

# On the Reaction of Consumption Expenditures to Electricity Price Shocks

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## 1. Motivation and research question

- Substantial and very heterogeneous electricity price changes in Swiss municipalities in 2023, 2024, and 2025:

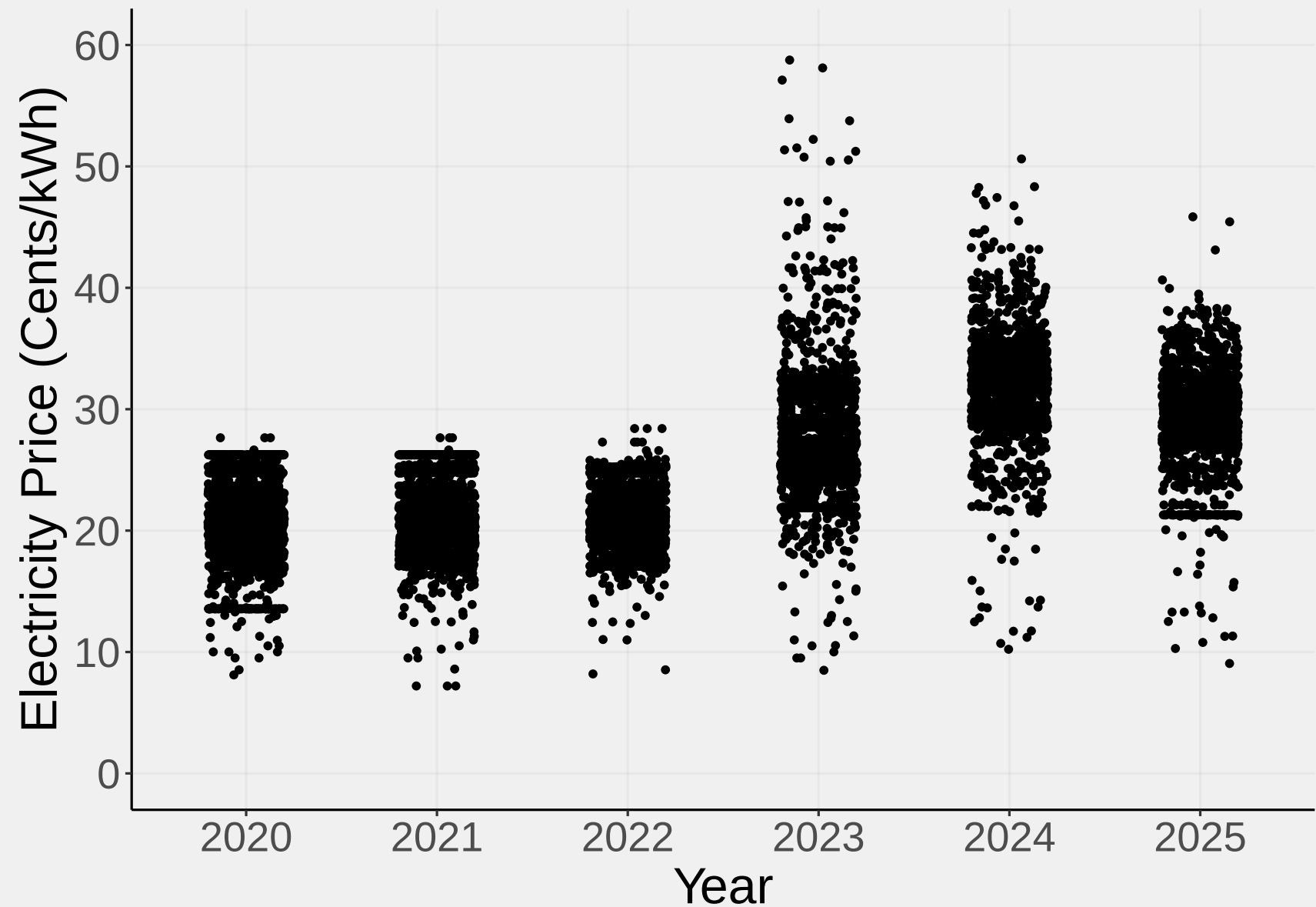


Figure 1. Variation of electricity price level across municipalities

- I want to quantify the impact of these price changes on consumption expenditures.
- I use transactional payment data to estimate the reaction of consumption expenditures.
- I can check for different reactions across expenditure categories.

