

Online Appendix: Consumers' Response to State Energy Efficient Appliance Rebate Programs

Sébastien Houde, Joseph E. Aldy*

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Our empirical strategy exploits variations across time and regions to isolate the effects of rebates. The time fixed effects are then crucial for controlling the effects of the retailer's pricing and advertising strategies. Although the retailer employed a national pricing strategy, one concern is that store managers in some states systematically deviated from the national strategy such that promotions and marketing efforts are correlated with the implementation of the rebate programs.

The national pricing strategy is illustrated in Figures A.4 and A.5 that show the median prices of the most popular refrigerator models for two major brands.¹ Each panel plots the weekly variation in price for a specific model of a specific brand. For each brand, we show the weekly variation for the nine most popular models offered by this brand. We use the sales rank during the period 2008-2012 as our measure of popularity. The red line corresponds to the median change in price relative to the average price over the lifetime of the product, where the median is taken across zip codes. That is, we computed week-zip code-specific changes in price for each model and then plotted the median of the weekly changes for a specific model. The grey band identifies the 25th and 75th percentile of these weekly changes in price. By presenting various quantiles of the distribution of weekly changes, we show that the local store managers comply with the national pricing policy; for the vast majority of weeks the 25th and 75th percentiles perfectly coincide with the median. Discrepancies occur

*Houde: Department of Agricultural and Resource Economics, University of Maryland; 2222B Symons Hall. College Park, MD 20742 (e-mail: shoude@umd.edu); Aldy: John F. Kennedy School of Government, Harvard University; Resources for the Future; National Bureau of Economic Research; Center for Strategic and International Studies; Harvard Kennedy School, 79 JFK Street, Mailbox 57, Cambridge, MA 02138 (e-mail: Joseph_Aldy@hks.harvard.edu). We first would like to thank Hasan Nazar, who worked on this project during his studies and as a research assistant at Harvard. We thank Carlos Paez for his excellent research assistance as well. We thank Chris Cloutier, Brandon Hurlbut, Lani MacRae, Susanne Rivera, and Toby Swope for assistance with the DOE SEEARP data. We would also like to thank Kenneth Gillingham, Lucas Davis, and two referees, in addition to numerous seminar participants at Harvard, the Stanford Institute of Theoretical Economics, and the AERE summer conference in Banff for feedback on earlier drafts of this paper.

¹Brand names are anonymized to keep the confidentiality of the data. Similar patterns are found for other brands, but not shown here.

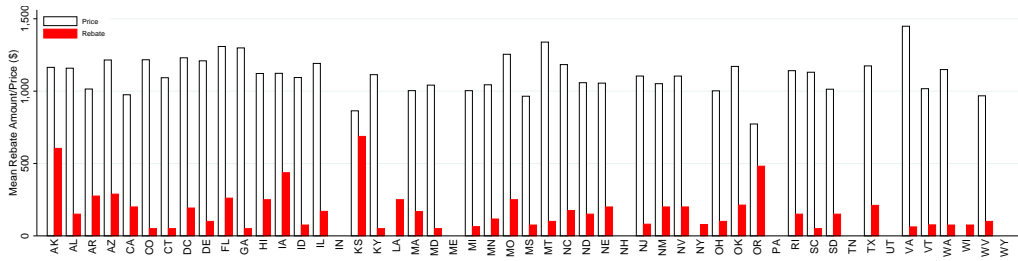
mostly at the time of large price changes, which suggests some stickiness of in-store prices surrounding those events.

Given that store managers comply with the national pricing strategy, we find that the week-year fixed effects do well in controlling for the variation in prices. Figure A.6 compares the ES market shares with normalized market shares, which are the residuals of a regression of market shares on week-year and state fixed effects. If the week-year fixed effects were to capture most of the temporal variation that is attributable to prices, we should expect that the normalized market shares in states that did not offer rebates for a given appliance category would be tightly concentrated around zero. This is exactly what we observe.

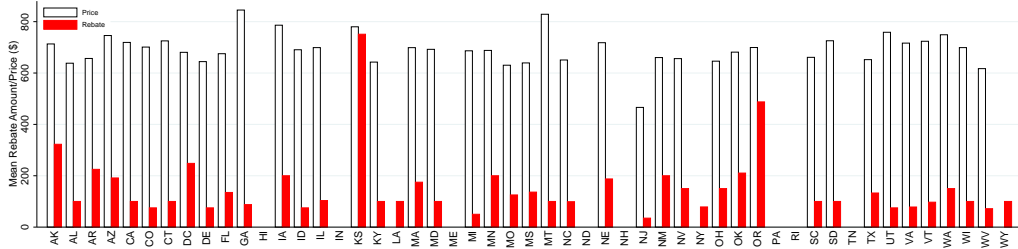
Below, we investigate alternative specifications that further validate the difference-in-differences strategy. First, we use the micro-data directly and control for demographics. Adding demographics allows us to account for changes in the composition of consumers going to the retailer's stores caused by the recession, which program administrators may have forecasted. For instance, program administrators in states where low-income households were hard hit by the recession may have decided to offer more generous rebates to attract these consumers to appliance stores. By controlling for demographics, income for instance, we are estimating the effect of rebates holding household composition fixed. To implement this estimator, we add to Equation ?? a vector of household-specific demographics that includes income, education, age of the head of the household, family size, political orientation, type of housing, and a home ownership dummy. Table A.4 shows the results where the dependent variable is the log of the expected energy use of the appliance purchased by each household. Overall, the results are similar to the main results relying on week-state averages. This suggests that changes in household composition are not an important source of endogeneity.

