Code and Programs

Promoting Sales of Energy Efficient Household Appliances: Outcomes and Cost Effectiveness of Rebate Programs

September 19, 2023

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1 Data Sources

1.1 Unit Sales and Price Data (GfK)

The data set is provided by the market research company Gesellschaft für Konsumforschung (GfK) Retail and Technology GmbH headquartered in Nuremberg, Germany. For contact details, see https://www.gfk.com/en-us/home. Due to a non-disclosure agreement and the proprietary nature of the data, the data set for this project cannot be made publicly available. Interested researchers can request the data directly from the company subject to the company's approval and conditions. The specific data we are working with is GfK's POS Retailer Panel for major domestic appliances, specifically white goods (Gesellschaft für Konsumforschung Retail and Technology GmbH).

1.2 Administrative Data on Eligible Products in Hungary and Austria (Washing Machines)

This data is contained in three data files `Eligible WM Austria.dta` (original file Austria_Eligible WM.xlsx), `Treated models HU RFGFRZ 2016.dta` (original file Qualifying FRZandRG_2016.xlsx) and `Treated models HU WM 2015.dta` (original file QualifyingWM_2015.xlsx), which were downloaded from the respective subsidies' web sites (in excel form, web sites are no longer operational as programs have expired). These six files are uploaded in the data repository, and contain model numbers of eligible products, and for Hungary, a number of other characteristics as well.

1.3 Administrative Data on Subsidy Disbursement and Replaced Appliances

Two files were provided to us by the Austrian subsidy administrator: `Austria Admin Data FF2010.dta` and `Austria Admin Data WM2010.dta`, regarding the Austrian refrigerator&freezer program in 2010 and the Austrian washing machine program in 2010. At the request of the subsidy administrator, we cannot make this data available. The variables contained in the data sets are summarized in the notes to Figures F.2 and F.3 in the Online Appendix, which are generated using the above data. Importantly, we use the median age of recycled appliances from these administrative databases to model how long an appliance is likely to stay in the household in our calculation of programs' costs and energy savings. These median statistics are reported in Table 1 in the manuscript.

1.4 Generation of Estimation Sample

The estimation sample used in the paper is a combination of four data sets: The raw data as provided by GfK GmbH is called `Full Subsidy Data.dta`. This data cannot be made available due to its proprietary nature. The data is merged by model number and country with `Eligible WM Austria.dta`, `Treated models HU RFGFRZ 2016.dta` and `Treated models HU WM 2015.dta`. These files contain an administrative list of eligible products for the Austrian washing machine program in 2010, the Hungarian refrigerator&freezer program in 2016, and the Hungarian washing machine program in 2015, respectively. Products' treatment status for these three programs is therefore determined by identifying specific models eligible for a subsidy within the GfK data, where the identification relies on model numbers as listed in administrative databases. For the remaining programs, treatment is determined by the energy label of the products, which is the sole criterion used to define eligibility. The do-file `Identifying_Treated_Models.do` performs the merge as described above, generates program-specific treatment indicators as well as country-date specific indicators for the subsidy months and months around the subsidy period. The do-file performs a minimal clean of the data (e.g. negative price and unit sales are replaced with missing values) and removes products, which are sold in only one country as the paper's identification strategy relies on comparison of the sales/prices of subsidized products in one country relative to the same product in other countries. After performing all of the above steps, the data is saved as

`Estimation Sample.dta`, which is the estimation sample used in generating all estimates in the paper.

2 Code

All programming and data work for this paper was performed using STATA statistical software.

2.1 Variables

The data set contains the following variables:

1. Product category (refrigerator, freezer, washing machine).
2. Unit sales: Sum of unit sales over all retailers for a given product in a given country, monthly frequency.
3. Price: Sales-weighted prices, monthly frequency.
4. ID: Product-specific identifier over time and across countries.
5. Month.
6. Year.
7. Country: Austria, Germany, Hungary, Poland, Czech Republic, Croatia, Slovenia, Serbia.
8. Specific characteristics that vary per product category: These are described in detail in Table C.1 of the Online Appendix to the manuscript. The two most important characteristics we make use of are a product's energy label and model number. These two features are essential to determining the treatment status of a product within a given program.

