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Departamento
Economía

# The Rise of Renewables and Competition in Electricity Markets

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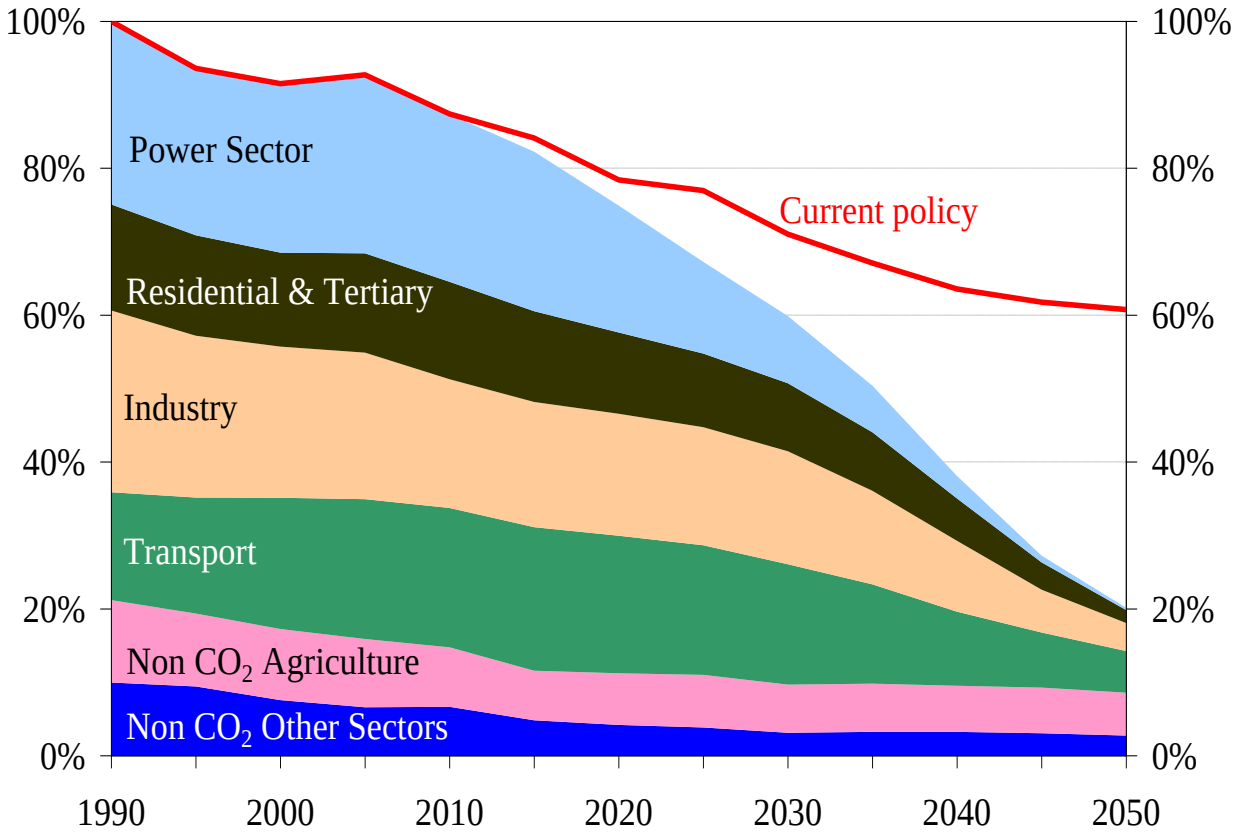
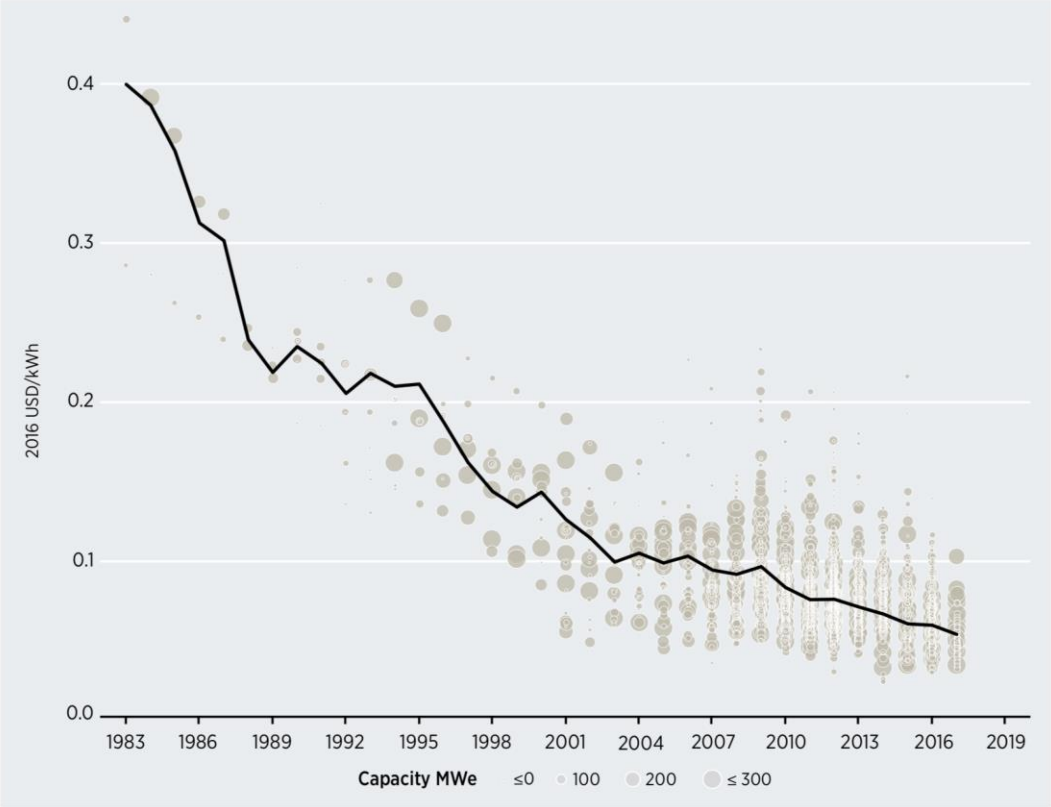
# Decarbonising our economies