Second, Table A.5 presents results where we include state-specific pre-announcement linear time trends in addition of the state-year fixed effects. This has little impact on the estimates. In general, we find little evidence that time-varying unobservables at the state level are an important concern in this context. As shown on Table A.6, using state fixed effects, instead of state-year fixed effects, leads to similar results.

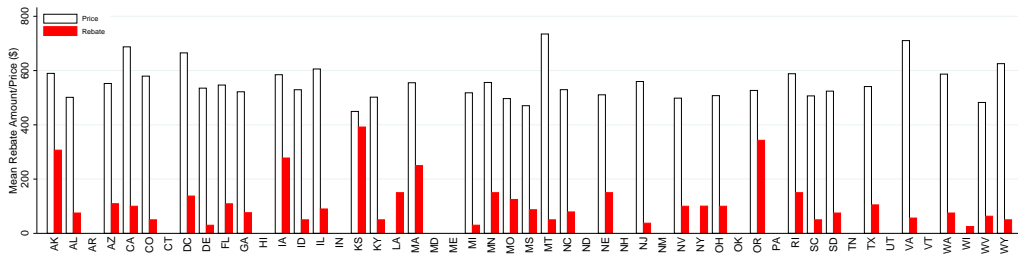
In the last specification test that we present (Table A.7), we exclude five states from the analysis: Florida, Iowa, Illinois, North Carolina, and Oregon. Iowa was excluded because the DOE data revealed that several claims differed drastically from the program guidelines. We found 375 instances of rebate claims covering 90% of the appliance cost and exceeding \$1,000. Other states were excluded because they offered ad valorem rebates. For these states, using the average rebate amount then leads to measurement error. Performing the estimation without these five states leads to qualitatively similar results for all three appliance categories.



(a) Refrigerators



(b) Clothes Washers



(c) Dishwashers

Figure A.1: Average Price vs. Rebate Amount

Each panel shows the average price of the appliance purchased (in white) and the average rebate amount claimed (in red). States with no average price but a positive rebate amount are states where program managers did not collect price information. States where both price and rebate information are missing did not offer rebates for this particular appliance.

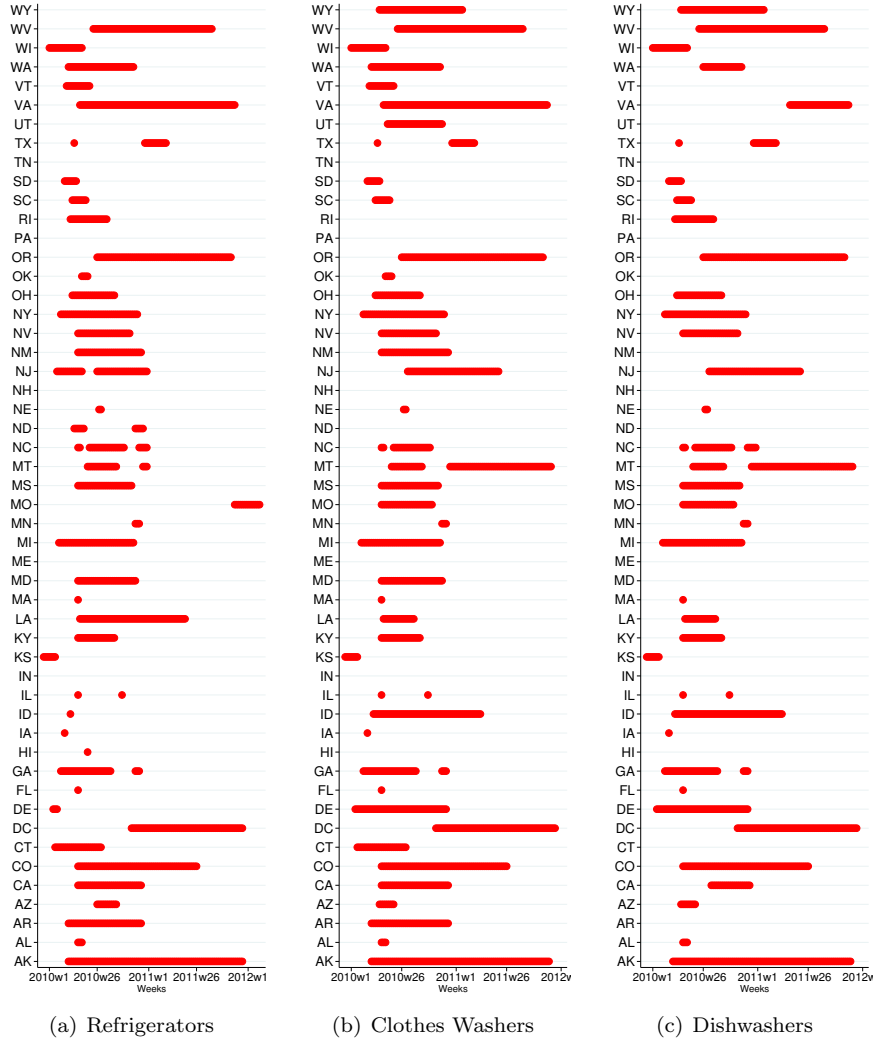


Figure A.2: Timing of Active Rebate Programs

Each panel identifies the weeks that a state rebate program was active for specific appliance category.

