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-103	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
M-102	-0.0966	-0.16	-0.074	-0.078	0	0	0
	(0.0782)	(0.17)	(0.067)	(0.067)	(.)	(.)	(.)
M-101	-0.0142	-0.064	0.0067	0.0036	0	0	0
	(0.0428)	(0.077)	(0.047)	(0.048)	(.)	(.)	(.)
M-100	-0.0395	-0.070	-0.037	-0.040	0	0	0
	(0.0315)	(0.056)	(0.037)	(0.037)	(.)	(.)	(.)
M-99	-0.0178	-0.096*	0.012	0.0096	0	0	0
	(0.0261)	(0.044)	(0.032)	(0.032)	(.)	(.)	(.)
M-98	0.00579	-0.062	0.028	0.026	0	0	0
	(0.0197)	(0.033)	(0.024)	(0.024)	(.)	(.)	(.)
M-97	-0.00313	-0.068*	0.018	0.015	0	0	0
	(0.0196)	(0.031)	(0.025)	(0.025)	(.)	(.)	(.)
M-96	0.0157	-0.028	0.026	0.024	0	0	0
	(0.0153)	(0.024)	(0.019)	(0.020)	(.)	(.)	(.)
M-95	0.0112	-0.026	0.017	0.015	0	0	0
	(0.0140)	(0.022)	(0.018)	(0.018)	(.)	(.)	(.)
M-94	0.0267*	-0.0019	0.028	0.024	0.081	0.075	0
	(0.0133)	(0.021)	(0.016)	(0.017)	(0.10)	(0.10)	(.)
M-93	0.0238*	0.021	0.0099	0.0040	0.042	0.036	0
	(0.0117)	(0.017)	(0.015)	(0.017)	(0.045)	(0.045)	(.)
M-92	0.0299**	0.024	0.018	0.0043	0.085**	0.079*	0
	(0.0107)	(0.016)	(0.014)	(0.015)	(0.032)	(0.032)	(.)
M-91	0.0201	0.016	0.0069	-0.0063	0.061*	0.056	0
	(0.0112)	(0.015)	(0.015)	(0.017)	(0.029)	(0.030)	(.)
M-90	0.0225*	0.019	0.0089	-0.0045	0.058*	0.052	0
	(0.0113)	(0.017)	(0.014)	(0.017)	(0.027)	(0.027)	(.)
M-89	0.0176	0.012	0.0062	0.0064	-0.0041	-0.010	0
	(0.0108)	(0.017)	(0.014)	(0.016)	(0.030)	(0.030)	(.)
M-88	0.0126	-0.0091	0.011	0.012	0.00067	-0.0052	0
	(0.0111)	(0.018)	(0.013)	(0.016)	(0.024)	(0.025)	(.)
M-87	0.0222*	-0.012	0.030*	0.037*	0.0037	-0.0019	0
	(0.0103)	(0.017)	(0.012)	(0.014)	(0.023)	(0.023)	(.)

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1) All	(2) One	(3) Two+	(4) Two	(5) Three+	(6) Three	(7) Four+
Dependent Variable: Ln monthly electricity use							
M-86	0.0267**	0.0023	0.028*	0.036**	0.00027	-0.0055	0
	(0.00954)	(0.015)	(0.012)	(0.014)	(0.022)	(0.022)	(.)
M-85	0.0287**	0.0084	0.027*	0.036**	-0.00024	-0.0062	0
	(0.00890)	(0.014)	(0.011)	(0.014)	(0.020)	(0.020)	(.)
M-84	0.0247**	0.014	0.017	0.021	0.0043	-0.0015	0
	(0.00883)	(0.013)	(0.011)	(0.014)	(0.021)	(0.021)	(.)
M-83	0.0253**	0.0085	0.022*	0.017	0.028	0.023	0
	(0.00882)	(0.014)	(0.011)	(0.014)	(0.018)	(0.018)	(.)
M-82	0.0319***	0.015	0.029**	0.020	0.045**	0.039*	0
	(0.00858)	(0.014)	(0.011)	(0.013)	(0.017)	(0.017)	(.)
M-81	0.0221*	0.017	0.012	0.0032	0.026	0.022	-0.14**
	(0.00878)	(0.014)	(0.011)	(0.013)	(0.020)	(0.021)	(0.048)
M-80	0.0273***	0.027*	0.015	0.0046	0.033*	0.029	0.0029
	(0.00826)	(0.013)	(0.010)	(0.013)	(0.017)	(0.017)	(0.062)
M-79	0.0233**	0.025	0.0097	0.0080	0.0094	0.0058	-0.022
	(0.00835)	(0.013)	(0.010)	(0.013)	(0.018)	(0.019)	(0.034)
M-78	0.0239**	0.020	0.013	0.012	0.012	0.0054	0.031
	(0.00804)	(0.013)	(0.010)	(0.013)	(0.016)	(0.018)	(0.037)
M-77	0.0210**	0.024*	0.0062	0.0069	0.0019	0.0016	-0.043
	(0.00783)	(0.012)	(0.0100)	(0.013)	(0.016)	(0.017)	(0.050)
M-76	0.0182*	0.014	0.0093	0.0096	0.0062	0.0050	-0.018
	(0.00773)	(0.012)	(0.0099)	(0.012)	(0.016)	(0.017)	(0.042)
M-75	0.0228**	0.020	0.013	0.019	0.0010	-0.0028	-0.0017
	(0.00777)	(0.012)	(0.010)	(0.013)	(0.016)	(0.018)	(0.039)
M-74	0.0190*	0.016	0.0078	0.0089	0.0042	-0.0074	0.041
	(0.00755)	(0.012)	(0.0098)	(0.013)	(0.014)	(0.015)	(0.032)
M-73	0.00612	-0.0051	0.00087	0.0034	-0.0049	-0.012	0.0065
	(0.00811)	(0.013)	(0.010)	(0.015)	(0.014)	(0.016)	(0.034)
M-72	0.0145	0.015	-0.00020	0.0012	-0.0042	-0.0022	-0.024
	(0.00745)	(0.012)	(0.0096)	(0.013)	(0.014)	(0.016)	(0.026)
M-71	0.0184**	0.017	0.0054	0.0060	0.0026	0.00093	-0.0046
	(0.00713)	(0.011)	(0.0091)	(0.012)	(0.014)	(0.016)	(0.024)
M-70	0.0239***	0.018	0.012	0.010	0.011	0.016	-0.013
	(0.00689)	(0.011)	(0.0088)	(0.012)	(0.013)	(0.015)	(0.025)
M-69	0.0197**	0.017	0.0070	0.0030	0.0094	0.015	-0.012
	(0.00677)	(0.011)	(0.0086)	(0.012)	(0.012)	(0.014)	(0.023)