## 2. Institutional background

- Heavily regulated electricity market in Switzerland: households cannot choose supplier.
- Prices are announced in advance and fixed for a full year (see illustration in Figure 2).
- There are more than 600 very heterogeneous electricity suppliers that differ in terms of their size, legal organization and procurement strategy.
- This leads to considerable electricity price differences between municipalities.

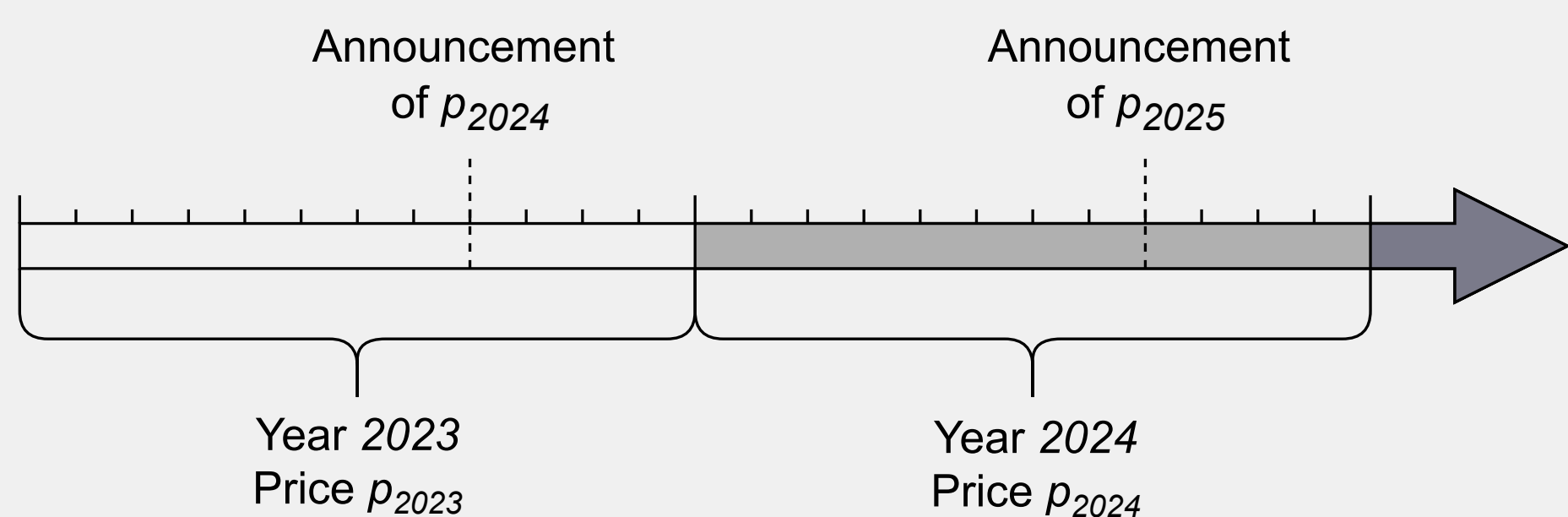


Figure 2. Timeline of electricity prices in Switzerland

## 3. Data

### Electricity prices

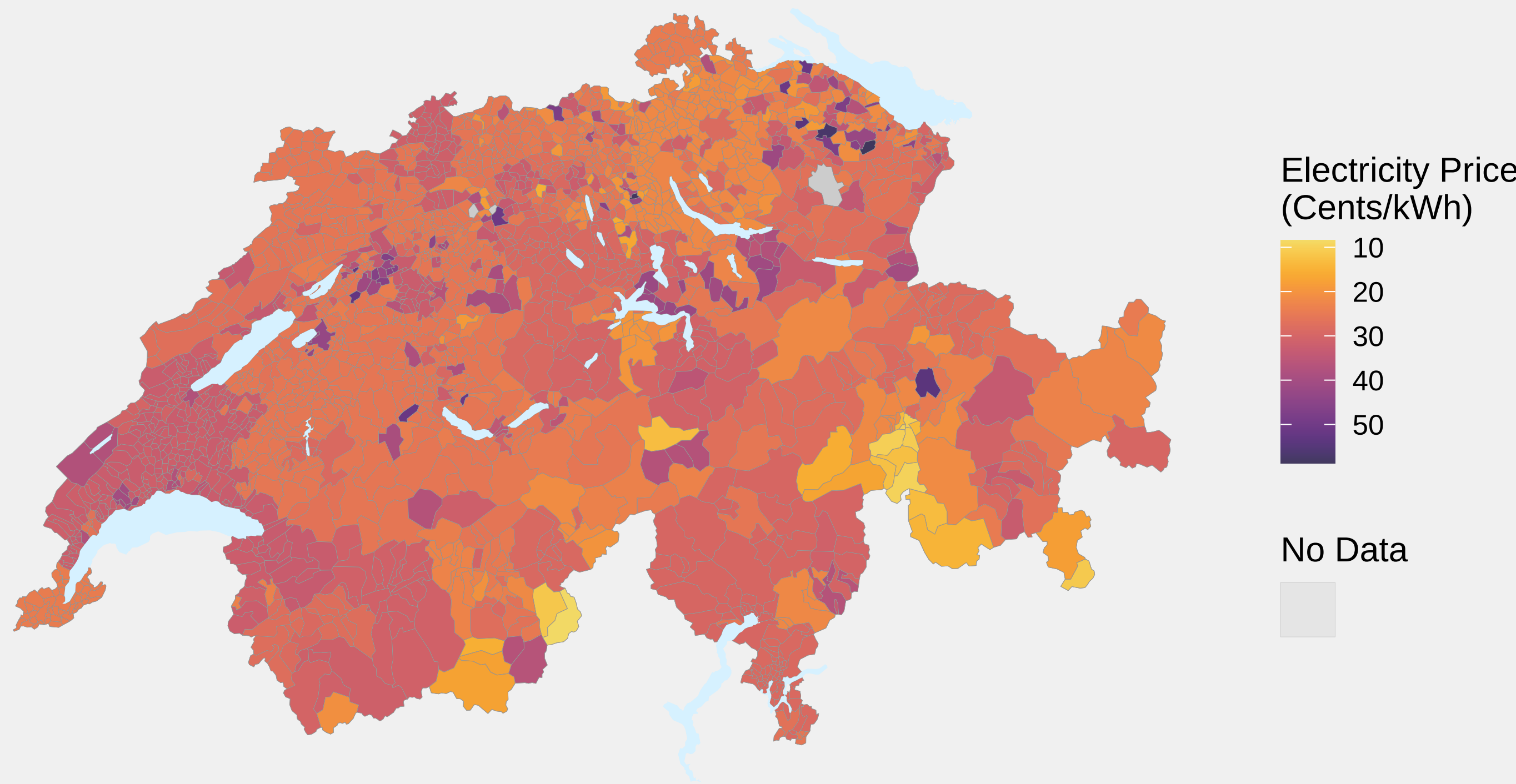


Figure 3. Electricity price in 2023

- Figure 3 shows that electricity prices in 2023 varied greatly even within regions.
  - In fact, electricity price changes are nearly uncorrelated with observable characteristics such as location, size, and wealth of a municipality.
  - The electricity price compared to other municipalities cannot explain future relative prices either.
- **The size of the electricity price changes in 2023 – 2025 came as a shock.**

### Transactional payment data

- Provided by Worldline Schweiz AG.
- Includes majority of digital payments in Switzerland since 2017.
- Various information around the payment included:
  - Merchant: address and category.
  - Customer: anonymized card number.
  - Payment: date, channel (point of sale or e-commerce), instrument, country of origin, amount, and currency.
- Challenge: place of residence of the cardholder is missing.
- Solution: weight transactions according to the probability that they are carried out near the place of residence. Choose the municipality with the highest number of weighted transactions.
- Restrict sample to cards that have at least one transaction in each year between 2020 and 2024 → around 3 million cards remain.