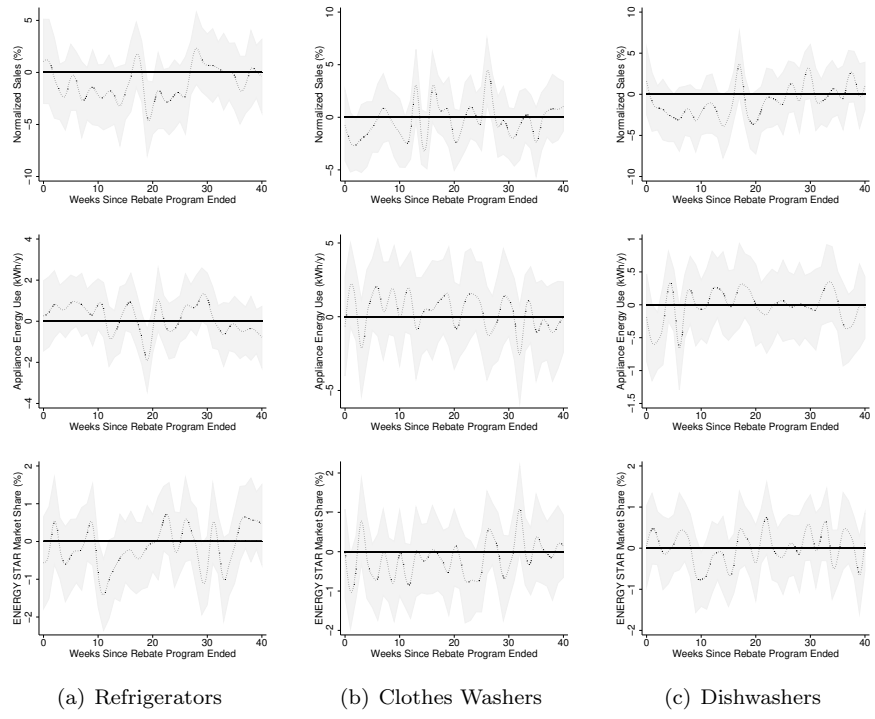


Figure A.3: Sales, Energy Efficiency, and ENERGY STAR Market Share: Post-Rebate Period

The figure shows normalized sales, expected appliance energy use (kWh/y), and ES market share. All three outcome variables are normalized using a regression that removes week-of-sample and state-year fixed effects. The figure presents a fitted spline and the 95% confidence interval. The X-axis corresponds to the number of weeks after a rebate program ended.

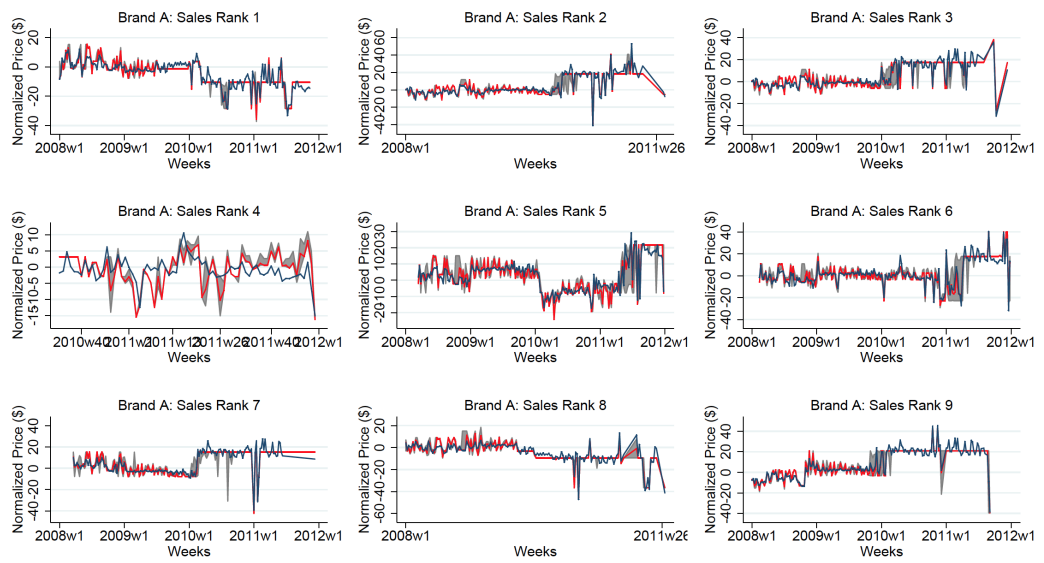


Figure A.4: Temporal and Cross Store Variation in Promotional Price, Nine Refrigerators of Brand A

Notes: The red line shows the normalized prices of the nine most popular refrigerator models offered by Brand A. The gray shaded are corresponds to the 25th and 75th percentile of the normalized price distribution. The blue line is the median price after controlling for brand-week-of-sample fixed effects.

