Comments on “The (smart) technology effect: consumers, not producers, benefit from more efficient trade in electricity markets,” by Matti Liski and Iivo Vehviläinen

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Summary

Empirical paper on how more “flexibility” in established wholesale markets (Iberian, Nordics, and CAISO) would affect

- Price dispersion,
- Price correlation, and
- Price levels

Authors compare simplified replicated market-clearing (find intersection between aggregate supply and demand) to market-clearing where the energy balance constraint, *D(P) - S(P) = 0*, is replaced by *1 GWh <= D(P) – S(P) <= 1 GWh.* Corresponds to more flexibility in the market.

Summary (cont'd)

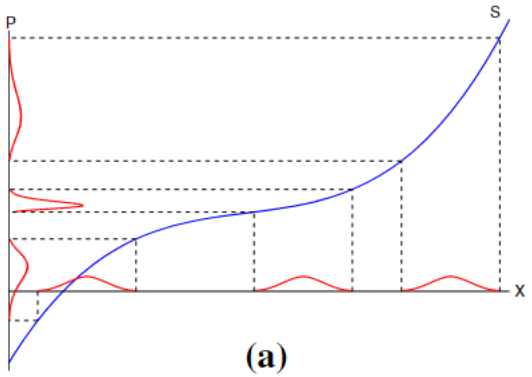


Fig. 2 *Panel* **a** price effects with a concave-convex supply function.
Source: Wozabal et al. (2016)

Typical aggregate supply function in „energy-only" day-ahead markets is concave-convex (inverse „S" shaped). Recently confirmed by Schöniger and Morawetz (2022) for 7 EU-countries

Comment: In low (net) demand hours commitment (as-offered) costs traded in different market segments can be substantial in simplified market mechanisms (see e.g., Graf et al 2020a and Graf et al 2021)

Summary (cont'd)

- Dominant effect capturing most of the surplus variation in all markets is price level channel
- Spain: variation of demand and supply and their correlation explains 13% in the total variation in consumer side welfare

