

Regional Modeling of Market Power in the 2024 South-East Europe's Electricity Price Crisis

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Extended Abstract

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Abstract Summary

During the summer of 2024, South-East Europe (SEE) experienced a severe, nearly three-month electricity price crisis. This period was marked by extreme evening price spikes and significant market splitting, with SEE clearing prices approaching 1000 €/MWh while neighboring Central European zones cleared under 100 €/MWh. While official reports attribute the crisis to system stress factors, such as extreme heatwaves and outages, this study investigates whether these conditions exacerbated market power vulnerabilities, specifically focusing on the Greek bidding zone.

To explore the link between market power and these extreme price spikes, we compute counterfactual price benchmarks utilizing bottom-up perfect competition and oligopoly market models. We formulate Equilibrium Problems with Equilibrium Constraints (EPECs) to simulate the non-cooperative strategic behavior of producers, accounting for vertical integration, forward market positions, and interconnection with the Bulgarian zone. Methodologically, we apply a globally optimal spatial branch-and-bound algorithm to the Mathematical Problem with Equilibrium Constraints (MPEC) subproblems. These are integrated into an ϵ -best response algorithm to efficiently compute ϵ -Generalized Nash Equilibria.

Our results demonstrate that perfect competition models consistently underestimate the crisis prices, whereas oligopolistic EPEC models, when calibrated with observed market data, accurately predict the timing and level of the price spikes. We find that the price spikes heavily align with periods where exercising market power would have been profitable. Ultimately, this research provides indication that market power was a driver of the 2024 SEE price crisis, underlining the need for enhanced regulatory monitoring during periods of system stress.