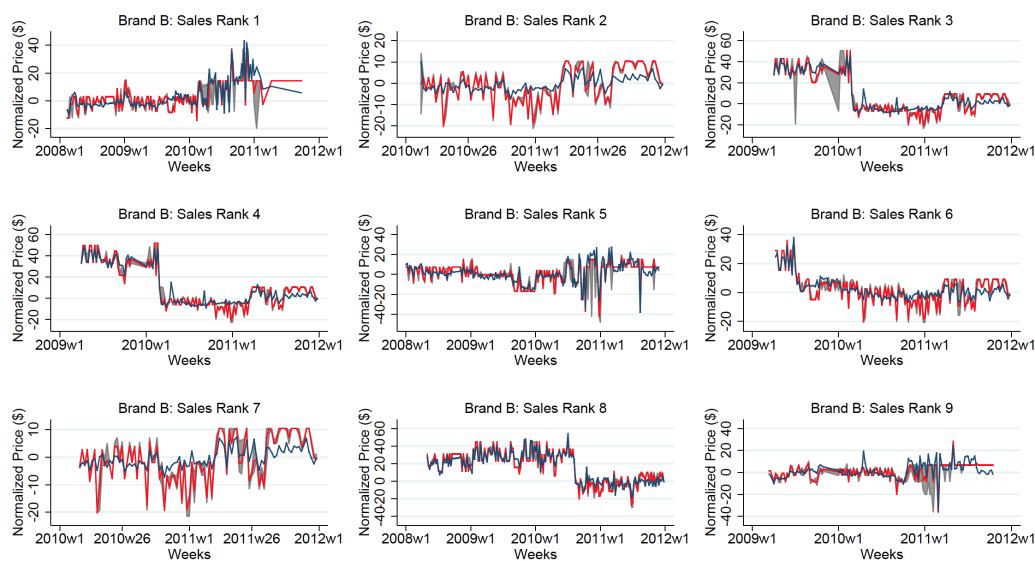
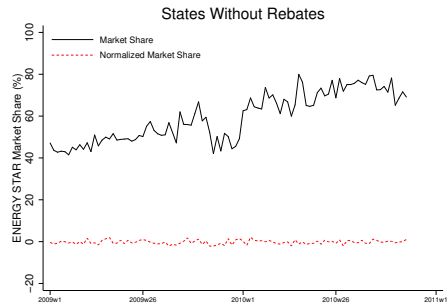
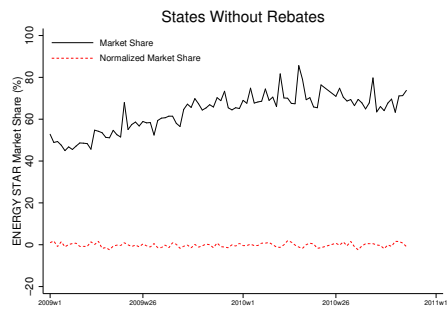


Figure A.5: Temporal and Cross Store Variation in Promotional Price, Nine Refrigerators of Brand B

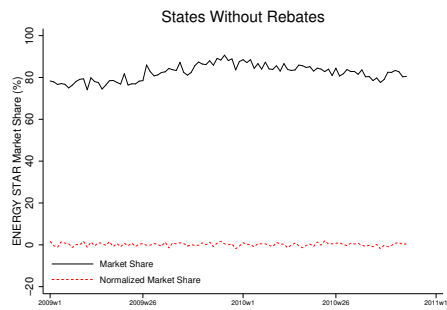
Notes: The red line shows the normalized prices of the nine most popular refrigerator models offered by Brand B. The gray shaded area corresponds to the 25th and 75th percentile of the normalized price distribution. The blue line is the median price after controlling for brand-week-of-sample fixed effects.



(a) Refrigerators



(b) Clothes Washers



(c) Dishwashers

Figure A.6: ES Market Shares vs. Normalized Market Shares, States Without Rebates

Each panel shows the weekly ES market share for all states that did not offer rebates and the corresponding normalized market shares. Normalized market shares are the residuals of a regression of market shares on state and week-year fixed effects. The figure shows that, for states without rebates, the fixed effects capture most of the variations in market shares.

Table A.1: External Validity

	Retailer	Other Retailers	t-statistics
Refrigerators			
Price	1154	1083	25.17
Rebate	180	135	98.84
kWh	480	456	60.92
Size	22	20	14.46
Clothes Washers			
Price	699	674	24.41
Rebate	114	113	4.66
kWh	160	175	-48.92
Size	4	4	0.63
Dishwashers			
Price	554	543	7.64
Rebate	116	85	86.97
kWh	160	174	-1.54
Size	4	4	0.05

Notes: Using the DOE data alone, this table compares the average price, rebate amount, kWh purchased, and size of the appliances purchased at our retailer (retailer from which we collected transaction level data) versus all other retailers. Note that some states did not record the retailer where the purchase was made.