Roadmap for moving to a competitive low carbon economy

Source: EC (2011)

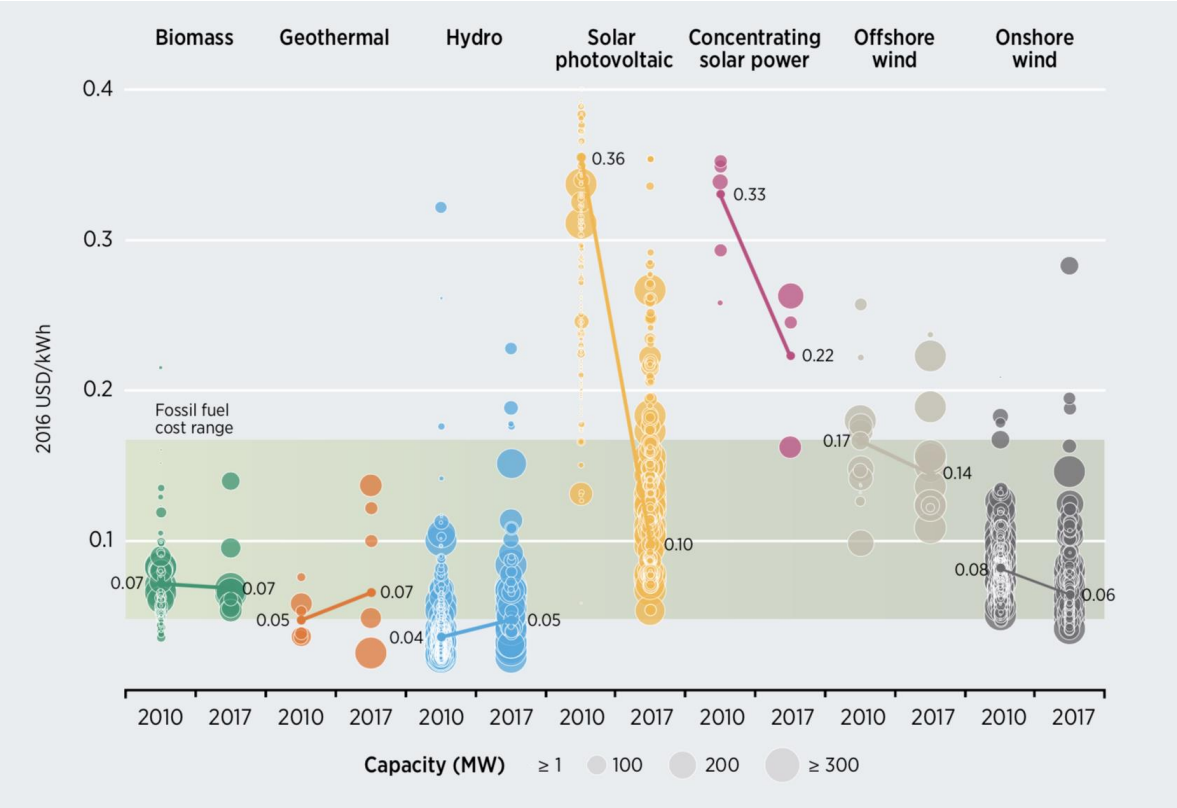
# Steep cost reductions for onshore wind




Global levelised average costs of electricity from large-scale onshore wind 1983-2017

Source: IRENA (2017)

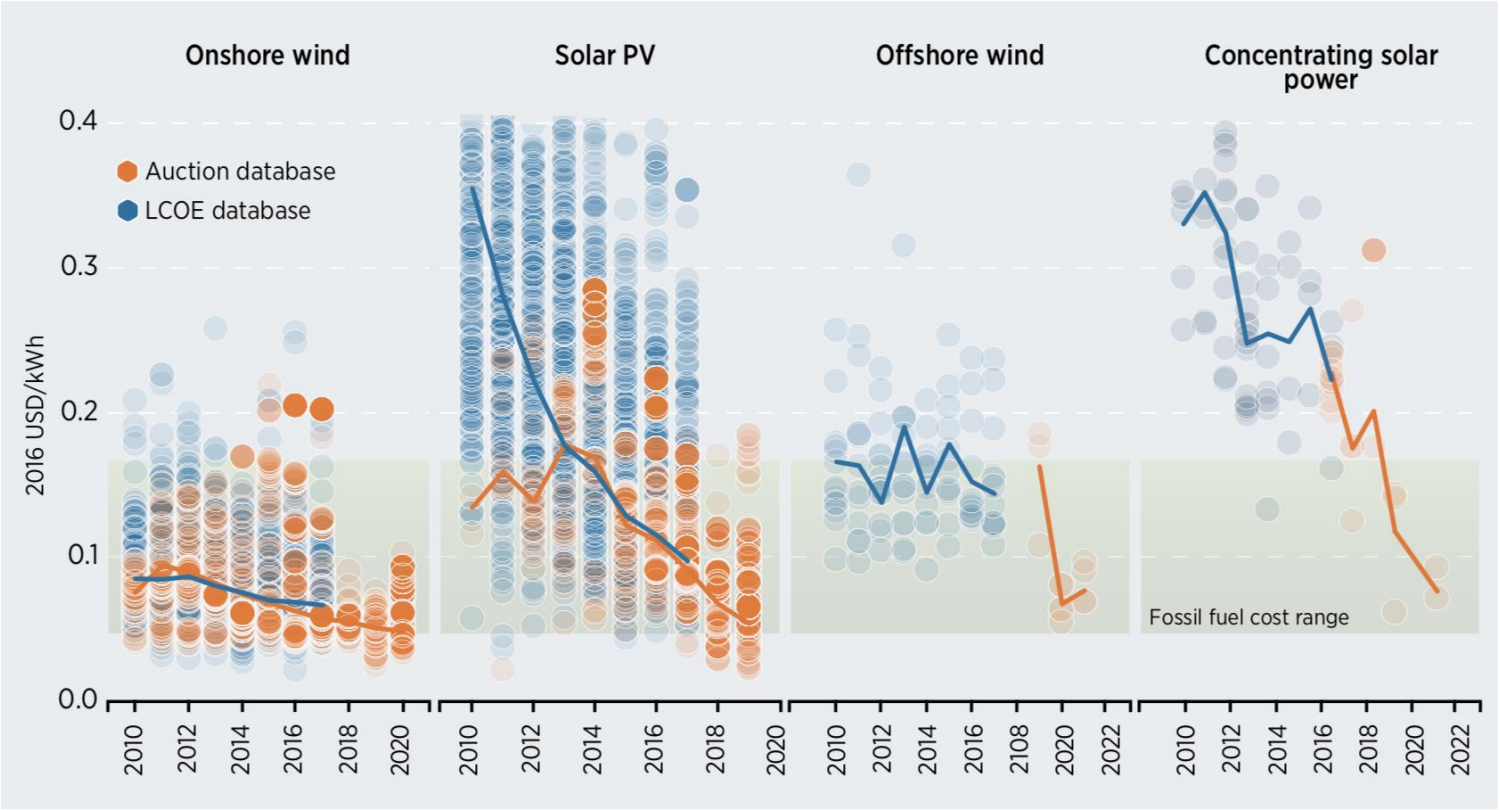
# Electricity from renewables has become competitive with most fossil fuels