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1) All	(2) One	(3) Two+	(4) Two	(5) Three+	(6) Three	(7) Four+
Dependent Variable: Ln monthly electricity use							
M-68	0.0250***	0.030**	0.0080	0.0060	0.0076	0.015	-0.017
	(0.00651)	(0.010)	(0.0084)	(0.012)	(0.012)	(0.015)	(0.021)
M-67	0.0119	0.020	-0.0049	-0.016	0.0054	0.0042	0.00020
	(0.00678)	(0.010)	(0.0089)	(0.012)	(0.013)	(0.016)	(0.022)
M-66	0.0161*	0.018	0.0039	-0.014	0.021	0.021	0.013
	(0.00649)	(0.010)	(0.0084)	(0.012)	(0.011)	(0.014)	(0.019)
M-65	0.0255***	0.028**	0.014	0.0074	0.017	0.012	0.018
	(0.00630)	(0.0099)	(0.0081)	(0.011)	(0.011)	(0.015)	(0.017)
M-64	0.0249***	0.025**	0.012	0.0057	0.016	0.0049	0.025
	(0.00599)	(0.0096)	(0.0077)	(0.011)	(0.011)	(0.014)	(0.016)
M-63	0.0256***	0.023*	0.017*	0.014	0.017	0.0031	0.030*
	(0.00604)	(0.010)	(0.0074)	(0.010)	(0.010)	(0.014)	(0.015)
M-62	0.0270***	0.026**	0.015*	0.012	0.015	-0.0028	0.032*
	(0.00583)	(0.0092)	(0.0076)	(0.011)	(0.010)	(0.015)	(0.014)
M-61	0.0263***	0.031***	0.011	0.011	0.0079	-0.013	0.026
	(0.00571)	(0.0091)	(0.0074)	(0.011)	(0.0099)	(0.014)	(0.014)
M-60	0.0251***	0.031***	0.011	0.0092	0.010	-0.0033	0.021
	(0.00581)	(0.0089)	(0.0075)	(0.011)	(0.010)	(0.013)	(0.015)
M-59	0.0284***	0.032***	0.015*	0.012	0.015	0.0077	0.018
	(0.00553)	(0.0089)	(0.0072)	(0.011)	(0.0094)	(0.012)	(0.014)
M-58	0.0331***	0.041***	0.016*	0.013	0.016	0.015	0.014
	(0.00545)	(0.0085)	(0.0072)	(0.011)	(0.0094)	(0.012)	(0.014)
M-57	0.0257***	0.032***	0.0086	0.0049	0.0091	0.016	-0.0015
	(0.00549)	(0.0085)	(0.0073)	(0.011)	(0.0097)	(0.012)	(0.015)
M-56	0.0260***	0.031***	0.012	0.0042	0.016	0.021	0.0072
	(0.00521)	(0.0084)	(0.0067)	(0.010)	(0.0087)	(0.011)	(0.013)
M-55	0.0175**	0.020*	0.0061	-0.00100	0.0097	0.0098	0.0063
	(0.00546)	(0.0088)	(0.0071)	(0.011)	(0.0093)	(0.012)	(0.014)
M-54	0.0202***	0.022**	0.0076	0.0058	0.0070	0.0014	0.0089
	(0.00532)	(0.0083)	(0.0071)	(0.011)	(0.0093)	(0.012)	(0.014)
M-53	0.0180***	0.021*	0.0070	0.0044	0.0071	0.00043	0.0099
	(0.00535)	(0.0085)	(0.0071)	(0.011)	(0.0093)	(0.013)	(0.013)
M-52	0.0211***	0.028***	0.0090	0.0094	0.0068	0.0049	0.0056
	(0.00512)	(0.0081)	(0.0068)	(0.010)	(0.0087)	(0.012)	(0.012)
M-51	0.0228***	0.030***	0.013*	0.019*	0.0072	0.0051	0.0061
	(0.00496)	(0.0080)	(0.0064)	(0.0093)	(0.0085)	(0.012)	(0.012)