Table A.2: External Validity: Consumers

	Retailer	Others
Median Household Income	68089 (26118.0)	66701 (25308.2)
Median Age in Years	39.2 (6.359)	39.4 (6.249)
Average Household Size	2.7 (0.444)	2.7 (0.420)
Female Population Share	50.9 (2.390)	51.0 (2.390)
White Population Share	75.3 (19.16)	77.0 (19.22)
Black Population Share	7.8 (11.77)	7.7 (11.98)
Hispanic Population Share	18.6 (19.03)	14.9 (16.83)
Homeowner Share	67.4 (15.38)	68.0 (16.00)
Below Poverty Line Share	11.9 (7.497)	12.0 (7.634)
High School Graduate Share	29.0 (9.641)	29.1 (9.806)
College Graduate or Above	11.6 (8.899)	12.1 (9.106)
Observations	135678	450581

Table A.3: The Time-Varying Marginal Effect of Rebates

Dep. Var.:	Refrigerators		Clothes Washers		Dishwashers	
	log(sales)	log(kWh)	log(sales)	log(kWh)	log(sales)	log(kWh)
Rebate Period						
Rebate×Wk. 1	0.14* (0.053)	-0.0025** (0.001)	0.10* (0.048)	-0.01 (0.006)	0.21** (0.076)	-0.00096 (0.001)
Rebate×Wks. 2-3	0.059** (0.024)	-0.0020* (0.001)	0.049** (0.021)	-0.0069 (0.004)	0.065 (0.036)	-0.00093 (0.001)
Rebate×Wks. 4-6	-0.0055 (0.018)	-0.00079 (0.001)	-0.0033 (0.016)	-0.0025 (0.002)	0.006 (0.013)	0.00082 (0.001)
Rebate×Wks. 7-9	-0.012 (0.018)	0.00022 (0.001)	0.0055 (0.019)	0.000071 (0.002)	-0.008 (0.011)	0.000027 (0.000)
Rebate×Wks. 10+	0.0038 (0.014)	-0.00076 (0.001)	0.0075 (0.016)	0.002 (0.002)	0.0027 (0.011)	0.0002 (0.001)
Pre-Rebate Period						
Rebate×1 Wk. Pre	-0.039* (0.017)	0.001 (0.001)	-0.049** (0.018)	0.0027 (0.002)	-0.044 (0.027)	-0.00022 (0.001)
Rebate×2-3 Wks. Pre	-0.022 (0.011)	0.00051 (0.001)	-0.017 (0.011)	0.0061* (0.003)	-0.036* (0.015)	0.0011 (0.001)
Rebate×4-6 Wks. Pre	-0.026* (0.012)	0.00031 (0.001)	-0.012 (0.012)	0.0027 (0.001)	-0.024 (0.016)	0.00066 (0.001)
Rebate×7-9 Wks. Pre	-0.030*** (0.007)	0.0012 (0.001)	-0.0093 (0.008)	0.0012 (0.001)	-0.030** (0.009)	0.00021 (0.000)
Rebate×10+ Wks. Pre	0.0034 (0.006)	-0.0003 (0.001)	0.0038 (0.008)	0.0013 (0.001)	-0.0027 (0.005)	0.00045 (0.000)
Post-Rebate Period						
Rebate×1 Wk. Post	0.0074 (0.023)	-0.00056 (0.001)	-0.0078 (0.018)	-0.0023 (0.004)	0.018 (0.027)	-0.00033 (0.001)
Rebate×2-3 Wks. Post	-0.0048 (0.015)	0.000029 (0.001)	-0.006 (0.015)	0.0067* (0.003)	-0.0056 (0.018)	-0.0011 (0.001)
Rebate×4-6 Wks. Post	-0.02 (0.018)	0.00009 (0.001)	-0.0049 (0.017)	0.0036 (0.002)	-0.026 (0.014)	0.0003 (0.000)
Rebate×7-9 Wks. Post	-0.022 (0.021)	0.00082 (0.001)	-0.0044 (0.018)	0.0049 (0.003)	-0.033 (0.017)	0.00025 (0.001)
Rebate×10+ Wks. Post	-0.026 (0.017)	-0.00023 (0.001)	-0.016 (0.018)	0.0059* (0.003)	-0.036* (0.015)	0.00093 (0.001)
# Obs.	12450	12450	12100	12100	12600	12600
R ²	0.996	0.901	0.996	0.936	0.995	0.989
# Clusters	50	50	50	50	50	50

Notes: All specifications have state-year fixed effects and week-of-sample fixed effects. The dummy variable for the pre-announcement period is omitted. The rebate amount is measured in hundred of dollars. Standard errors (in parentheses) clustered at the state level. * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$).

Table A.4: The Marginal Effect of Rebates on Appliance Energy Efficiency: Micro-Data and Controlling for Demographics