## 4. Theoretical foundations of the empirical strategy

### Theoretical consumption evolution

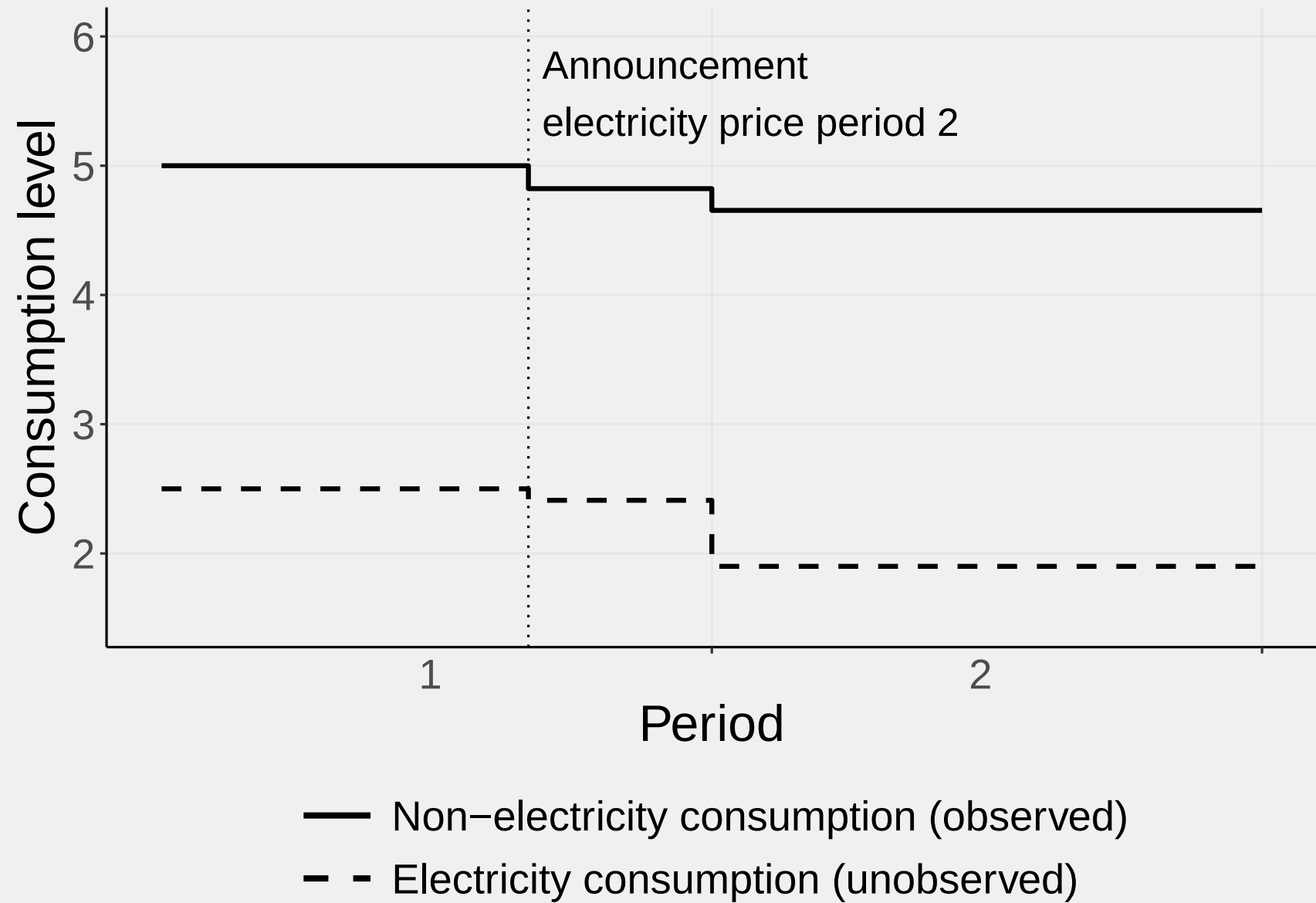


Figure 4. Theoretical evolution of electricity and non-electricity consumption after the announcement of a higher electricity price in the second period

### Empirical analysis

- Figure 4 illustrates that I can estimate the reaction of consumption expenditures around the announcement and the implementation of the new electricity price.
- This allows for a structural interpretation of the results in terms of the inter- and intratemporal elasticity of substitution.
- As an alternative, I can estimate the reaction of consumption expenditures continuously over time:

$$\Delta_k \ln(C_{i,t}) = \beta_k \Delta \ln(P_{i,t}) + \alpha_i + \gamma_t + u_{i,t} \quad (1)$$

where  $\Delta_k$  measures the difference over  $k$  periods,  $C$  are consumption expenditures,  $P$  is the electricity price,  $i$  stands for a municipality,  $t$  for time,  $\alpha_i$  are municipality fixed effects,  $\gamma_t$  time fixed effects and  $u$  is the usual error term.