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All	One	Two+	Two	Three+	Three	Four+
Dependent Variable: Ln monthly electricity use							
M-50	0.0252***	0.036***	0.014*	0.021*	0.0063	0.00029	0.0087
	(0.00485)	(0.0078)	(0.0063)	(0.0093)	(0.0084)	(0.013)	(0.011)
M-49	0.0279***	0.035***	0.016**	0.024*	0.0089	0.0037	0.011
	(0.00480)	(0.0078)	(0.0063)	(0.0096)	(0.0082)	(0.012)	(0.011)
M-48	0.0306***	0.032***	0.022***	0.028**	0.016*	0.018	0.012
	(0.00480)	(0.0080)	(0.0063)	(0.0096)	(0.0081)	(0.011)	(0.011)
M-47	0.0280***	0.024**	0.020**	0.023*	0.016	0.019	0.010
	(0.00469)	(0.0078)	(0.0061)	(0.0095)	(0.0079)	(0.012)	(0.010)
M-46	0.0277***	0.026***	0.019**	0.024**	0.014	0.015	0.0093
	(0.00454)	(0.0072)	(0.0061)	(0.0092)	(0.0080)	(0.012)	(0.010)
M-45	0.0238***	0.026***	0.012*	0.015	0.0088	0.016	0.00070
	(0.00450)	(0.0072)	(0.0061)	(0.0093)	(0.0080)	(0.012)	(0.011)
M-44	0.0213***	0.027***	0.0087	0.0083	0.0075	0.023*	-0.0070
	(0.00438)	(0.0069)	(0.0060)	(0.0093)	(0.0077)	(0.011)	(0.010)
M-43	0.0135**	0.014*	0.0035	0.0014	0.0039	0.0095	-0.0027
	(0.00448)	(0.0071)	(0.0061)	(0.0096)	(0.0079)	(0.012)	(0.010)
M-42	0.0137**	0.011	0.0088	0.0051	0.010	0.023*	-0.0012
	(0.00453)	(0.0075)	(0.0060)	(0.0093)	(0.0078)	(0.011)	(0.011)
M-41	0.0142**	0.017*	0.0084	0.011	0.0056	0.022*	-0.0086
	(0.00446)	(0.0073)	(0.0060)	(0.0096)	(0.0076)	(0.011)	(0.010)
M-40	0.0165***	0.024***	0.0092	0.015	0.0037	0.012	-0.0047
	(0.00433)	(0.0068)	(0.0057)	(0.0092)	(0.0071)	(0.010)	(0.0097)
M-39	0.0144***	0.023***	0.0039	0.0094	-0.0010	0.0072	-0.0090
	(0.00433)	(0.0069)	(0.0059)	(0.0097)	(0.0073)	(0.010)	(0.010)
M-38	0.0188***	0.024***	0.0076	0.0098	0.0051	0.0058	0.0029
	(0.00415)	(0.0067)	(0.0057)	(0.0095)	(0.0069)	(0.010)	(0.0092)
M-37	0.0182***	0.023***	0.0091	0.014	0.0051	-0.00095	0.0080
	(0.00413)	(0.0065)	(0.0058)	(0.0092)	(0.0074)	(0.011)	(0.0097)
M-36	0.0178***	0.015*	0.012*	0.019*	0.0065	0.0050	0.0059
	(0.00412)	(0.0068)	(0.0056)	(0.0086)	(0.0073)	(0.011)	(0.010)
M-35	0.0180***	0.016*	0.011	0.016	0.0065	0.0071	0.0046
	(0.00408)	(0.0065)	(0.0056)	(0.0086)	(0.0074)	(0.011)	(0.0097)
M-34	0.0182***	0.015*	0.012*	0.015	0.0087	0.016	0.0017
	(0.00396)	(0.0066)	(0.0054)	(0.0085)	(0.0070)	(0.0098)	(0.0097)
M-33	0.00970*	0.013*	-0.00031	0.00083	-0.0014	0.010	-0.011
	(0.00390)	(0.0064)	(0.0054)	(0.0086)	(0.0069)	(0.0099)	(0.0094)

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All	One	Two+	Two	Three+	Three	Four+
Dependent Variable: Ln monthly electricity use							
M-32	0.00584	0.013*	-0.0075	-0.013	-0.0038	0.013	-0.016
	(0.00381)	(0.0060)	(0.0055)	(0.0092)	(0.0068)	(0.010)	(0.0092)
M-31	0.00449	0.0021	-0.0051	-0.0059	-0.0046	0.0062	-0.013
	(0.00394)	(0.0063)	(0.0058)	(0.0086)	(0.0078)	(0.011)	(0.011)
M-30	0.00678	0.0041	-0.000090	-0.0017	0.00090	0.0071	-0.0041
	(0.00369)	(0.0061)	(0.0053)	(0.0085)	(0.0067)	(0.011)	(0.0085)
M-29	0.00740*	0.012*	-0.0021	-0.0053	0.000043	0.0097	-0.0072
	(0.00355)	(0.0056)	(0.0052)	(0.0087)	(0.0064)	(0.0098)	(0.0084)
M-28	0.00932**	0.015**	-0.00015	0.00070	-0.00087	0.0065	-0.0064
	(0.00345)	(0.0056)	(0.0050)	(0.0085)	(0.0060)	(0.0088)	(0.0082)
M-27	0.00794*	0.0098	0.0050	0.012	-0.00024	0.0063	-0.0050
	(0.00329)	(0.0054)	(0.0046)	(0.0073)	(0.0059)	(0.0085)	(0.0079)
M-26	0.00963**	0.014**	0.0046	0.012	-0.00080	-0.0025	-0.00012
	(0.00319)	(0.0054)	(0.0044)	(0.0070)	(0.0056)	(0.0085)	(0.0075)
M-25	0.00647*	0.012*	0.00036	0.0097	-0.0062	-0.012	-0.0029
	(0.00315)	(0.0051)	(0.0045)	(0.0071)	(0.0059)	(0.0087)	(0.0079)
M-24	0.00726*	0.0081	0.0049	0.012	0.00030	-0.0018	0.0015
	(0.00300)	(0.0048)	(0.0044)	(0.0069)	(0.0057)	(0.0082)	(0.0078)
M-23							
M-22							
M-21							
M-20							
M-19							
M-18							
M-17							
M-16							
M-15							

