

The impact of start costs in electricity market models at high levels of wind penetration

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Outline

- ▶ Start costs and power markets
- ▶ Market models
- ▶ Results
- ▶ Discussion

Start costs and power markets



(a) Start costs



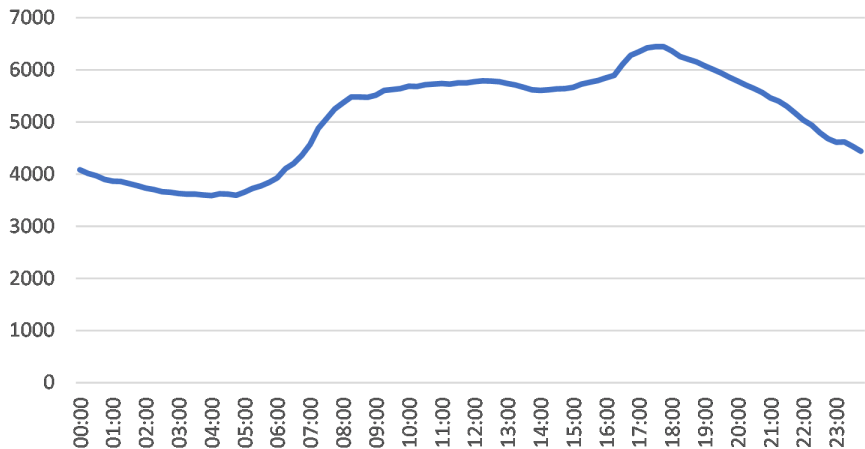
(b) No load costs



(c) Incremental costs

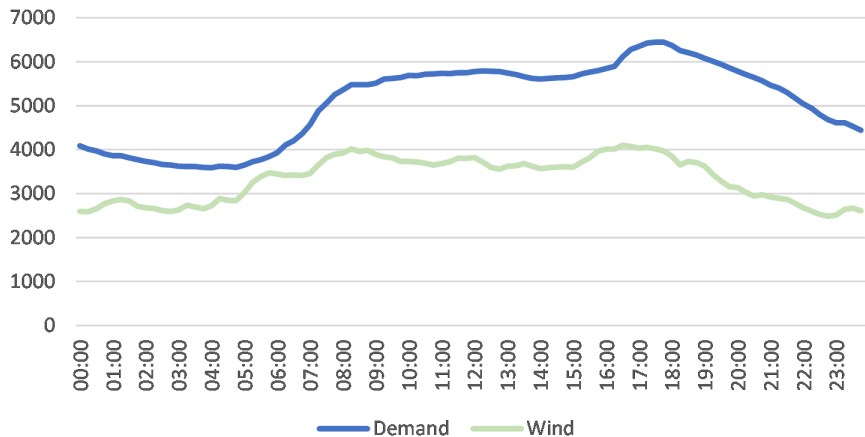
Start costs and power markets

Demand



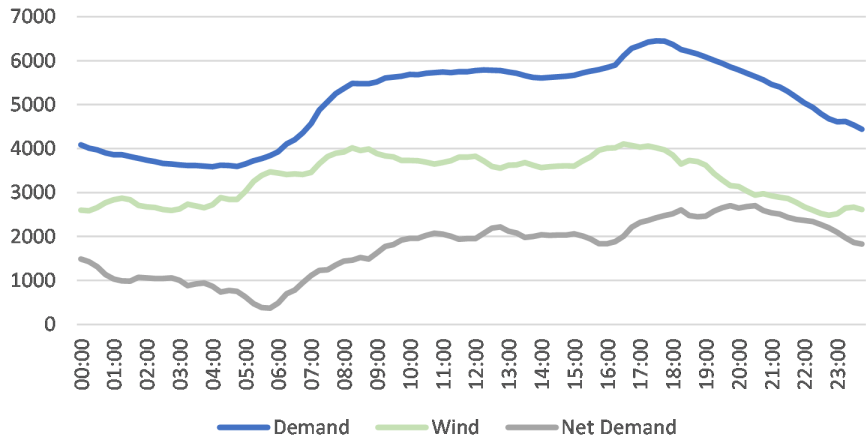
Start costs and power markets

Demand and wind

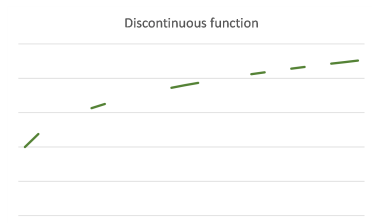
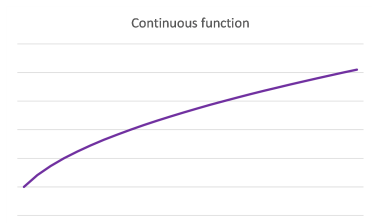


Start costs and power markets

Net demand



Start costs and power markets



Start costs and power markets

Electricity Market Design

Background

Over the last year, electricity prices have been significantly higher than before. Prices started rising rapidly in summer of 2021 when Russia reduced its gas supplies to Europe while global demand picked up as COVID-19 restrictions were eased. Subsequently, Russia's invasion of Ukraine and its weaponisation of energy sources have led to substantially lower levels of gas delivery to the EU and increased disruptions of gas supply, further driving up the price. This has had a severe impact on EU households and the economy. High gas prices influence the price of electricity from gas fired power plants, often needed to satisfy electricity demand.

The research questions

- ▶ What is the impact of start costs and no load costs in power markets?
- ▶ How does this change with wind power?
- ▶ How does this change with market power?
- ▶ Can we neglect start costs and no load costs in high RES-E power markets?