Global levelised costs of electricity for large-scale renewables 2010-2017

Source: IRENA (2017)

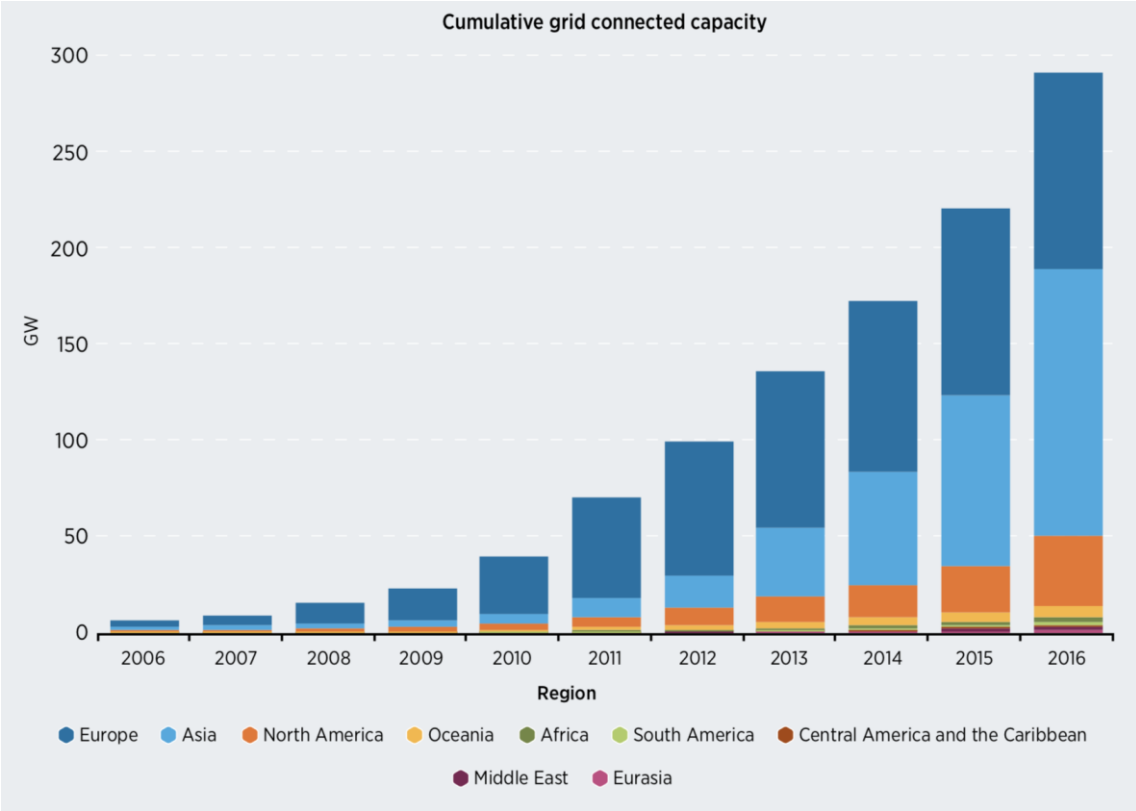
# Future costs reductions expected




Levelised costs of electricity for wind, solar and concentrating solar, 2010-2020

Source: IRENA (2017)