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1) All	(2) One	(3) Two+	(4) Two	(5) Three+	(6) Three	(7) Four+
Dependent Variable: Ln monthly electricity use							
M-14							
M-13							
M-12							
M-11	0.00167	0.0029	0.0046	0.0072	0.0025	-0.0039	0.0068
	(0.00285)	(0.0044)	(0.0041)	(0.0065)	(0.0052)	(0.0084)	(0.0067)
M-10	0.00243	0.0013	0.0048	0.0064	0.0033	0.0020	0.0044
	(0.00288)	(0.0045)	(0.0043)	(0.0065)	(0.0057)	(0.0082)	(0.0076)
M-9	0.00102	0.000042	-0.00041	-0.0011	-0.00020	0.0012	-0.00079
	(0.00296)	(0.0047)	(0.0045)	(0.0073)	(0.0058)	(0.0091)	(0.0074)
M-8	-0.00484	-0.0066	-0.0052	-0.0099	-0.0023	0.0020	-0.0045
	(0.00311)	(0.0051)	(0.0047)	(0.0075)	(0.0060)	(0.0093)	(0.0077)
M-7	-0.00341	-0.00025	-0.0075	-0.017*	-0.0013	0.00022	-0.0017
	(0.00317)	(0.0049)	(0.0049)	(0.0080)	(0.0062)	(0.0095)	(0.0080)
M-6	-0.00253	0.0014	-0.0065	-0.018*	0.00090	-0.0022	0.0032
	(0.00309)	(0.0048)	(0.0049)	(0.0081)	(0.0062)	(0.0095)	(0.0081)
M-5	-0.00364	0.0018	-0.0065	-0.013	-0.0022	-0.0054	0.00014
	(0.00313)	(0.0048)	(0.0050)	(0.0079)	(0.0064)	(0.0098)	(0.0084)
M-4	-0.00476	-0.000012	-0.0074	-0.0047	-0.0099	-0.024*	-0.00093
	(0.00315)	(0.0050)	(0.0049)	(0.0079)	(0.0061)	(0.0098)	(0.0077)
M-3	-0.0106**	-0.0038	-0.012*	-0.0012	-0.021***	-0.039***	-0.0090
	(0.00322)	(0.0052)	(0.0049)	(0.0080)	(0.0062)	(0.010)	(0.0077)
M-2	-0.00833**	0.00046	-0.012*	-0.010	-0.014*	-0.032**	-0.0033
	(0.00319)	(0.0050)	(0.0049)	(0.0084)	(0.0060)	(0.0097)	(0.0076)
M-1	-0.0173***	-0.0027	-0.027***	-0.032***	-0.025***	-0.049***	-0.0090
	(0.00337)	(0.0053)	(0.0053)	(0.0085)	(0.0066)	(0.010)	(0.0088)
M0	-0.0219***	-0.00036	-0.040***	-0.044***	-0.037***	-0.061***	-0.022**
	(0.00328)	(0.0051)	(0.0051)	(0.0084)	(0.0062)	(0.0097)	(0.0080)
M1	-0.0410***	-0.013*	-0.068***	-0.077***	-0.062***	-0.093***	-0.043***
	(0.00352)	(0.0056)	(0.0053)	(0.0089)	(0.0064)	(0.011)	(0.0080)
M2	-0.0490***	-0.017**	-0.077***	-0.089***	-0.069***	-0.096***	-0.053***
	(0.00359)	(0.0055)	(0.0055)	(0.0094)	(0.0065)	(0.011)	(0.0082)
M3	-0.0514***	-0.018***	-0.084***	-0.096***	-0.076***	-0.097***	-0.063***
	(0.00357)	(0.0055)	(0.0055)	(0.0091)	(0.0068)	(0.011)	(0.0085)

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1) All	(2) One	(3) Two+	(4) Two	(5) Three+	(6) Three	(7) Four+
Dependent Variable: Ln monthly electricity use							
M4	-0.0524***	-0.016**	-0.088***	-0.099***	-0.082***	-0.096***	-0.073***
	(0.00353)	(0.0055)	(0.0053)	(0.0088)	(0.0066)	(0.011)	(0.0083)
M5	-0.0508***	-0.013*	-0.087***	-0.097***	-0.080***	-0.099***	-0.068***
	(0.00366)	(0.0056)	(0.0056)	(0.0092)	(0.0070)	(0.011)	(0.0088)
M6	-0.0496***	-0.014*	-0.082***	-0.098***	-0.072***	-0.098***	-0.056***
	(0.00367)	(0.0055)	(0.0058)	(0.0096)	(0.0071)	(0.012)	(0.0085)
M7	-0.0487***	-0.0094	-0.081***	-0.091***	-0.074***	-0.095***	-0.061***
	(0.00360)	(0.0056)	(0.0054)	(0.0087)	(0.0068)	(0.011)	(0.0086)
M8	-0.0506***	-0.0092	-0.087***	-0.096***	-0.082***	-0.099***	-0.070***
	(0.00364)	(0.0057)	(0.0054)	(0.0091)	(0.0066)	(0.011)	(0.0084)
M9	-0.0539***	-0.014*	-0.092***	-0.094***	-0.091***	-0.10***	-0.083***
	(0.00377)	(0.0060)	(0.0056)	(0.0094)	(0.0068)	(0.011)	(0.0085)
M10	-0.0494***	-0.0081	-0.088***	-0.090***	-0.087***	-0.10***	-0.077***
	(0.00380)	(0.0059)	(0.0058)	(0.0096)	(0.0070)	(0.011)	(0.0091)
M11	-0.0503***	-0.0064	-0.091***	-0.093***	-0.090***	-0.11***	-0.077***
	(0.00371)	(0.0057)	(0.0056)	(0.0092)	(0.0070)	(0.011)	(0.0089)
M12	-0.0499***	-0.0027	-0.092***	-0.084***	-0.098***	-0.12***	-0.083***
	(0.00372)	(0.0056)	(0.0057)	(0.0093)	(0.0072)	(0.012)	(0.0087)
Gap 1		0	-0.085***	-0.079***	-0.088***	-0.091***	-0.086***
		(.)	(0.0056)	(0.0092)	(0.0069)	(0.011)	(0.0087)
M13	-0.0533***	-0.0084	-0.11***	-0.094***	-0.11***	-0.13***	-0.11***
	(0.00381)	(0.0058)	(0.0057)	(0.0090)	(0.0072)	(0.012)	(0.0090)
M14	-0.0553***	-0.015*	-0.11***	-0.097***	-0.12***	-0.13***	-0.11***
	(0.00382)	(0.0060)	(0.0059)	(0.0096)	(0.0074)	(0.012)	(0.0094)
M15	-0.0567***	-0.011	-0.11***	-0.090***	-0.12***	-0.13***	-0.12***
	(0.00387)	(0.0059)	(0.0060)	(0.0096)	(0.0076)	(0.012)	(0.0095)
M16	-0.0579***	-0.0081	-0.11***	-0.091***	-0.12***	-0.13***	-0.11***
	(0.00387)	(0.0059)	(0.0060)	(0.0096)	(0.0076)	(0.013)	(0.0094)
M17	-0.0590***	-0.0099	-0.10***	-0.090***	-0.11***	-0.13***	-0.10***
	(0.00391)	(0.0060)	(0.0061)	(0.010)	(0.0073)	(0.012)	(0.0092)
M18	-0.0598***	-0.014*	-0.10***	-0.094***	-0.11***	-0.13***	-0.10***
	(0.00395)	(0.0060)	(0.0062)	(0.010)	(0.0075)	(0.012)	(0.0095)
M19	-0.0609***	-0.015*	-0.11***	-0.095***	-0.11***	-0.13***	-0.10***
	(0.00394)	(0.0060)	(0.0062)	(0.010)	(0.0077)	(0.012)	(0.0099)
M20	-0.0591***	-0.015*	-0.11***	-0.092***	-0.12***	-0.14***	-0.11***
	(0.00404)	(0.0062)	(0.0062)	(0.010)	(0.0075)	(0.012)	(0.0096)