Set up

Continuous function



Discontinuous function



Continuous function



Discontinuous function



Results

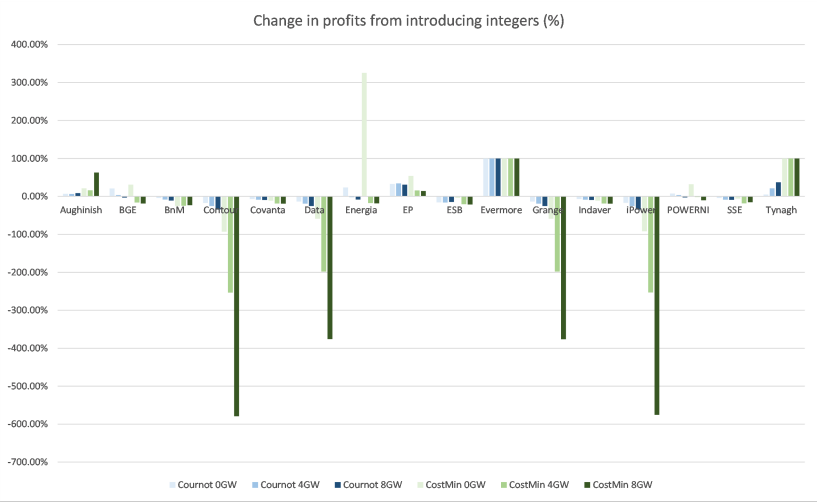


Figure: Change in profits by firm from the introduction of integers

Results

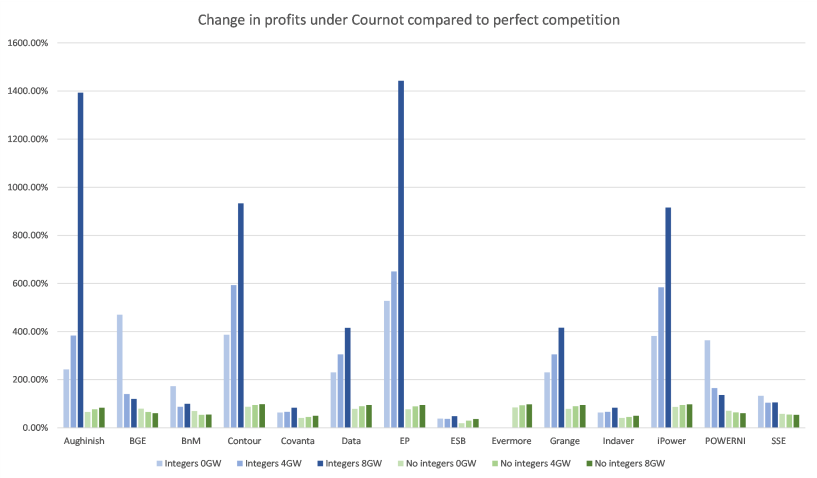


Figure: Change in profits by firm from the introduction of market power

Results

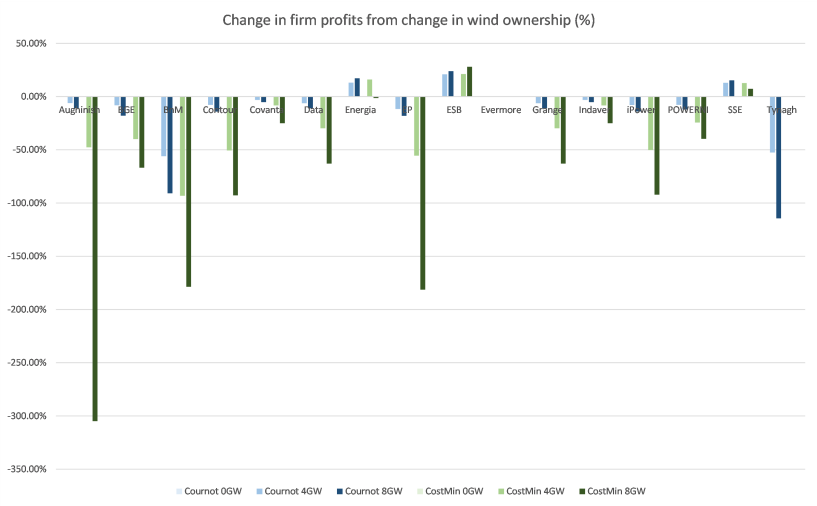


Figure: Change in profits by firm moving from even to uneven wind ownership