	Refrigerators	Clothes Washers	Dishwashers
Rebate Period Only	-0.0017*** (0.0005)	-0.0089 (0.005)	-0.00092 (0.001)
Rebate Period, 2 Mos. Pre, 2 Wks. Post	-0.00068* (0.0003)	-0.0033 (0.002)	-0.0011 (0.001)
Time-Varying Effect of Rebates			
Rebate Period			
Rebate × Wk. 1	-0.0024 (0.0013)	-0.054*** (0.0077)	-0.0041 (0.0029)
Rebate × Wks. 2-3	-0.00011 (0.0021)	-0.018* (0.0074)	-0.0018 (0.0007)
Rebate × Wks. 4-6	-0.00051 (0.0006)	-0.0012 (0.0032)	-0.00067 (0.0007)
Rebate × Wks. 7-9	-0.0013 (0.0011)	0.0013 (0.0034)	-0.0011 (0.0007)
Rebate × Wks. 10+	-0.0017 (0.0011)	0.0011 (0.0032)	-0.0009 (0.0006)
Pre-Rebate Period			
Rebate × 1 Wk. Pre	0.0015 (0.0009)	0.0062* (0.0028)	-0.0001 (0.0011)
Rebate × 2-3 Wks. Pre	0.0012 (0.0011)	0.0047 (0.0040)	0.0032 (0.0007)
Rebate × 4-6 Wks. Pre	0.00091 (0.0009)	0.0042** (0.0015)	-0.00024 (0.0006)
Rebate × 7-9 Wks. Pre	0.0019 (0.0011)	0.0038 (0.0026)	-0.0000039 (0.0005)
Rebate × 10+ Wks. Pre	-0.00012 (0.0007)	-0.00031 (0.0013)	0.0016 (0.0006)
Post-Rebate Period			
Rebate × 1 Wk. Post	0.0002 (0.0011)	0.0038 (0.0040)	-0.0062 (0.0034)
Rebate × 2-3 Wks. Post	-0.0015 (0.0010)	0.0019 (0.0038)	-0.0016 (0.0009)
Rebate × 4-6 Wks. Post	0.00012 (0.0010)	0.0043* (0.0018)	-0.00057 (0.0007)
Rebate × 7-9 Wks. Post	0.00067 (0.0008)	0.0043 (0.0025)	-0.000093 (0.0007)
Rebate × 10+ Wks. Post	0.000084 (0.0007)	0.0073* (0.0028)	0.00036 (0.0005)

Notes: All specifications have state-year fixed effects, week-of-sample fixed effects, and controls for demographics. The dummy variable for the pre-announcement period is omitted. The rebate amount is measured in hundred of dollars. Standard errors (in parentheses) clustered at the state level. * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$).

Table A.5: The Marginal Effect of Rebates on Sales, Appliance Energy Efficiency, and ES Market Share with Pre-Announcement Linear Time Trends

Dep. Var.:	Rebate Period Only		Rebate Period, 2 Months Pre, 2 Weeks Post		Rebate Period, 3 Months Pre, 3 Months Post				
	log(sales)	log(kWh)	ES	log(sales)	log(kWh)	ES	log(sales)	log(kWh)	ES
Refrigerators									
Est.	0.10***	-0.0037**	0.020***	0.012	-0.00013	0.0021	0.0065	0.00021	-0.0014
s.e.	(0.020)	(0.001)	(0.005)	(0.007)	(0.0003)	(0.002)	(0.006)	(0.0005)	(0.0013)
# Obs	12450	12450	12450	12450	12450	12450	12450	12450	12450
R ²	0.996	0.903	0.917	0.995	0.902	0.916	0.995	0.902	0.916
Clothes Washers									
Est.	0.069***	-0.017***	0.021***	0.0099**	-0.0017	0.00092	0.0044	0.00017	-0.00098
s.e.	(0.015)	(0.004)	(0.005)	(0.003)	(0.001)	(0.001)	(0.005)	(0.001)	(0.0012)
# Obs	12100	12100	12100	12100	12100	12100	12100	12100	12100
R ²	0.996	0.936	0.918	0.996	0.936	0.917	0.996	0.936	0.917
Dishwashers									
Est.	0.098***	-0.00049	0.0073**	0.023**	-0.000092	0.00034	-0.00023	-0.00012	-0.00029
s.e.	(0.018)	(0.000)	(0.003)	(0.008)	(0.0003)	(0.001)	(0.009)	(0.0003)	(0.0017)
# Obs	12600	12600	12600	12600	12600	12600	12600	12600	12600
R ²	0.995	0.989	0.767	0.995	0.989	0.767	0.995	0.989	0.767

Notes: The dummy variable for the pre-announcement period is omitted. The rebate amount is measured in hundred of dollars. Standard errors (in parentheses) clustered at the state level. * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$). All specifications have week-of-sample, state-year fixed effects and state-specific pre-announcement linear time trends.

Table A.6: The Marginal Effect of Rebates on Sales, Appliance Energy Efficiency, and ES Market Share with State Fixed Effects