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All	One	Two+	Two	Three+	Three	Four+
Dependent Variable: Ln monthly electricity use							
M21	-0.0610***	-0.014*	-0.11***	-0.092***	-0.12***	-0.13***	-0.11***
	(0.00411)	(0.0061)	(0.0064)	(0.011)	(0.0075)	(0.012)	(0.0098)
M22	-0.0531***	-0.0024	-0.099***	-0.077***	-0.11***	-0.12***	-0.11***
	(0.00408)	(0.0060)	(0.0065)	(0.012)	(0.0075)	(0.012)	(0.0096)
M23	-0.0543***	-0.0050	-0.099***	-0.064***	-0.12***	-0.13***	-0.11***
	(0.00415)	(0.0061)	(0.0064)	(0.011)	(0.0078)	(0.012)	(0.0100)
M24	-0.0511***	-0.0031	-0.097***	-0.049***	-0.12***	-0.13***	-0.11***
	(0.00421)	(0.0063)	(0.0065)	(0.011)	(0.0079)	(0.013)	(0.0099)
Gap 2		0	-0.098***	0	-0.11***	-0.100***	-0.11***
		(.)	(0.0085)	(.)	(0.0089)	(0.016)	(0.011)
M25	-0.0521***	-0.0054	-0.10***	-0.053***	-0.12***	-0.12***	-0.13***
	(0.00431)	(0.0064)	(0.0067)	(0.011)	(0.0079)	(0.012)	(0.010)
M26	-0.0557***	-0.010	-0.10***	-0.049***	-0.13***	-0.13***	-0.13***
	(0.00431)	(0.0064)	(0.0068)	(0.012)	(0.0081)	(0.013)	(0.010)
M27	-0.0544***	-0.0073	-0.096***	-0.039***	-0.12***	-0.11***	-0.13***
	(0.00437)	(0.0066)	(0.0069)	(0.012)	(0.0082)	(0.013)	(0.010)
M28	-0.0553***	-0.0054	-0.096***	-0.037**	-0.12***	-0.11***	-0.13***
	(0.00445)	(0.0065)	(0.0070)	(0.012)	(0.0082)	(0.014)	(0.010)
M29	-0.0553***	-0.0046	-0.093***	-0.041**	-0.12***	-0.097***	-0.13***
	(0.00449)	(0.0067)	(0.0071)	(0.013)	(0.0082)	(0.014)	(0.010)
M30	-0.0562***	-0.011	-0.092***	-0.046***	-0.11***	-0.095***	-0.12***
	(0.00453)	(0.0070)	(0.0072)	(0.013)	(0.0083)	(0.014)	(0.010)
M31	-0.0543***	-0.0093	-0.096***	-0.041**	-0.12***	-0.093***	-0.13***
	(0.00451)	(0.0069)	(0.0076)	(0.013)	(0.0090)	(0.015)	(0.011)
M32	-0.0530***	-0.0038	-0.094***	-0.049***	-0.11***	-0.089***	-0.12***
	(0.00459)	(0.0069)	(0.0075)	(0.013)	(0.0089)	(0.016)	(0.010)
M33	-0.0542***	-0.0028	-0.096***	-0.056***	-0.11***	-0.074***	-0.13***
	(0.00466)	(0.0072)	(0.0075)	(0.013)	(0.0089)	(0.016)	(0.011)
M34	-0.0495***	0.0021	-0.093***	-0.047***	-0.11***	-0.058***	-0.13***
	(0.00474)	(0.0070)	(0.0076)	(0.014)	(0.0089)	(0.016)	(0.011)
M35	-0.0467***	0.0050	-0.094***	-0.037**	-0.12***	-0.065***	-0.14***
	(0.00472)	(0.0070)	(0.0077)	(0.014)	(0.0090)	(0.016)	(0.011)
M36	-0.0392***	0.014	-0.092***	-0.028*	-0.12***	-0.065***	-0.14***
	(0.00471)	(0.0070)	(0.0078)	(0.013)	(0.0093)	(0.017)	(0.011)
Gap 3		0	-0.089***	0	-0.100***	0	-0.10***
		(.)	(0.011)	(.)	(0.011)	(.)	(0.012)