# Renewables are growing everywhere




Cumulative solar PV capacity by region, 2006-2016

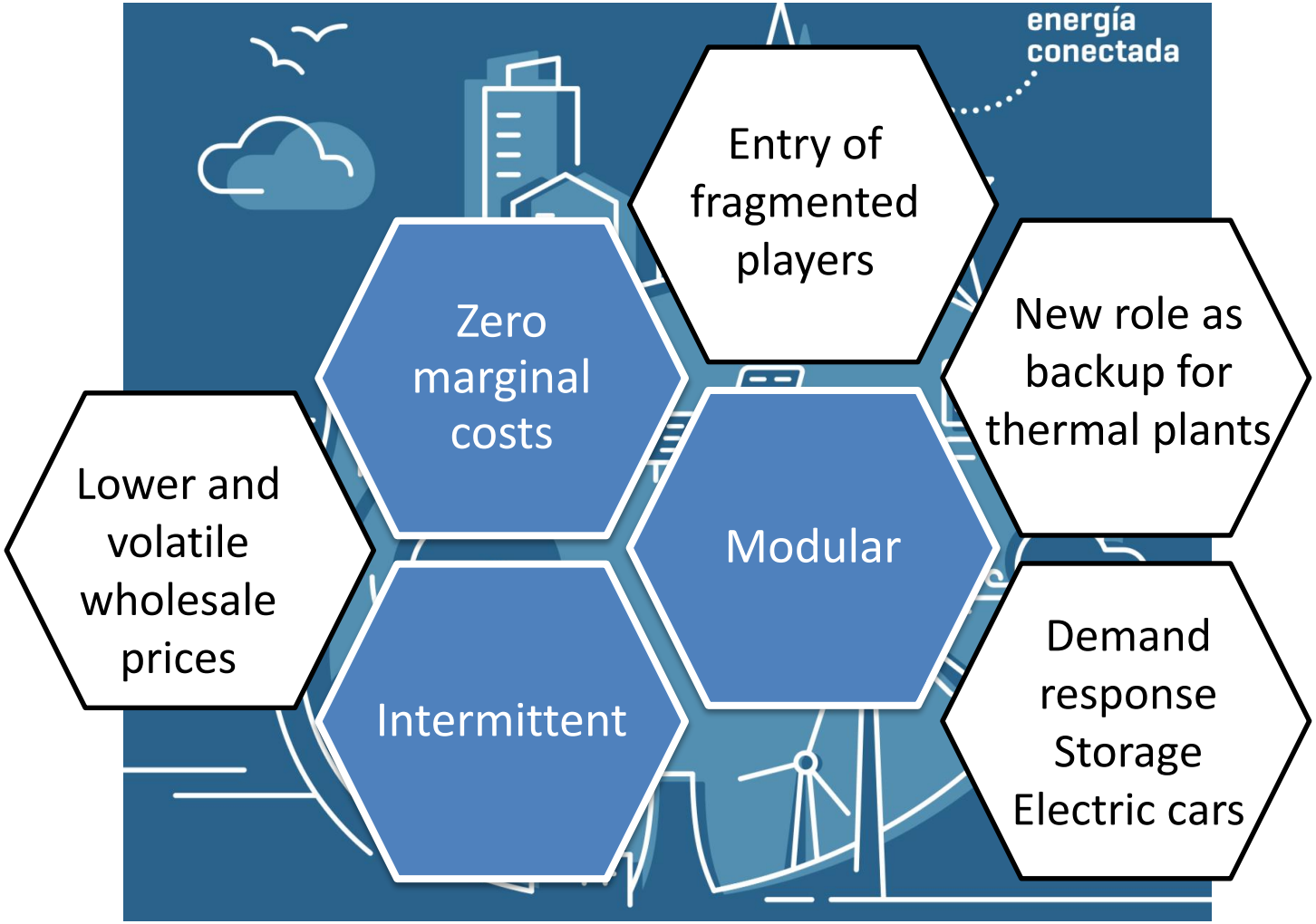
Source: IRENA (2017)

# This Talk

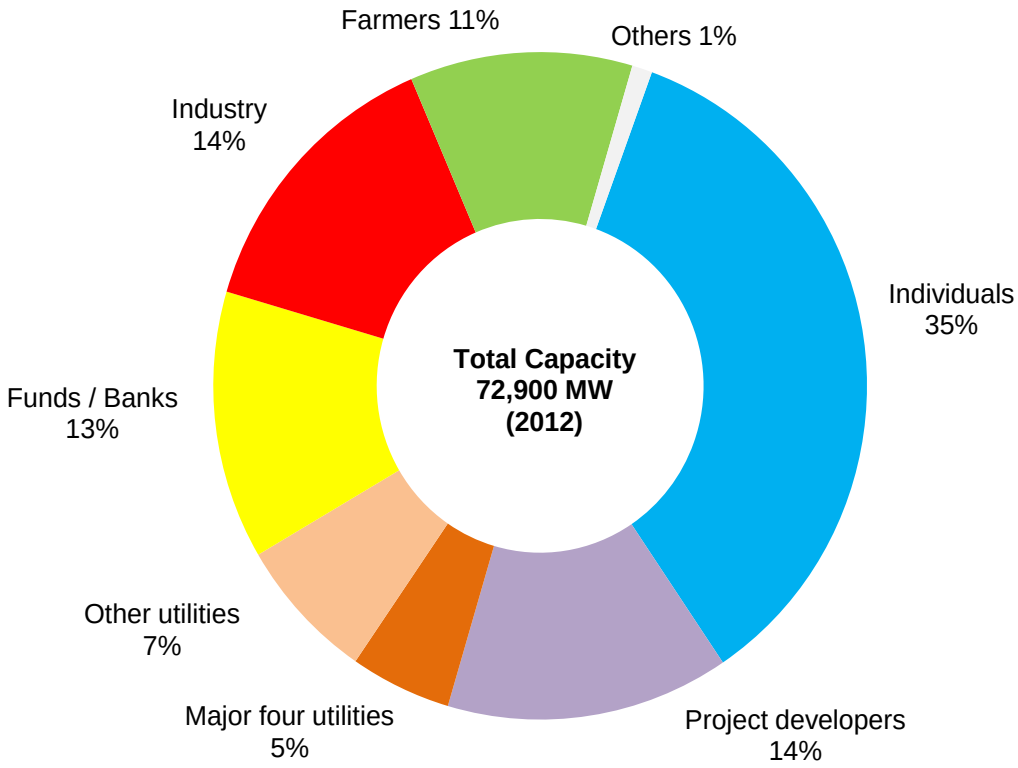
- Renewables: a game changer
- Impact of renewables on competition
- The need for a new market design
- Designing electricity auctions

The new challenges introduced by renewables require (more-than-ever) a **close interaction between regulatory and competition agencies**