Dep. Var.:	Rebate Period Only			Rebate Period, 2 Months Pre, 2 Weeks Post			Rebate Period, 3 Months Pre, 3 Months Post		
	log(sales)	log(kWh)	ES	log(sales)	log(kWh)	ES	log(sales)	log(kWh)	ES
Refrigerators									
Est.	0.058***	-0.0019*	0.0079	0.0076*	-0.00013	0.001	0.0062	-0.000047	-0.00034
s.e.	(0.014)	(0.001)	(0.005)	(0.003)	(0.0002)	(0.001)	(0.005)	(0.0003)	(0.0010)
# Obs	12450	12450	12450	12450	12450	12450	12450	12450	12450
R^2	0.995	0.878	0.897	0.995	0.878	0.897	0.995	0.878	0.897
Clothes Washers									
Est.	0.032**	-0.015***	0.013**	0.0045*	-0.0038**	-0.00013	0.0036	-0.0026	-0.0013
s.e.	(0.012)	(0.004)	(0.004)	(0.002)	(0.001)	(0.001)	(0.003)	(0.002)	(0.0013)
# Obs	12100	12100	12100	12100	12100	12100	12100	12100	12100
R^2	0.996	0.915	0.902	0.996	0.914	0.901	0.996	0.914	0.901
Dishwashers									
Est.	0.051***	-0.00082	0.0042	0.0095**	-0.00033*	-0.0013	0.0028	-0.00035	-0.0015
s.e.	(0.012)	(0.001)	(0.004)	(0.003)	(0.0002)	(0.002)	(0.004)	(0.0002)	(0.0022)
# Obs	12600	12600	12600	12600	12600	12600	12600	12600	12600
R^2	0.994	0.985	0.722	0.994	0.985	0.722	0.994	0.985	0.722

Notes: The dummy variable for the pre-announcement period is omitted. The rebate amount is measured in hundred of dollars. Standard errors (in parentheses) clustered at the state level. * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$). All specifications have week-of-sample and state fixed effects.

Table A.7: The Marginal Effect of Rebates on Sales, Appliance Energy Efficiency, and ES Market Share without Problematic States

Dep. Var.:	Rebate Period Only			Rebate Period, 2 Months Pre, 2 Weeks Post			Rebate Period, 3 Months Pre, 3 Months Post		
	log(sales)	log(kWh)	ES	log(sales)	log(kWh)	ES	log(sales)	log(kWh)	ES
Refrigerators									
Est.	0.093***	-0.0037***	0.022***	0.014	-0.00043	0.0035	0.0072	0.000036	0.00037
s.e.	(0.021)	(0.001)	(0.005)	(0.009)	(0.0004)	(0.003)	(0.005)	(0.0005)	(0.0012)
# Obs	11205	11205	11205	11205	11205	11205	11205	11205	11205
R ²	0.995	0.898	0.911	0.995	0.898	0.91	0.995	0.898	0.910
Clothes Washers									
Est.	0.060***	-0.018***	0.022***	0.010*	-0.0023	0.0012	0.0044	-0.00036	-0.00027
s.e.	(0.017)	(0.004)	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.001)	(0.0011)
# Obs	10890	10890	10890	10890	10890	10890	10890	10890	10890
R ²	0.996	0.933	0.913	0.996	0.933	0.913	0.996	0.933	0.912
Dishwashers									
Est.	0.090***	-0.00066	0.0067*	0.028**	-0.00029	0.000017	-0.0015	-0.00041	0.00012
s.e.	(0.018)	(0.0005)	(0.003)	(0.010)	(0.0005)	(0.001)	(0.006)	(0.0003)	(0.0012)
# Obs	11340	11340	11340	11340	11340	11340	11340	11340	11340
R ²	0.995	0.988	0.76	0.995	0.988	0.76	0.995	0.988	0.760

Notes: The dummy variable for the pre-announcement period is omitted. The rebate amount is measured in hundred of dollars. Standard errors (in parentheses) clustered at the state level. * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$). All specifications have week-of-sample and state fixed effects.

Table A.8: Impact of Program Characteristics on Appliance Energy Efficiency

	Dependent Variable: Percentage Energy Savings in Each State		
	Refrigerators	Clothes Washers	Dishwashers
Rebate Amount (\$)	-0.0037 (0.0019)	0.024*** (0.0041)	0.0010* (0.00038)
Duration (weeks)	0.0020 (0.0015)	-0.0039 (0.0042)	0.00025 (0.00028)
Advalorem=1	1.60 (0.84)	-2.74 (2.03)	-0.36* (0.13)
Online=1	-0.036 (0.55)	1.16 (1.20)	-0.021 (0.083)
Reservation System=1	-0.21 (0.52)	-1.18 (1.19)	0.050 (0.081)
Recycling Requirement=1	-0.30 (0.57)	0.053 (1.36)	0.24* (0.091)
Recycling Incentive=1	0.56 (0.76)	-0.082 (1.76)	0.010 (0.11)
Eligibility Criteria=2	1.34 (0.95)	-1.81 (3.73)	0.41 (0.22)
Eligibility Criteria=3	1.32 (1.20)	-1.37 (3.94)	0.41 (0.23)
Eligibility Criteria=4	0.64 (1.45)	-1.69 (3.98)	0.55* (0.24)
# Obs.	42	42	36
R^2	0.332	0.611	0.621

Notes: The dependent variable is the average energy savings in each state measured in percentage. The rebate amount is measured in hundred of dollars. A positive estimate means that a “feature” increases savings. For instance, increasing the rebate amount for clothes washers from \$0 to \$100 increases savings by 2.4%. The savings were estimated over the rebate period, two months before the start of the rebate period, and two Wks. Post the end of the rebate period. The dummy “advalorem” takes the value one when ad valorem rebates are offered. The dummy “online” takes the value one if rebates could be claimed online. The dummy “reservation system” is zero if consumers had to buy then apply, and takes the value one if reservations were allowed. The eligibility criteria are coded as follows: (1) ES (omitted), (2) ES baseline with marginal rebate increases for higher efficiency, (3) more efficient than ES, and (4) more efficient than ES baseline with marginal rebate increases for higher efficiency. Standard errors in parentheses. * ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$)