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1) All	(2) One	(3) Two+	(4) Two	(5) Three+	(6) Three	(7) Four+
Dependent Variable: Ln monthly electricity use							
M37	-0.0435***	0.0047	-0.092***	-0.028*	-0.12***	-0.051**	-0.14***
	(0.00480)	(0.0072)	(0.0080)	(0.013)	(0.0095)	(0.016)	(0.011)
M38	-0.0498***	0.0012	-0.097***	-0.021	-0.13***	-0.060***	-0.15***
	(0.00485)	(0.0072)	(0.0083)	(0.014)	(0.0099)	(0.017)	(0.012)
M39	-0.0475***	0.0046	-0.098***	-0.027	-0.13***	-0.062***	-0.15***
	(0.00487)	(0.0072)	(0.0082)	(0.014)	(0.0096)	(0.016)	(0.012)
M40	-0.0471***	0.0036	-0.092***	-0.025	-0.12***	-0.067***	-0.14***
	(0.00494)	(0.0072)	(0.0083)	(0.014)	(0.0099)	(0.017)	(0.012)
M41	-0.0481***	0.0063	-0.093***	-0.038*	-0.12***	-0.066***	-0.13***
	(0.00499)	(0.0073)	(0.0085)	(0.015)	(0.0099)	(0.017)	(0.012)
M42	-0.0515***	0.0021	-0.090***	-0.036*	-0.11***	-0.056**	-0.13***
	(0.00502)	(0.0074)	(0.0085)	(0.014)	(0.010)	(0.019)	(0.012)
M43	-0.0503***	0.0014	-0.086***	-0.033*	-0.11***	-0.054**	-0.13***
	(0.00504)	(0.0074)	(0.0085)	(0.014)	(0.010)	(0.019)	(0.012)
M44	-0.0500***	0.0051	-0.088***	-0.040**	-0.11***	-0.046*	-0.13***
	(0.00512)	(0.0075)	(0.0087)	(0.015)	(0.010)	(0.020)	(0.012)
M45	-0.0495***	0.0064	-0.089***	-0.038*	-0.11***	-0.038	-0.13***
	(0.00522)	(0.0075)	(0.0090)	(0.015)	(0.011)	(0.020)	(0.013)
M46	-0.0449***	0.010	-0.089***	-0.043**	-0.11***	-0.039*	-0.13***
	(0.00529)	(0.0077)	(0.0089)	(0.015)	(0.011)	(0.019)	(0.013)
M47	-0.0426***	0.010	-0.091***	-0.043**	-0.11***	-0.064**	-0.13***
	(0.00525)	(0.0077)	(0.0090)	(0.016)	(0.011)	(0.020)	(0.012)
M48	-0.0392***	0.014	-0.086***	-0.030	-0.11***	-0.074**	-0.12***
	(0.00528)	(0.0077)	(0.0093)	(0.015)	(0.011)	(0.023)	(0.013)
Gap 4		0	-0.094***	0	-0.11***	0	-0.11***
		(.)	(0.016)	(.)	(0.016)	(.)	(0.017)
M49	-0.0407***	0.0065	-0.091***	-0.029*	-0.12***	-0.084***	-0.13***
	(0.00532)	(0.0078)	(0.0091)	(0.015)	(0.011)	(0.022)	(0.013)
M50	-0.0447***	0.0063	-0.090***	-0.034*	-0.12***	-0.077***	-0.13***
	(0.00539)	(0.0079)	(0.0093)	(0.015)	(0.011)	(0.019)	(0.013)
M51	-0.0479***	0.0061	-0.083***	-0.027	-0.11***	-0.076***	-0.12***
	(0.00559)	(0.0081)	(0.0093)	(0.015)	(0.011)	(0.019)	(0.013)
M52	-0.0484***	0.0054	-0.086***	-0.029*	-0.12***	-0.074***	-0.13***
	(0.00549)	(0.0080)	(0.0095)	(0.015)	(0.012)	(0.020)	(0.014)
M53	-0.0444***	0.0077	-0.090***	-0.056**	-0.11***	-0.055**	-0.13***
	(0.00553)	(0.0082)	(0.011)	(0.021)	(0.012)	(0.019)	(0.015)

