

Billing dataset – Space heat demand and energy prices panel dataset

Years: 2003-2019, $N = 4,494,943$ (annual billing observations)

Reasons for observations being dropped in the data cleaning process:
(sorted by number of observations dropped)

- Complete lack of price data for 2003-2006 period: 909,458 obs.
- Partial lack of price data for 2007-2019 period: 543,544 obs.
- Building occurs only once in the sample: 231,888 obs.
- Energy carrier other than gas, oil, or district heating: 53,674 obs.
- Imputed total cost values (e.g. 1,000.00 Euros) used as a placeholder (not the real costs, leads to price outliers): 31,665 obs.
- Duplicate observations based on building ID and year combination: 1,722 obs.
- Strong price deviations or price changes indicating data errors or deviations from ordinary building use (Alternative criteria: <2 Cents/kWh, (or) >100 Cents/kWh, (or) >10 (< -10) Cents/ kWh price change to the previous year : 1,717 obs.
- Deviations in the annual billing period length >10 days: 65 obs.

Additional data

- Administrative areas (BKG, 2021)
- Postal codes (OSM, 2021; OSM, 2021a)
- Degree days (IWU, 2021)
- Regional income (Statistische Ämter, 2021)
- Regional retirement (DESTATIS, 2021)
- Consumer price index (DESTATIS, 2021)

Processed space heat demand and energy prices panel dataset

Years: 2007-2019, $N = 2,721,210$

- After the matching with the additional data sources, some observations are incomplete due to a lack of degree days data or changes in the administrative areas and therefore get dropped: 1,940 obs.

Processed and matched space heat demand and energy prices panel dataset

Years: 2007-2019, $N = 2,719,270$

Ordinary Least Squares (OLS) Regressions

Years: 2007-2019, $N = 2,719,270$

m1.ols: Space heat demand as response variable (RV), energy price as only explanatory variable (EV)

m2.ols: Adding additional EVs to ***m1.ols***; no grouping terms used

Fixed Effects (FE) Regressions

Years: 2007-2019, $N = 2,719,270$

m1.fe: Space heat consumption as RV, only price as EV, building ID and year as fixed effects grouping terms

m2.fe: Adding additional EVs to ***m1.fe***, building ID and year remain as fixed effects grouping terms

m3.fe: Removing EVs showing no effects from ***m2.fe***, building ID and year remain as fixed effects grouping terms

Bayesian Regression Analysis

Separate workflow
See Figure xxx