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STROMMARKTTREFFEN „MARKET POWER IN ENERGY MARKETS“

Electricity Prices during the Energy Crisis in Germany: The Role of Market Power

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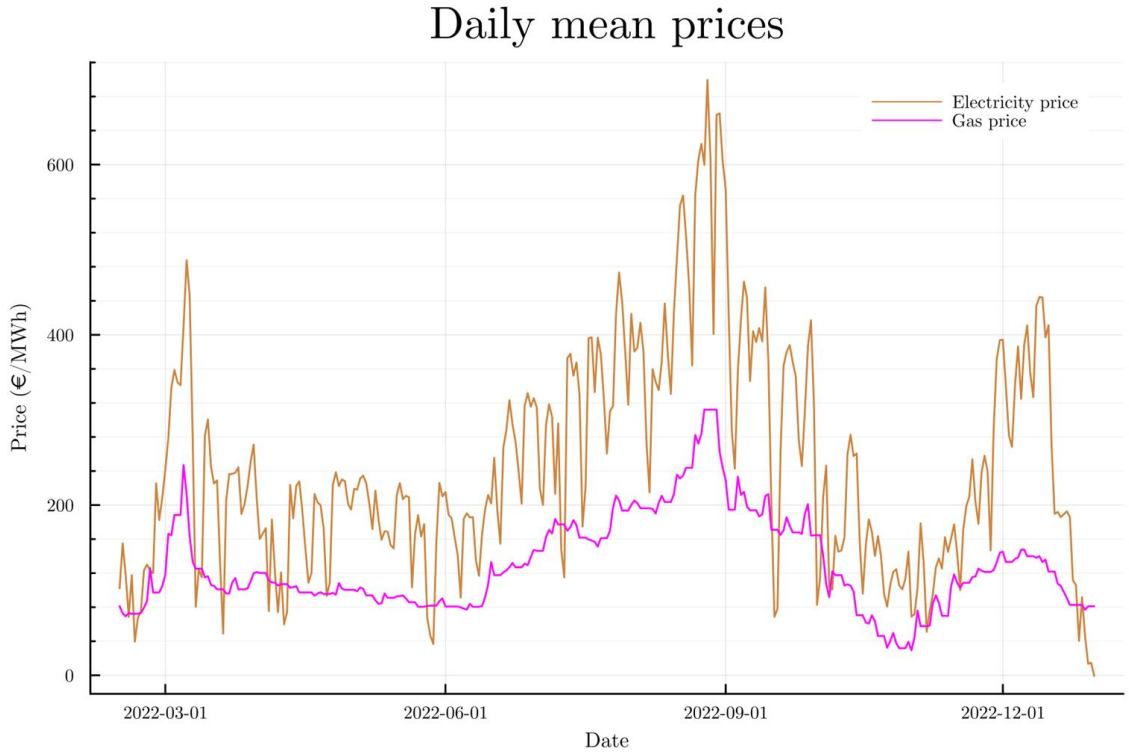
Motivation



RESEARCH QUESTION

CAN THE HIGH ELECTRICITY PRICES IN GERMANY DURING THE ENERGY CRISIS IN 2022 BE JUSTIFIED THROUGH RISING MARGINAL COSTS, I.E. HIGHER GAS PRICES?

IF NOT, CAN EXCESSIVE PRICES BE EXPLAINED THROUGH THE EXERCISE OF MARKET POWER?

The Model

- Electricity dispatch model:
  - Construct hourly supply and demand curves in the German day-ahead wholesale market
  - Solve for partial equilibrium: Supply = domestic demand + net exports

- Supply:
  - Must runs with zero marginal costs (hydro, nuclear, biomass, solar, wind)
  - Thermal power plants aggregated at firm and technology level (coal, natural gas, oil, waste)
  - Marginal costs depending on efficiency, quantity, input costs and carbon price

The Model – Two types of conduct

- Competitive benchmark model:
  - Plants produce up to capacity until price = marginal costs

$$MC_{f,i,t,h}(q_{f,i,t,h}) = (c_{f,i} + \tilde{c}_{f,i}\ q_{f,i,t,h})\ p_{i,t}^{input} + e_i\ p_t^{CO_2}$$

- Cournot Model:
  - 5 largest firms decide quantities according to Cournot profit maximization
  - Plants produce up to capacity until price = marginal costs + markup