## 5. Preliminary results

### Yearly spending data

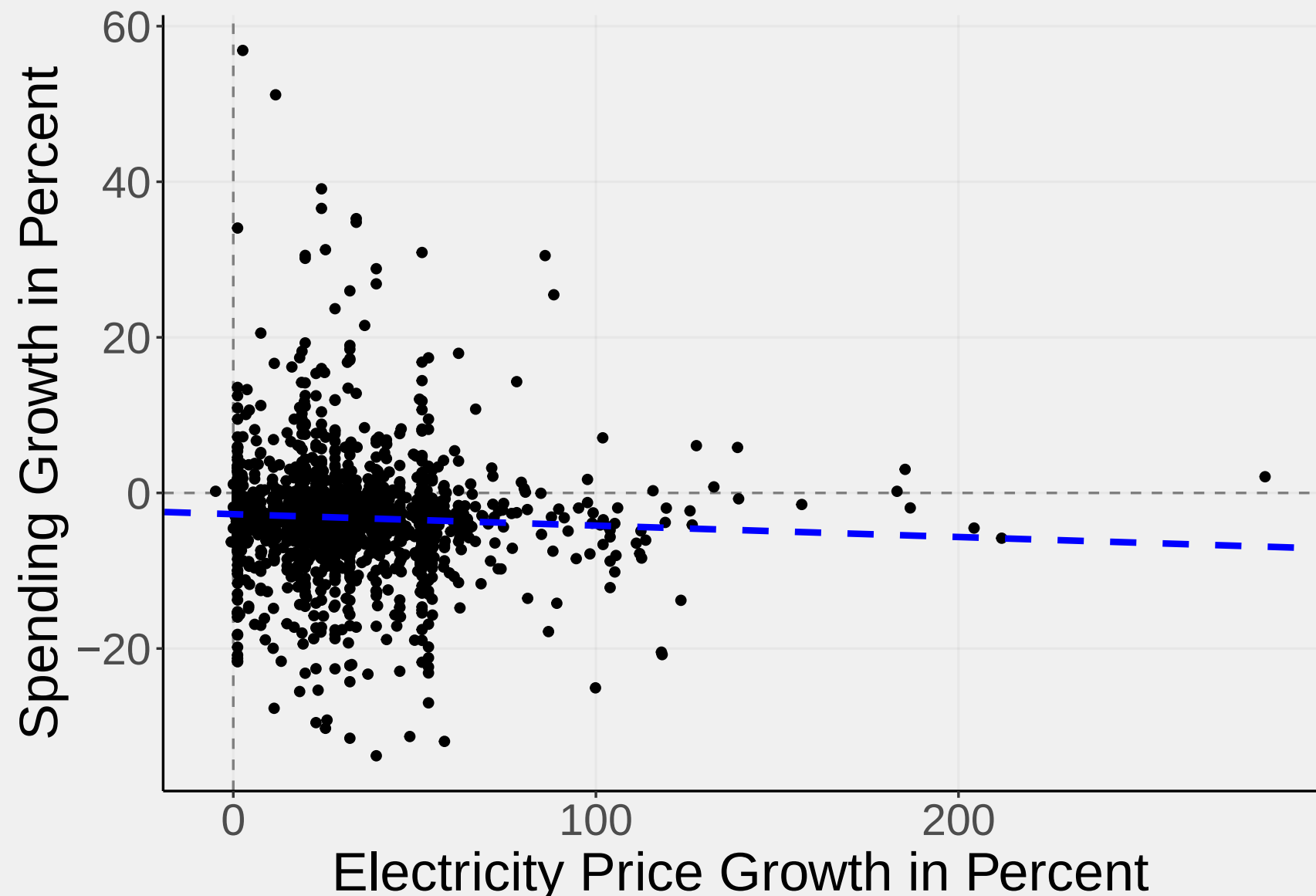


Figure 5. Scatterplot of electricity price growth and spending growth in 2023 with regression line