Table A.9: DOE's C4A Energy Savings Estimates

	kWh/y saved (D&R)	$kWh/y^{ES} - kWh/y^{Non-ES}$ (NPD, non-sales weighted)	$kWh/y^{ES} - kWh/y^{Non-ES}$ adjusted: 5-year Accelerated Replacement	% Freeriders No. Accelerated Replacement	% Freeriders 5-year Accelerated Replacement
Refrigerator	116	65	97	< 0%	< 0%
Washer	257	201	344	< 0%	25%
Dishwasher	57	34	82	< 0%	30%

Notes: Sources: Department of Energy (DOE), D&R International (2013), and NPD Marketing Group. The difference in average electricity consumption between ES and non-ES models ($kWh/y^{ES} - kWh/y^{Non-ES}$) is the difference observed in the choice set of the NPD data for the years 2010-2011 (Table A.10). The adjustment for the accelerated replacement uses the sales-weighted average electricity consumption purchased in the year 2001 observed in the NPD data. For refrigerators, the 2001 average is obtained directly from the DOE data that provide information on the appliances replaced.

Table A.10: Cost-Effectiveness Analysis

	Δ kWh/y	Rebate (\$)	Cost-Effectiveness (\$/kWh saved)						
			Proportion of Inframarginal Consumers		Non-Switchers		92%		
			0%	25%	50%	70%	85%	90%	92%
Refrigerators									
ES vs. Non-ES	-65	128	0.09	0.12	0.18	0.29	0.59	0.88	1.10
Top 5% vs. Bottom 95%	-183	128	0.04	0.05	0.08	0.13	0.26	0.39	0.48
Top 10% vs. Bottom 90%	-165	128	0.04	0.06	0.09	0.14	0.28	0.43	0.53
Top 20% vs. Bottom 80%	-142	128	0.05	0.07	0.10	0.16	0.33	0.49	0.62
Clothes Washers									
ES vs. Non-ES	-201	107	0.02	0.03	0.04	0.07	0.14	0.21	0.26
Top 5% vs. Bottom 95%	-115	107	0.02	0.03	0.05	0.08	0.15	0.23	0.29
Top 10% vs. Bottom 90%	-116	107	0.02	0.03	0.05	0.08	0.15	0.23	0.29
Top 20% vs. Bottom 80%	-121	107	0.02	0.03	0.05	0.08	0.16	0.23	0.29
Dishwashers									
ES vs. Non-ES	-34	84	0.07	0.09	0.14	0.23	0.46	0.68	0.85
Top 5% vs. Bottom 95%	-108	84	0.03	0.05	0.07	0.11	0.23	0.34	0.43
Top 10% vs. Bottom 90%	-83	84	0.00	0.05	0.08	0.14	0.27	0.41	0.51
Top 20% vs. Bottom 80%	-57	84	0.00	0.07	0.10	0.17	0.35	0.52	0.65

Notes: The rebate amount for each appliance category is the non-weighted average of the rebate amount offered by each state. The estimates in bold correspond to the proportions of free riders and non-switchers estimated (Table ??). For all appliances, we assume a lifetime of 15 years.

Table A.11: Cost-Effectiveness Analysis: No Adjustment for Accelerated Replacement

	Δ kWh/y	Rebate (\$)	Cost-Effectiveness (\$/kWh saved)						
			0%	25%	50%	70%	85%	90%	92%
Refrigerators									
ES vs. Non-ES	-65	128	0.13	0.18	0.26	0.44	0.88	1.31	1.64
Top 5% vs Bottom 95%	-183	128	0.05	0.06	0.09	0.16	0.31	0.47	0.58
Top 10% vs Bottom 90%	-165	128	0.05	0.07	0.10	0.17	0.34	0.52	0.65
Top 20% vs Bottom 80%	-142	128	0.06	0.08	0.12	0.20	0.40	0.60	0.75
Clothes Washers									
ES vs. Non-ES	-201	107	0.04	0.05	0.07	0.12	0.24	0.35	0.44
Top 5% vs. Bottom 95%	-115	107	0.06	0.08	0.12	0.21	0.41	0.62	0.78
Top 10% vs. Bottom 90%	-116	107	0.06	0.08	0.12	0.20	0.41	0.61	0.77
Top 20% vs. Bottom 80%	-121	107	0.06	0.08	0.12	0.20	0.39	0.59	0.74
Dishwashers									
ES vs. Non-ES	-34	84	0.16	0.22	0.33	0.55	1.10	1.65	2.06
Top 5% vs. Bottom 95%	-108	84	0.05	0.07	0.10	0.17	0.35	0.52	0.65
Top 10% vs. Bottom 90%	-83	84	0.07	0.09	0.13	0.22	0.45	0.67	0.84
Top 20% vs. Bottom 80%	-57	84	0.10	0.13	0.20	0.33	0.65	0.98	1.23

Notes: The rebate amount for each appliance category is the non-weighted average of the rebate amount offered by each state. The estimates in bold correspond to the proportions of freeiders and non-switchers estimated (Table ??). For all appliances, we assume a lifetime of 15 years.