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All	One	Two+	Two	Three+	Three	Four+
Dependent Variable: Ln monthly electricity use							
M54	-0.0480***	0.010	-0.091***	-0.050**	-0.11***	-0.072**	-0.13***
	(0.00562)	(0.0080)	(0.011)	(0.016)	(0.013)	(0.027)	(0.015)
M55	-0.0475***	0.011	-0.096***	-0.055**	-0.12***	-0.047*	-0.14***
	(0.00582)	(0.0082)	(0.011)	(0.017)	(0.013)	(0.023)	(0.016)
M56	-0.0451***	0.0087	-0.096***	-0.057**	-0.12***	-0.040	-0.14***
	(0.00576)	(0.0085)	(0.011)	(0.018)	(0.014)	(0.025)	(0.016)
M57	-0.0541***	0.0012	-0.095***	-0.064***	-0.11***	-0.048	-0.13***
	(0.00590)	(0.0086)	(0.011)	(0.019)	(0.013)	(0.026)	(0.015)
M58	-0.0467***	0.0043	-0.097***	-0.059**	-0.12***	-0.070*	-0.13***
	(0.00593)	(0.0087)	(0.012)	(0.019)	(0.014)	(0.032)	(0.016)
M59	-0.0424***	0.0029	-0.10***	-0.053**	-0.13***	-0.084*	-0.14***
	(0.00593)	(0.0085)	(0.012)	(0.018)	(0.015)	(0.038)	(0.016)
M60	-0.0388***	0.012	-0.100***	-0.041*	-0.13***	-0.098**	-0.14***
	(0.00597)	(0.0086)	(0.012)	(0.018)	(0.015)	(0.037)	(0.016)
Gap 5		0	-0.099***	0	-0.11***	0	-0.12***
		(.)	(0.019)	(.)	(0.019)	(.)	(0.020)
M61	-0.0410***	0.0096	-0.092***	-0.021	-0.13***	-0.065*	-0.15***
	(0.00612)	(0.0089)	(0.012)	(0.018)	(0.014)	(0.027)	(0.017)
M62	-0.0416***	0.0095	-0.093***	-0.029	-0.13***	-0.060*	-0.15***
	(0.00617)	(0.0088)	(0.012)	(0.018)	(0.015)	(0.028)	(0.017)
M63	-0.0450***	0.0071	-0.095***	-0.027	-0.13***	-0.051	-0.16***
	(0.00625)	(0.0089)	(0.012)	(0.018)	(0.015)	(0.028)	(0.017)
M64	-0.0505***	0.0042	-0.097***	-0.027	-0.14***	-0.065*	-0.16***
	(0.00629)	(0.0091)	(0.012)	(0.018)	(0.016)	(0.031)	(0.018)
M65	-0.0472***	0.0046	-0.093***	-0.018	-0.14***	-0.051	-0.17***
	(0.00633)	(0.0092)	(0.012)	(0.017)	(0.016)	(0.026)	(0.019)
M66	-0.0468***	0.0043	-0.084***	-0.031	-0.12***	-0.041	-0.14***
	(0.00637)	(0.0092)	(0.012)	(0.018)	(0.016)	(0.028)	(0.019)
M67	-0.0521***	-0.00022	-0.071***	-0.018	-0.10***	-0.023	-0.13***
	(0.00649)	(0.0095)	(0.013)	(0.019)	(0.016)	(0.026)	(0.019)
M68	-0.0525***	0.0012	-0.080***	-0.024	-0.11***	-0.037	-0.14***
	(0.00655)	(0.0095)	(0.013)	(0.019)	(0.017)	(0.031)	(0.019)
M69	-0.0548***	-0.0036	-0.072***	-0.022	-0.10***	-0.046	-0.12***
	(0.00668)	(0.0099)	(0.013)	(0.018)	(0.017)	(0.032)	(0.020)
M70	-0.0527***	-0.00044	-0.080***	-0.039*	-0.11***	-0.076*	-0.12***
	(0.00669)	(0.0099)	(0.013)	(0.019)	(0.018)	(0.030)	(0.021)

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All	One	Two+	Two	Three+	Three	Four+
Dependent Variable: Ln monthly electricity use							
M71	-0.0455***	0.0052	-0.090***	-0.034	-0.13***	-0.083**	-0.14***
	(0.00677)	(0.0097)	(0.014)	(0.019)	(0.018)	(0.030)	(0.022)
M72	-0.0439***	0.0022	-0.10***	-0.047*	-0.14***	-0.098**	-0.15***
	(0.00687)	(0.0097)	(0.013)	(0.019)	(0.018)	(0.034)	(0.021)
Gap 6		0	-0.085**	0	-0.10***	0	-0.11***
		(.)	(0.029)	(.)	(0.029)	(.)	(0.030)
M73	-0.0432***	0.0100	-0.095***	-0.040*	-0.13***	-0.083**	-0.15***
	(0.00695)	(0.0098)	(0.013)	(0.019)	(0.017)	(0.030)	(0.020)
M74	-0.0482***	0.0022	-0.10***	-0.042*	-0.15***	-0.13***	-0.15***
	(0.00703)	(0.010)	(0.014)	(0.019)	(0.019)	(0.033)	(0.023)
M75	-0.0458***	0.0076	-0.077***	-0.026	-0.12***	-0.096**	-0.12***
	(0.00710)	(0.010)	(0.014)	(0.019)	(0.019)	(0.031)	(0.024)
M76	-0.0537***	0.0022	-0.066***	-0.0071	-0.11***	-0.080*	-0.12***
	(0.00728)	(0.010)	(0.015)	(0.022)	(0.021)	(0.033)	(0.026)
M77	-0.0510***	-0.0026	-0.067***	-0.0074	-0.12***	-0.057	-0.14***
	(0.00735)	(0.011)	(0.016)	(0.023)	(0.022)	(0.035)	(0.027)
M78	-0.0532***	-0.00018	-0.073***	-0.029	-0.11***	-0.043	-0.14***
	(0.00733)	(0.010)	(0.016)	(0.022)	(0.021)	(0.033)	(0.027)
M79	-0.0530***	0.0032	-0.077***	-0.030	-0.12***	-0.057	-0.14***
	(0.00742)	(0.010)	(0.016)	(0.022)	(0.021)	(0.031)	(0.026)
M80	-0.0570***	-0.0045	-0.075***	-0.039	-0.10***	-0.043	-0.13***
	(0.00761)	(0.011)	(0.015)	(0.022)	(0.021)	(0.035)	(0.026)
M81	-0.0539***	-0.0054	-0.080***	-0.054*	-0.095***	-0.045	-0.12***
	(0.00772)	(0.011)	(0.016)	(0.023)	(0.023)	(0.038)	(0.029)
M82	-0.0546***	-0.0033	-0.083***	-0.055**	-0.10***	-0.12*	-0.091**
	(0.00786)	(0.011)	(0.017)	(0.021)	(0.026)	(0.045)	(0.031)
M83	-0.0511***	0.0014	-0.091***	-0.056*	-0.12***	-0.099*	-0.12***
	(0.00759)	(0.011)	(0.017)	(0.024)	(0.024)	(0.044)	(0.028)
M84	-0.0445***	0.0057	-0.11***	-0.051	-0.15***	-0.13**	-0.16***
	(0.00752)	(0.010)	(0.019)	(0.030)	(0.025)	(0.043)	(0.030)
Gap 7		0	-0.14	0	-0.16	0	-0.16
		(.)	(0.10)	(.)	(0.10)	(.)	(0.10)
M85	-0.0468***	0.0039	-0.11***	-0.068*	-0.14***	-0.12**	-0.15***
	(0.00774)	(0.011)	(0.021)	(0.033)	(0.025)	(0.045)	(0.029)
M86	-0.0502***	-0.0041	-0.11***	-0.068	-0.15***	-0.12*	-0.16***
	(0.00788)	(0.011)	(0.024)	(0.036)	(0.032)	(0.047)	(0.042)