# Renewables: a game changer



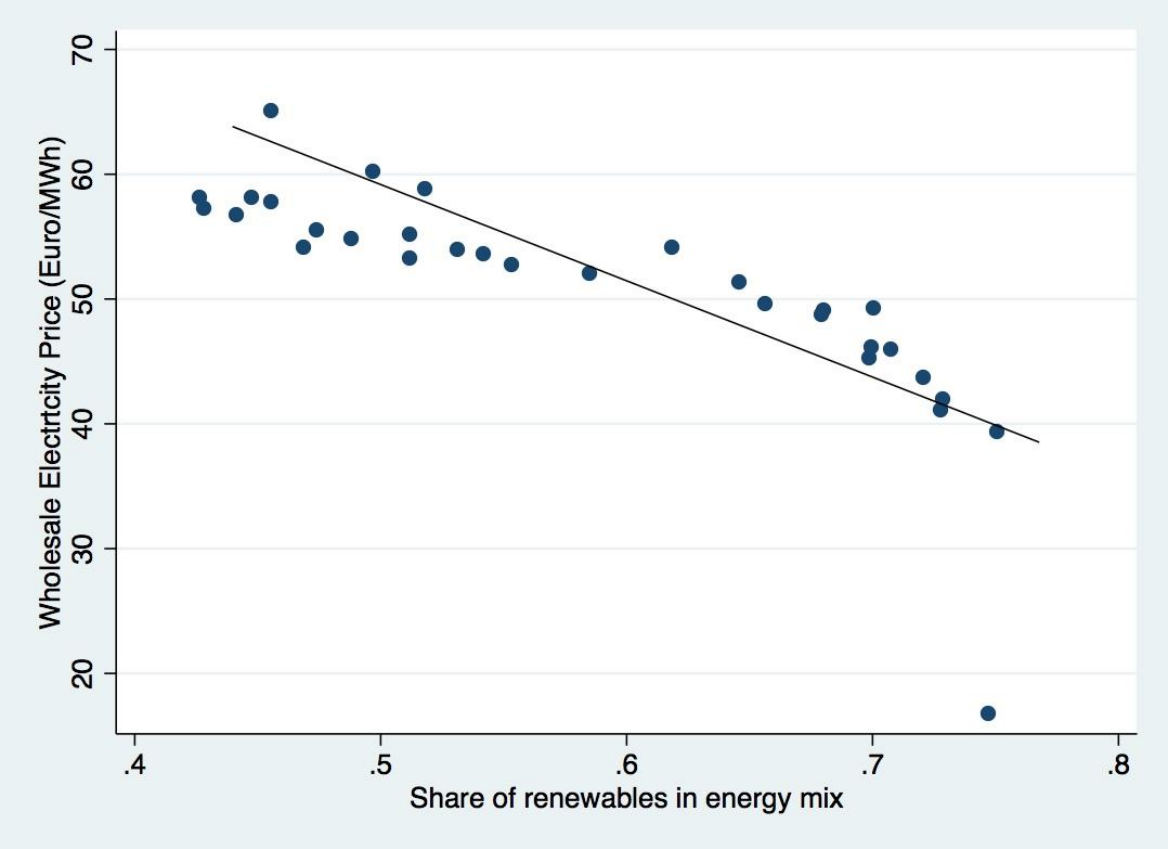
# A more fragmented market structure




Breakdown of ownership patterns for renewable generation capacities in Germany, 2012

Source: Fabra et al. (2014)

# Renewables depress electricity prices




Wholesale electricity prices in MIBEL versus the share of renewables in the mix, January 2018

# Renewables depress electricity prices

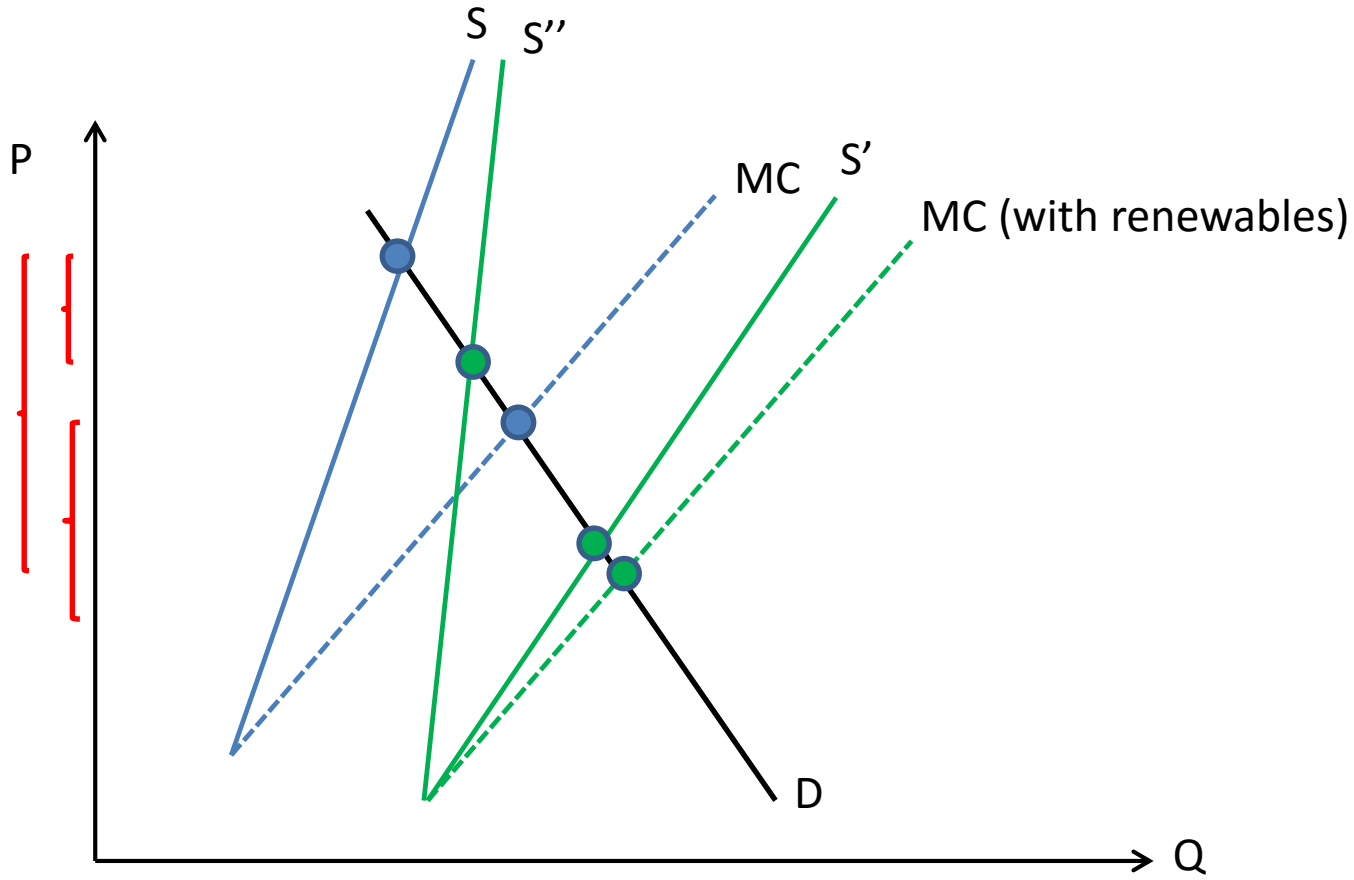
Which are the drivers of electricity market prices?