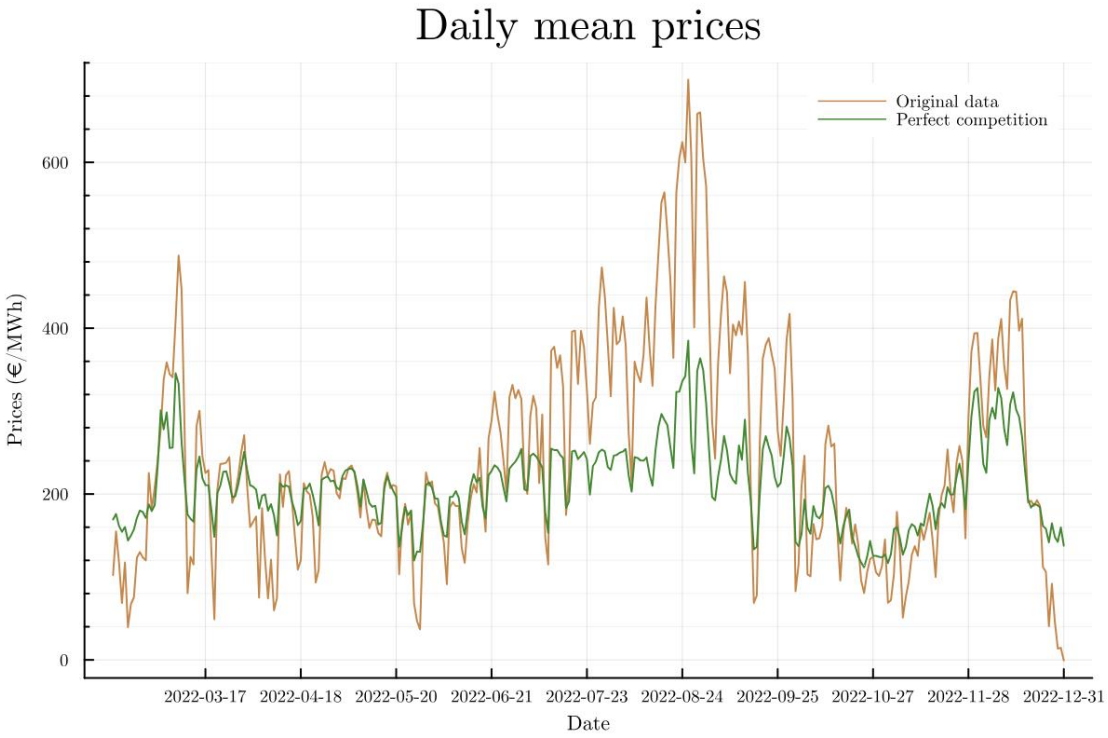
$$p_{t,h} = MC_{f,i,t,h} + \theta \frac{q_{f,t,h}}{\sum_o b_{o,t,h}}$$

  - θ indicates how close conduct is to Cournot Competition (θ = 1) or perfect competition (θ = 0)