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1) All	(2) One	(3) Two+	(4) Two	(5) Three+	(6) Three	(7) Four+
Dependent Variable: Ln monthly electricity use							
M87	-0.0419***	0.0017	-0.076**	-0.031	-0.11***	-0.11*	-0.11**
	(0.00820)	(0.012)	(0.023)	(0.034)	(0.031)	(0.046)	(0.040)
M88	-0.0448***	0.013	-0.070**	-0.025	-0.11**	-0.030	-0.16***
	(0.00847)	(0.012)	(0.023)	(0.029)	(0.035)	(0.049)	(0.048)
M89	-0.0408***	0.0083	-0.050*	-0.011	-0.086*	-0.0091	-0.14**
	(0.00861)	(0.013)	(0.022)	(0.027)	(0.035)	(0.051)	(0.046)
M90	-0.0499***	0.0016	-0.053*	-0.017	-0.083*	-0.023	-0.12*
	(0.00875)	(0.013)	(0.023)	(0.030)	(0.036)	(0.053)	(0.049)
M91	-0.0641***	-0.0070	-0.073**	-0.058*	-0.068	-0.038	-0.083
	(0.00922)	(0.013)	(0.024)	(0.029)	(0.039)	(0.054)	(0.056)
M92	-0.0707***	-0.022	-0.068**	-0.060*	-0.049	-0.015	-0.069
	(0.00963)	(0.014)	(0.024)	(0.031)	(0.038)	(0.056)	(0.052)
M93	-0.0597***	-0.016	-0.067*	-0.059	-0.045	0.023	-0.10
	(0.00963)	(0.014)	(0.027)	(0.033)	(0.043)	(0.065)	(0.055)
M94	-0.0584***	-0.017	-0.069*	-0.061	-0.045	-0.020	-0.055
	(0.00963)	(0.013)	(0.029)	(0.038)	(0.044)	(0.070)	(0.050)
M95	-0.0600***	-0.012	-0.062*	-0.031	-0.086	-0.10	-0.050
	(0.00994)	(0.013)	(0.028)	(0.034)	(0.046)	(0.073)	(0.054)
M96	-0.0466***	-0.0020	-0.019	0.0084	-0.035	-0.069	0.0012
	(0.0104)	(0.015)	(0.029)	(0.034)	(0.055)	(0.10)	(0.055)
Gap 8		0	-0.38***	0	-0.40***	0	-0.41***
		(.)	(0.020)	(.)	(0.021)	(.)	(0.021)
M97	-0.0342**	0.015	-0.030	0.00095	-0.054	-0.013	-0.080
	(0.0107)	(0.015)	(0.030)	(0.035)	(0.060)	(0.10)	(0.065)
M98	-0.0499***	-0.0077	-0.018	0.031	-0.12	-0.019	-0.22**
	(0.0110)	(0.016)	(0.029)	(0.031)	(0.073)	(0.11)	(0.069)
M99	-0.0491***	-0.0077	-0.011	0.026	-0.055	-0.041	-0.039
	(0.0111)	(0.017)	(0.037)	(0.039)	(0.093)	(0.13)	(0.077)
M100	-0.0525***	-0.0084	-0.0080	0.015	0.0026	0.061	-0.057
	(0.0122)	(0.017)	(0.042)	(0.049)	(0.069)	(0.090)	(0.10)
M101	-0.0421***	-0.012	-0.018	0.018	-0.070	-0.026	-0.20***
	(0.0127)	(0.020)	(0.050)	(0.057)	(0.087)	(0.10)	(0.011)
M102	-0.0521***	-0.0087	-0.11	-0.077	-0.15	-0.12	-0.16***
	(0.0145)	(0.022)	(0.061)	(0.072)	(0.078)	(0.095)	(0.011)
M103	-0.0385*	0.018	-0.11	-0.078	-0.15	-0.18	0.15***
	(0.0191)	(0.035)	(0.068)	(0.080)	(0.099)	(0.098)	(0.011)

Table H.9: Event-Study Estimates: Selection Into Challenges

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All	One	Two+	Two	Three+	Three	Four+
Dependent Variable: Ln monthly electricity use							
M104	0.0224	-0.021	0.14	0.097	0.33***	0	0.32***
	(0.0418)	(0.032)	(0.097)	(0.099)	(0.010)	(.)	(0.011)
M105	0.0422	0.024	0.030	-0.070	0.40***	0	0.39***
	(0.0430)	(0.054)	(0.15)	(0.12)	(0.010)	(.)	(0.011)
M106	0.0797	0.041	-0.076	-0.046	0	0	0
	(0.0642)	(0.16)	(0.12)	(0.12)	(.)	(.)	(.)
M107	0.464***	0	0	0	0	0	0
	(0.00609)	(.)	(.)	(.)	(.)	(.)	(.)
M108	0	0	0	0	0	0	0
	(0.00331)	(.)	(.)	(.)	(.)	(.)	(.)
_cons	6.775***	6.78***	6.77***	6.77***	6.76***	6.77***	6.76***
	(0.00331)	(0.0037)	(0.0038)	(0.0040)	(0.0039)	(0.0041)	(0.0040)
							N
	2130468	1466749	1517749	1250749	1332230	1167230	1230230

All specifications include individual and month-of-year fixed effects. Specification (1) is all participants pooled. (2) is households that undertake a single challenge only; (3) is households that undertake two or more challenges; (4) households that undertake two challenges only; (5) households undertaking three or more challenges; (6) three challenges only; (7) Four or more challenges. Standard errors are clustered at the household level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

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