| | MODEL 1 | | MODEL 2 | |
|---|---|---|---|---|
| **Variable** | **Day-ahead prices** | **Day-ahead prices** | **Day-ahead prices** | **Day-ahead prices** |
| Carbon price | 0.22*** | 0.22*** | 0.19*** | 0.19*** |
| Natural gas price | 0.42*** | 0.42*** | | |
| Share of renewables | -0.09*** | -0.11*** | -0.10*** | -0.12*** |
| Import | 0.16*** | 0.16*** | 0.15*** | 0.18*** |
| Electricity demand | 0.23*** | 0.24** | 0.44*** | 0.54*** |
| Oil price | | | 0.33*** | 0.39*** |
| | | | | |
| R2 | 65% | 68% | 51% | 64% |
| Country Fixed Effects | YES | YES | YES | YES |
| Estimation Method | FMOLS | DOLS | FMOLS | DOLS |

Day-ahead Electricity Prices in 13 EU countries, 2007-2014

Source: European Commission (2015)

# Which part of the price reduction is due to stronger competition?




**The price reduction depends on the impact of renewables on market power**

# Effects of renewables on competition

- Research hypotheses:
  - Renewables mitigate market power because of…
    - More fragmented market structure
    - Uncertainty about which plant will set the market price (pivotality status)
  - Potential countervailing effects because of…
    - Risk aversion
    - Adverser selection (winner's curse)

# Renewables mitigate incumbents' market power in sequential markets

Ito and Reguant (2016) "Sequential Markets, Market Power and Arbitrage"

- Ito and Reguant (2016) study MIBEL
- Forward price premium between day-ahead and intraday markets
- Role of renewables in arbitraging price differences and mitigating incumbents' ability to exercise market power across markets