The Model - Data and Calibration

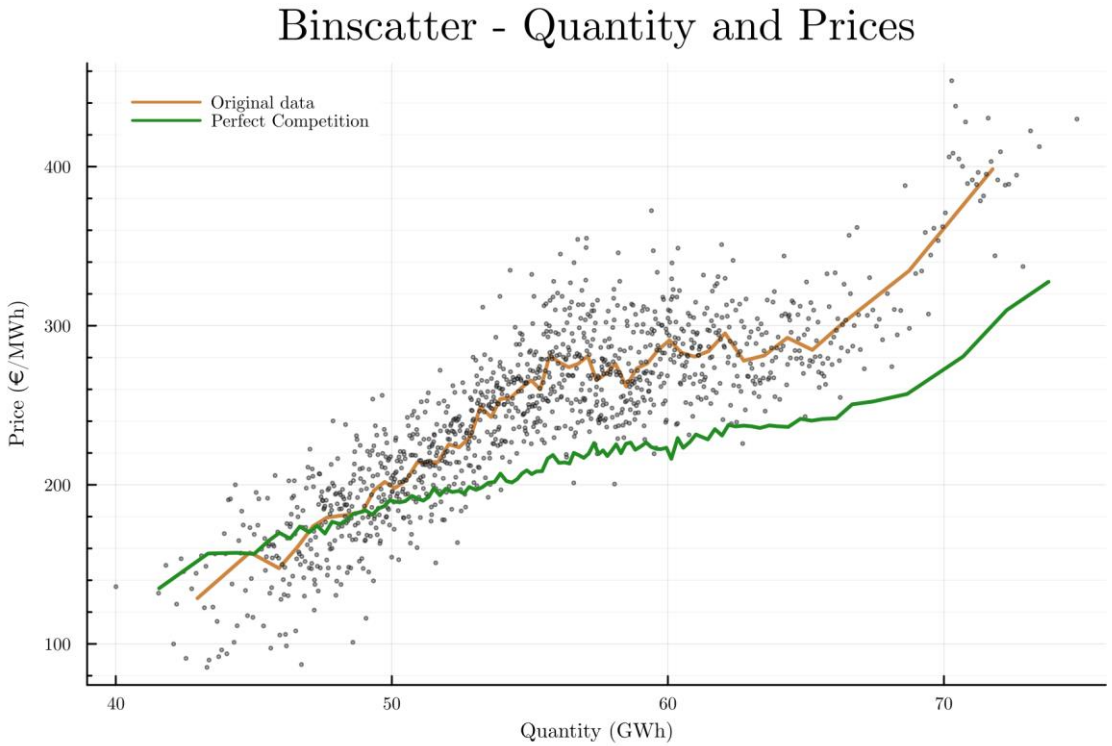
- Demand Data:
  - Prices, quantities and exports from *SMARD* in hourly resolution
  - Domestic elasticities to calibrate demand curves from *Hirth et. al. (2023)* and export elasticities estimated following *Reguant (2019)*
- Supply Data:
  - Power plant calibration from *Open Power Systems Database*
  - Emissionfactor from *Umweltbundesamt (2016)*
  - Estimate slope and intercept for increasing marginal costs
  - Quantities of must runs and generation forecast for solar and wind from *SMARD*