### Monthly spending data

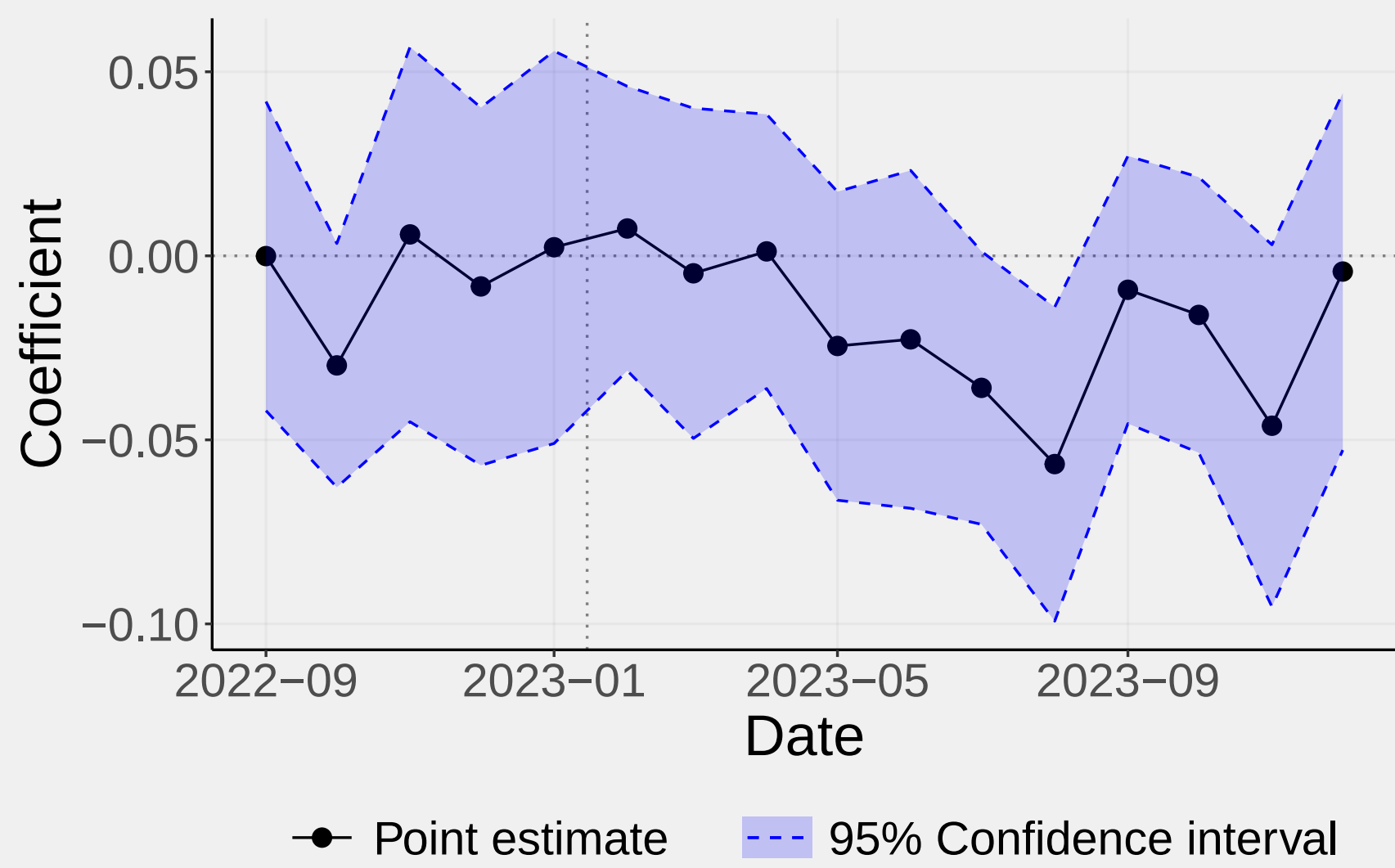


Figure 6. Monthly regression of change in spending compared to August 2022 on change in electricity price in 2023

|                       | Coefficient | Standard error | p-value |
|-----------------------|-------------|----------------|---------|
| $\Delta \ln(P_{i,t})$ | -0.010      | 0.010          | 0.331   |

Table 1. Output of regression (1) with  $k = 12$  months using data from 2022-01 to 2023-12

## 6. Conclusion

### Summary

- Substantial electricity price changes in 2023 – 2025 whereby the extent was hardly predictable.
- I use transactional payment data to estimate consumption expenditures on a local level.
- My preliminary results in Figures 5 and 6 and Table 1 suggest a negative relation between electricity price changes and consumption expenditures.

### Roadmap

- The empirical analysis should be supplemented by a structural interpretation.
- I can expand the analysis further (e.g., reaction across expenditure categories, heterogeneities).