# Foward premium in MIBEL: day-ahead vs intraday markets

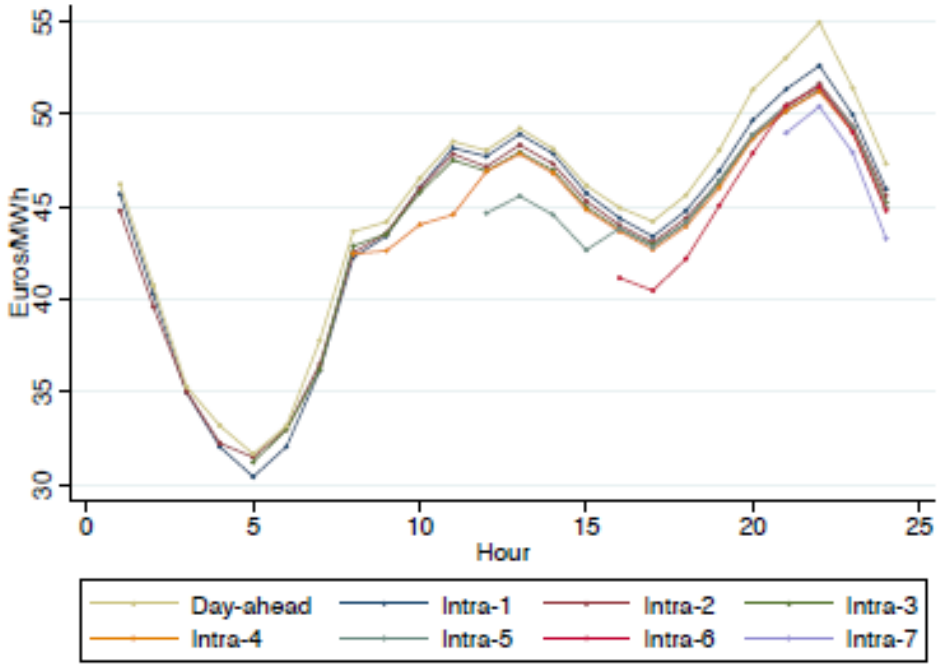
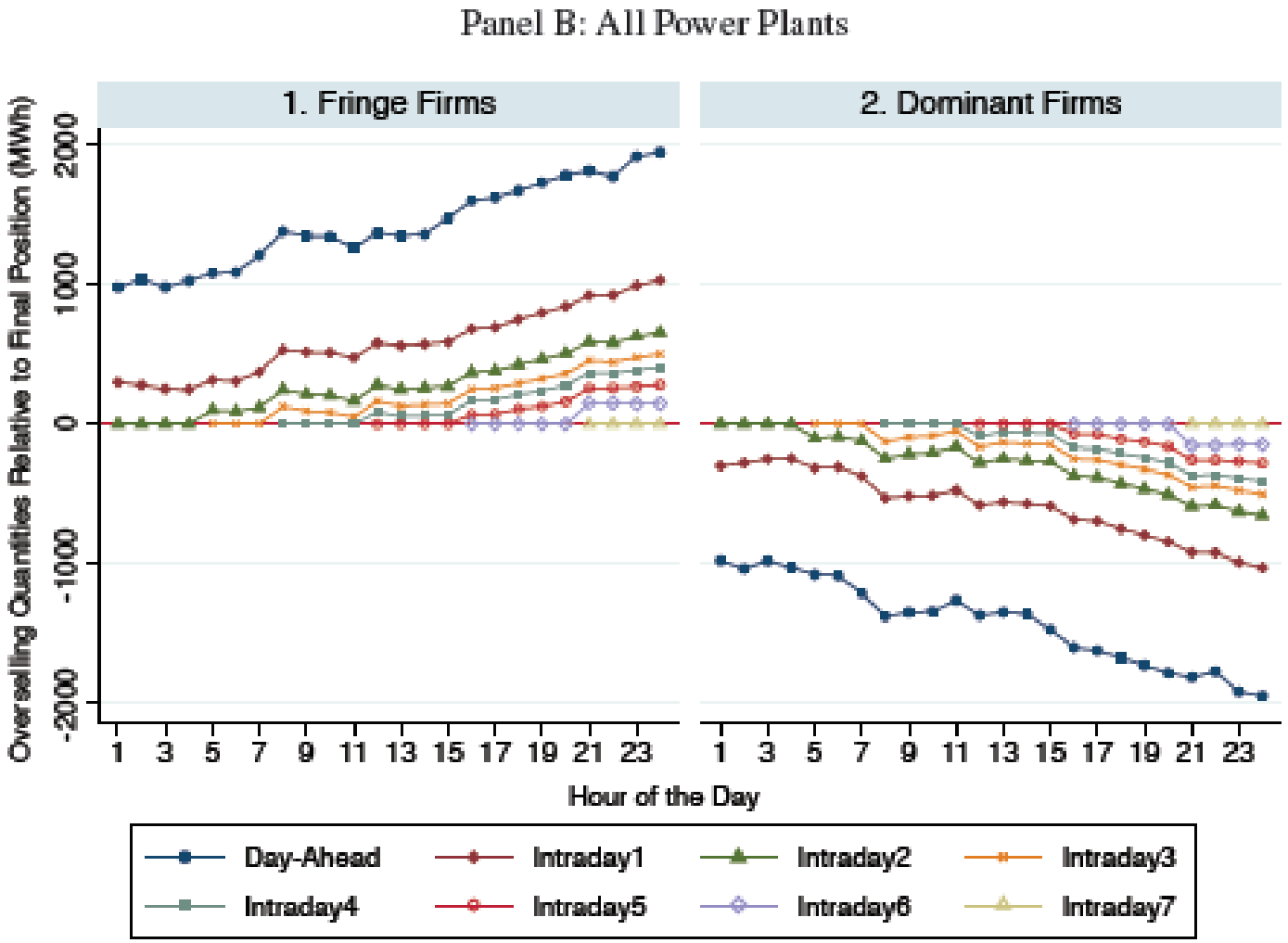