2.2 Stata "∗.do" Files for Tables and Figures

1. `Descriptive_Statistics.do`: This do file generates Tables C.2 and C.3 in the Online Appendix.
2. `Comparison_Subsidized_All.do`: This do file generates Table C.5 in the Online Appendix.
3. `Identifying_Treated_Models.do`: Apart from generating the estimation sample as described above, this do-file also generates some descriptive statistics, which are summarized in Tables C.4 and C.6 in the Online Appendix.

4. AT_Program_Estimates.do: This do file generates Table 2 in the main text, Tables D.1, D.2, and D.3 in the Online Appendix, columns (1)-(6) in Table D.11 in the Online Appendix, as well as rows (1), (2), and (4) in Table 3 in the main text, rows (1), (2), and (4) in Table 4 in the main text, and rows (1), (2), and (4) in Table 5 of the main text. All estimates pertain to the Austrian programs.

5. HU_Program_Estimates.do The do file generates Tables D.4, D.5, D.6, and D.7 in the Online Appendix, Columns (7)-(10) in Table D.11 in the Online Appendix, as well as rows (3) and (7) in Table 3 in the main text, rows (3) and (7) in Table 4 in the main text, and rows (3) and (7) in Table 5 in the main text. All estimates pertain to the Hungarian programs.

6. HR_Program_Estimates.do: This do file generates Tables D.8 and D.9 in the Online Appendix, columns (11)-(14) in Table D.11 in the Online Appendix, as well as rows (5) and (6) in Table 3 in the main text, rows (5) and (6) in Table 4 in the main text, and rows (5) and (6) in Table 5 in the main text. All estimates pertain to the Croatian programs.

7. Counterfactuals.do: The formulas for the calculation of programs' costs and energy savings contained within AT_Program_Estimates.do, HU_Program_Estimates.do, and HR_Program_Estimates.do rely on an estimate of counterfactual sales of subsidized products in the absence of a subsidy. This do file performs the calculation of the counterfactuals, whose estimates are directly included in the formulas for costs and energy savings.

8. Cluster_level.do: This do file generates Tables E.1, E.2, and E.3 in the Online Appendix, Section E, which performs numerous exercises on statistical inference.

9. Estimates_for_plots_longer_window_new_reference 3.do: This do-files runs all regressions with 6 leads and 6 lags around subsidy periods (if possible), generates cumulative sums of coefficient estimates (our specifications use the log change of units sales as a dependent variable) and normalizes these relative to the 3rd month before the start of a program. These do-files generates the data file Estimates_for_plots_6_new_reference.dta, which is made available in the data repository.

10. Estimates_label.do: This do-files runs unit sales and price regressions with 3 leads and 3 lags around subsidy periods (if possible) by label for the Hungarian 2015 and 2016 subsidy programs and generates cumulative sums. The file produces the data file Estimates_for_plots_label.dta, which is made available in the data repository.

11. Plots_12.do: Uses Estimates_for_plots_6_new_reference.dta to generate all plots shown in Figures 1 and 2 in the main text.

12. Plot_F1.do: This do file uses Estimates_for_plots_label.dta to generate the plots shown in Figure F.1 in the Online Appendix.

13. Plot_F2.do: This do file generates the plots shown in Figure F.2 in the Online Appendix.

14. Plot_F3.do: This do file generates the plots shown in Figure F.3 in the Online Appendix.

15. `Plot_F4.do`: This do file generates the plots shown in Figure F.4 in the Online Appendix.

16. `Identifying_close_substitutes_CEM procedure.do`: This do file generates Table D.10 in the Online Appendix, which investigates the impact of the programs on non-subsidized close substitutes.

17. Tables 1 is not empirical. It summarizes eligibility and other conditions for each program studies in the paper.

18. Tables A.1 and A.2 are not empirical. They summarize institutional detail pertaining to energy labels and energy regulation in the EU and are produced using the sources listed in the tables' notes and the reference section. Table C.1 in the Online Appendix is not empirical. This table lists all product characteristics available in the data by product category, i.e. refrigerator, freezer or washing machine.