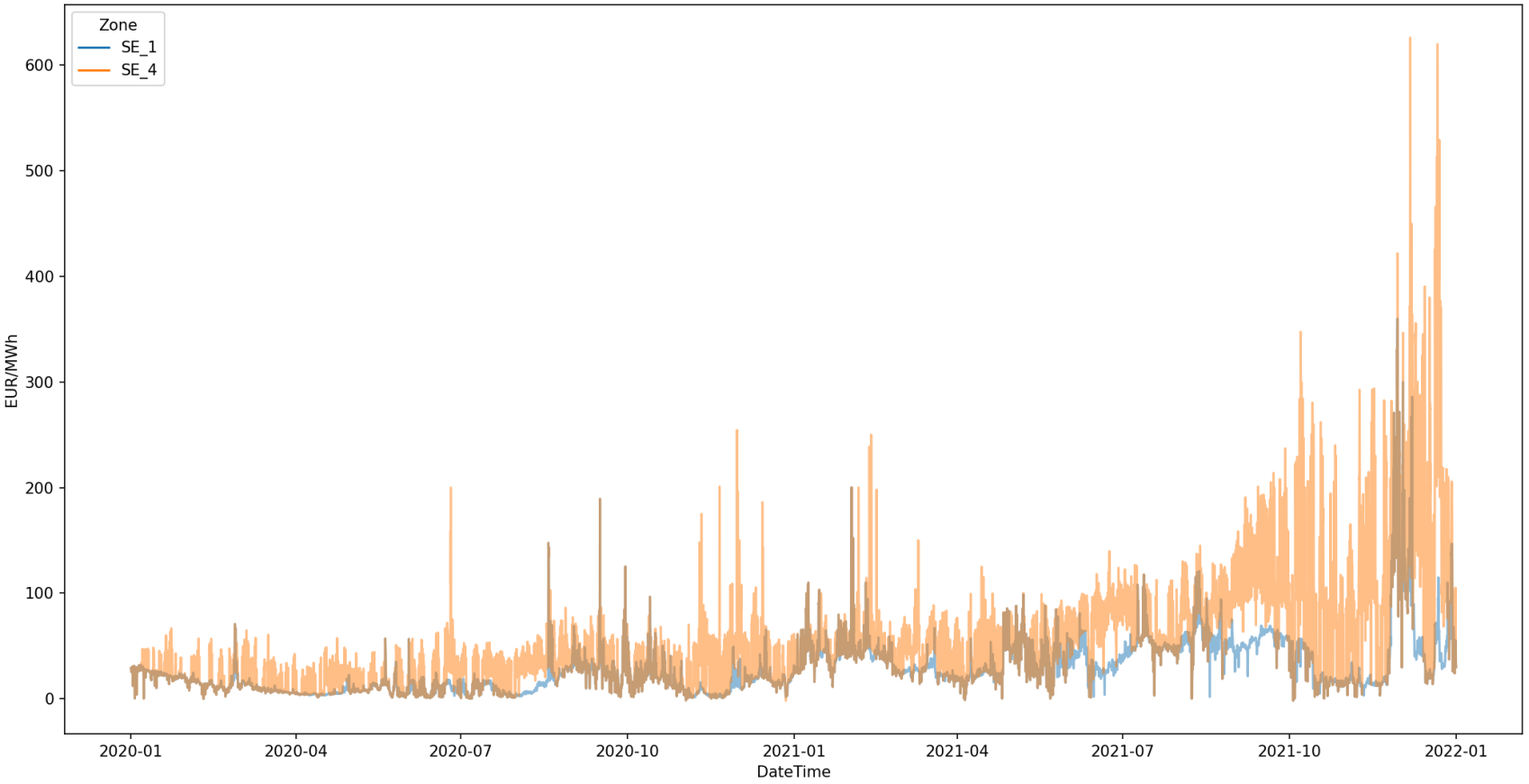
General Comments

- Great paper that puts together actual offer and bid data of three electricity markets (Nordics, Iberian, CAISO) for several years
- Cross-country (market) analyses are rare because market microstructure typically differs widely
- Benefit of the paper is that counter-factual market outcomes between different markets are analyzed using the same technique

Comment 1 – Location

- *All* electricity markets are locational even though simplified market-clearing algorithms deployed in some day-ahead markets do not account explicitly account for transmission constraints.
- System analysis is a very strong assumption, see e.g., difference in locational day-ahead market prices within Sweden on the next slide

Comment 1 – Location (cont'd)



Source: Own elaboaration, raw data Entso-E.

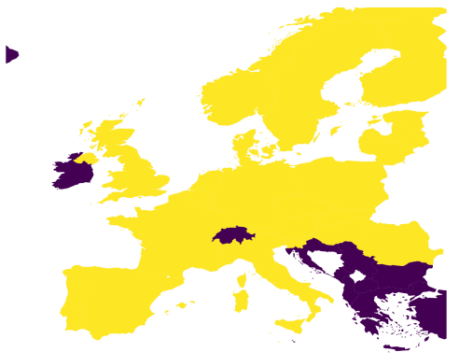
Comment 1 – Location (cont'd)

Liski and Vehviläinen (2022)	Graf and Wolak (2020)	Graf et al (2020b)
Supply = Demand	Convex market-clearing with zonal network model	Non-convex market clearing with nodal transmission network model

The locational market-clearing in Graf and Wolak (2020) might be an easy extension that would fit the Nordic market better.

Comment 2 – Endogenous Imports

Price-Coupling of Regions (2018)



- Largest day-ahead market (yellow) for electricity in the world with about 2,900 TWh of annual consumption (Eurostat, 2017)
- Intra-day market integration in process
- Largest integrated US market is Pennsylvania-New Jersey-Maryland interconnection (PJM) with annual demand of about 800 TWh

- Large part of pan-European cross-border flows determined through the joint day-ahead market-clearing
- Algorithm (EUPHEMIA) accounts for regional differences in day-ahead market design, e.g., block-bids
- Regional day-ahead market clearing can be replicated for given level of coupled net-imports

Source: Graf et al. (2020b).

Authors assume that Nordic market as well as Iberian markets are energy islands using fixed amount of net imports into these markets. The net-import model deployed in Graf et al. (2020b) might be an easy extension that could be used as a robustness check.

Comment 3 – Intertemporal Balance

- Authors argue that their flexibility option is generic and can range from demand side response through „smart“ devices to mining cryptocurrencies
- For the case of smart devices, some kind of intertemporal balance constraint is missing in the counter-factual market-clearing algorithm. E.g., assume a demand for cooling in hour *x*, smart device anticipates price spike and by pre-cooling ensures that consumers most likely will not notice a difference in comfort. In terms of electricity consumption, the reduced consumption in hour *x* is compensated by an increased consumption in hour *x-1.*

Minor Comments

- Market micro-structure matters a lot, e.g., unsatisfactory results of the Iberian market could be related to the extremely tight day-ahead market price floor/cap (180 EUR/MWh) in this "market"
- Define Nordics (NO, SE, FI, DK)?
- Markets are different in size measured in average annual system demand (load). Wouldn't it make sense to make the aggregate size of the flexible technology relative to the demand or peak demand?
- Market-clearing algorithms are publicly available
- Mean absolute deviation might be the better metric when comparing actual to replicated market-clearing prices
- Why are reduced form regression performed on daily averages and not on hourly data?

References

Graf, C. and Wolak, F. A. (2020). *Measuring the Ability to Exercise Unilateral Market Power in Locational-Pricing Markets: An Application to the Italian Electricity Market.* Working Paper.

Graf, C., Quaglia, F., and Wolak, F. A. (2020a). *Simplified Electricity Market Models with Significant Intermittent Renewable Capacity: Evidence from Italy. Working Paper.*

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