Results – Perfect Competition



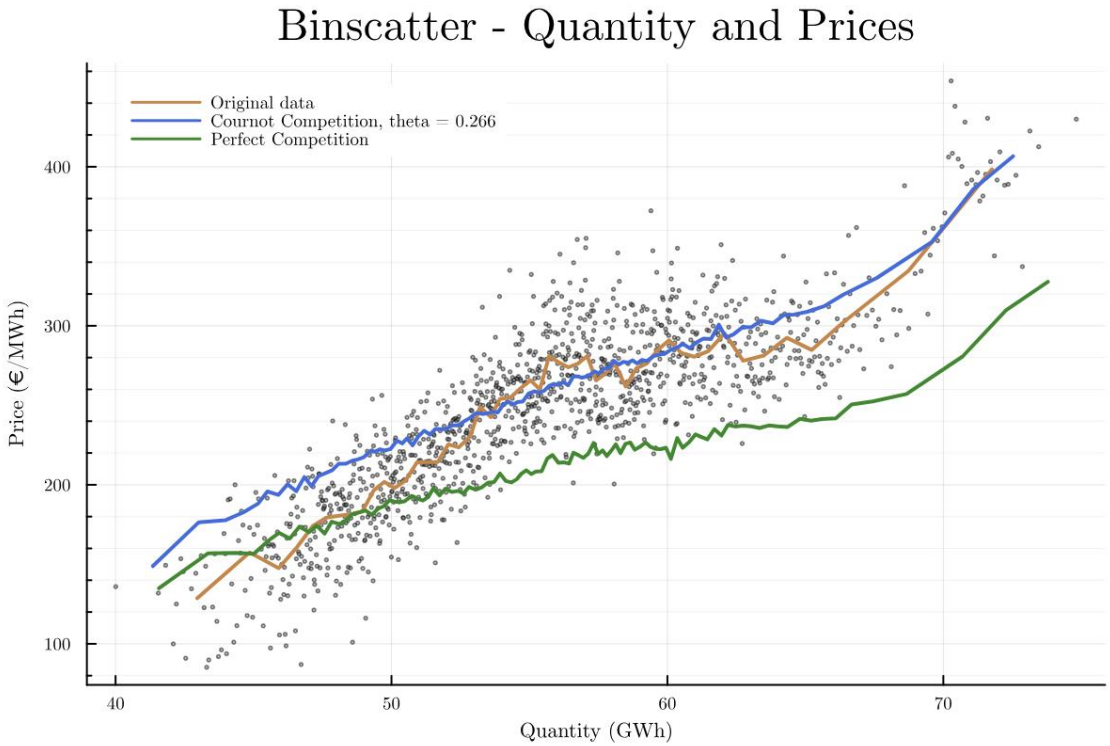
MODEL WITH PERFECT COMPETITION UNABLE TO EXPLAIN HIGH PRICE SPIKES

Results – Model Comparison



MODEL WITH PERFECT COMPETITION UNABLE TO EXPLAIN PRICES ESPECIALLY FOR HIGH QUANTITY HOURS

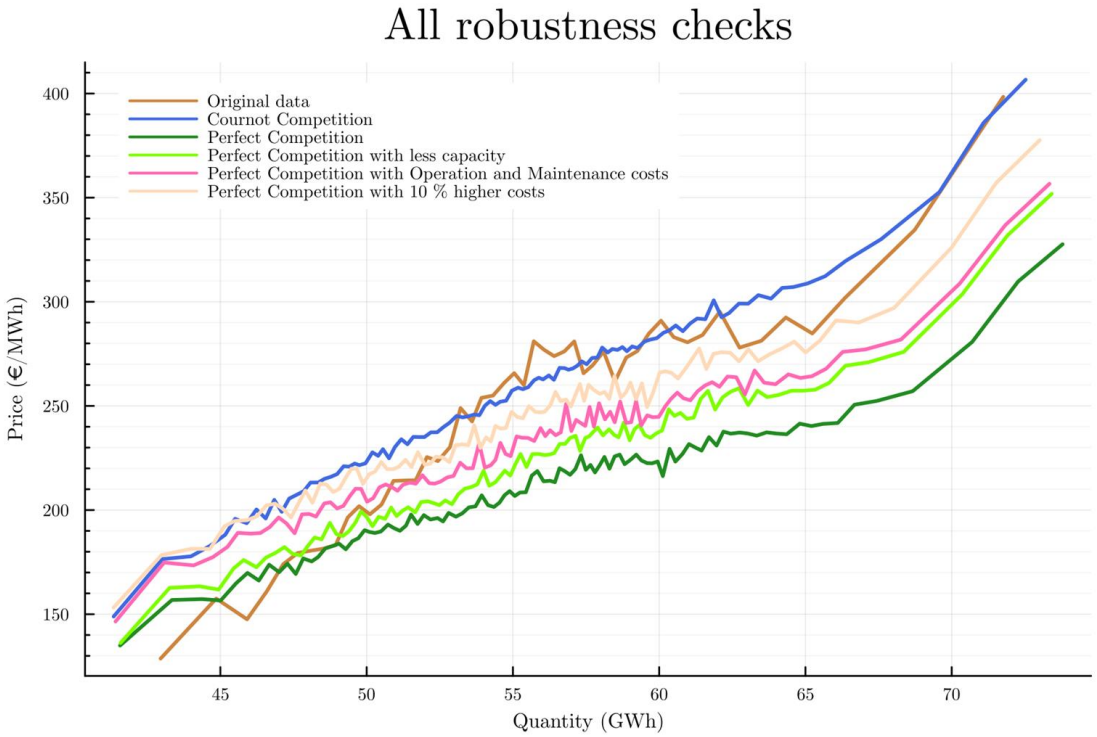
Results – Model Comparison



COURNOT MODEL EXPLAINS OBSERVED PRICES FOR HIGH QUANTITY HOURS BETTER

AVERAGE MARK UP FOR HIGH QUANTITY HOURS: 17.45 % , EXTRA PROFITS: 11.5 BN €

Results – Robustness Checks



ROBUSTNESS CHECKS DECREASE DIFFERENCE, BUT COURNOT MODEL STILL PERFORMS BETTER (ESPECIALLY FOR PEAK HOURS)

Conclusion

- Higher input costs alone not able to explain price spikes
- Model with market power explains observed prices better
- Evidence for concern of exercise of market power during energy crisis in 2022 raised by German competition authotity (Bundeskartellamt)

→Average mark up of 17.45 % leading to unjustified profits of 11.2 bn €

Thank you for listening