Results

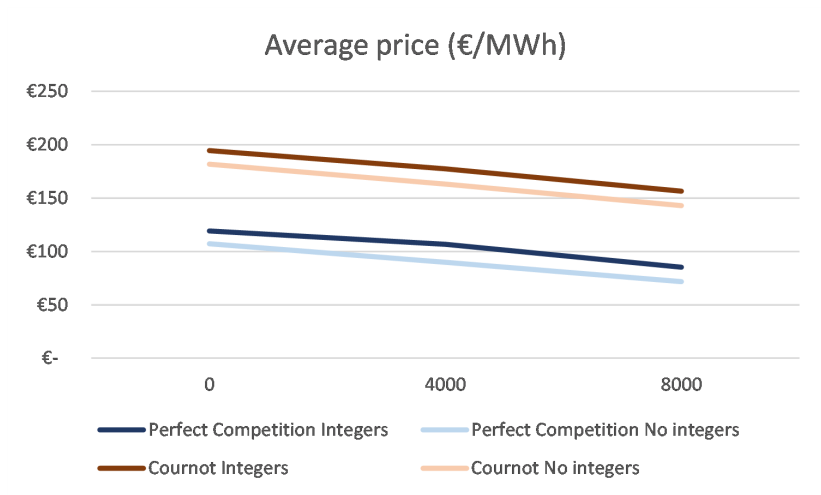


Figure: Average electricity prices under each scenario

Key points

- ▶ Ignoring start costs changes the results
- ▶ Ownership of wind makes a big difference
- ▶ Market power influences consumer costs more than integers
- ▶ Higher wind levels impact most results
- ▶ Takeaway: high RES-E markets need to account for start costs

Thank you

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