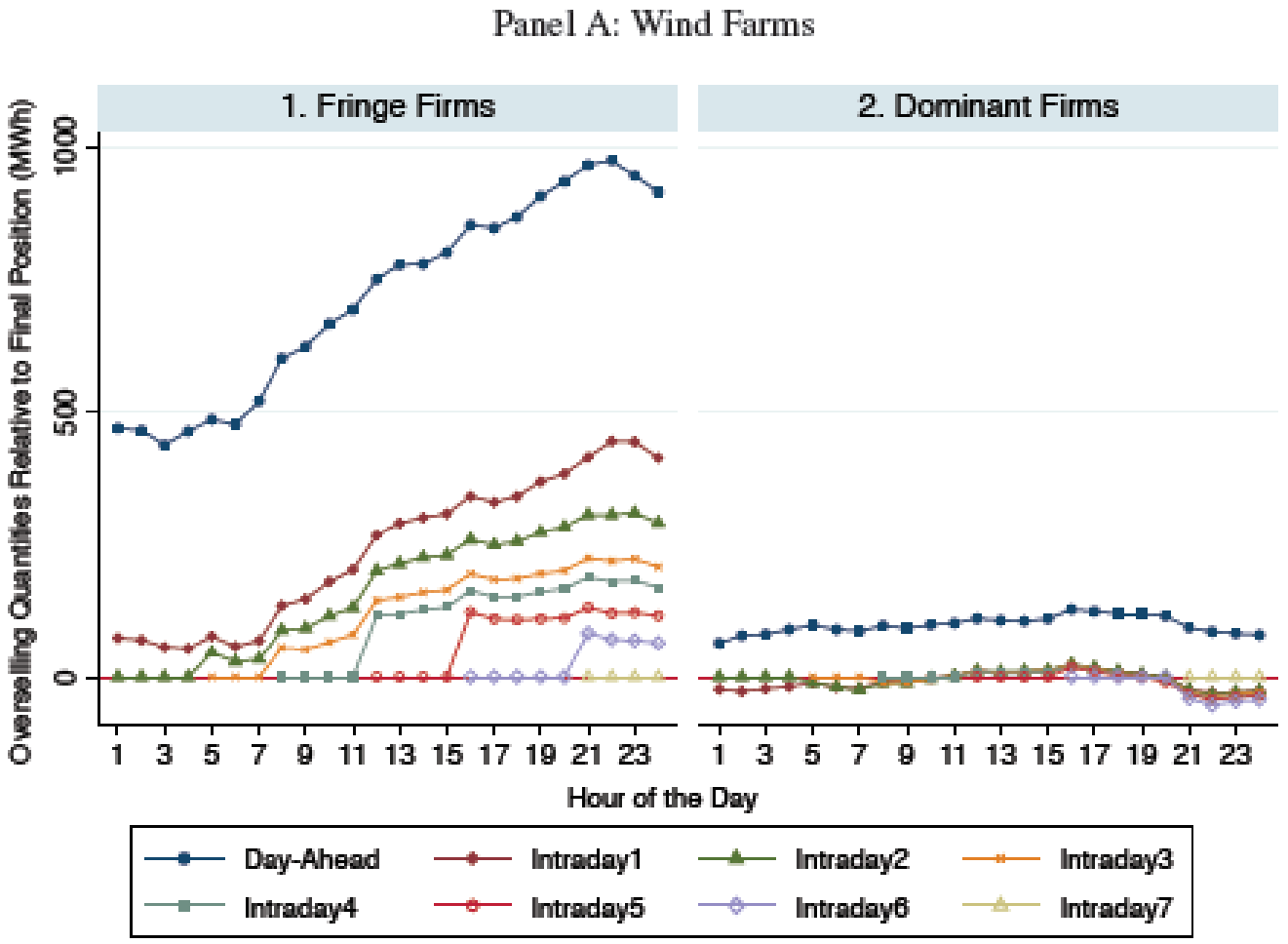

Figure 3: Market Clearing Price in the Day-ahead and Intra-day Markets

This figure shows the average market clearing price (Euro per MWh) in the day-ahead and intra-day markets, in which the horizontal axis shows hours for electricity delivery. Day-ahead market tends to exhibit prices that are on average higher than in the subsequent sequential markets.

# Over-selling/buying day-ahead: fringe firms versus dominant firms



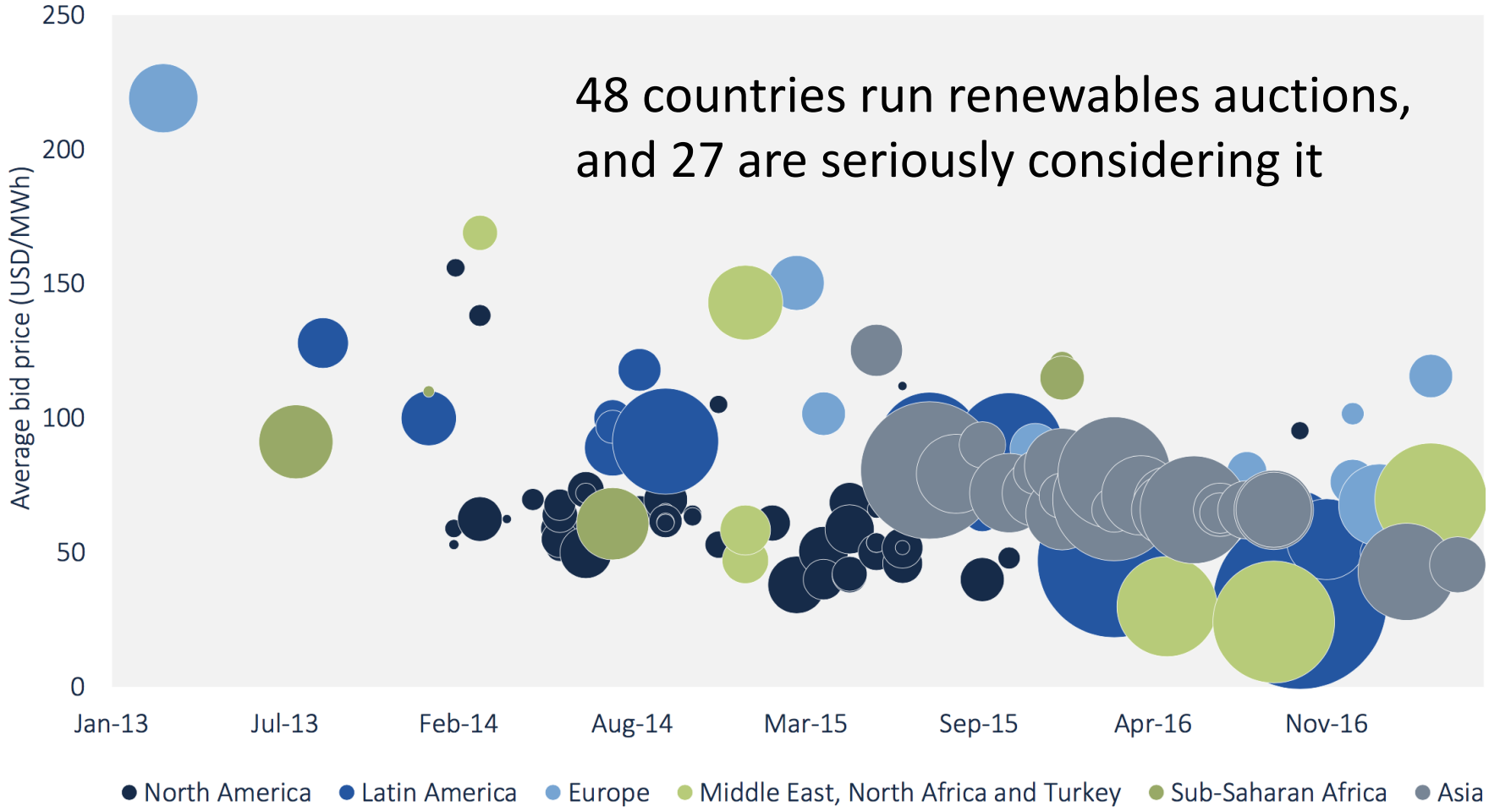
# Over-selling/buying day-ahead by wind farms: fringe firms versus dominant firms



# Need to re-think market design

- Shift of focus from the short to the long-run
- Need to de-risk investments
- Auctions for long-term contracts
  - Renewable energy
  - Back up capacity
- Liquid spot markets
- Important role for System Operators
- Market integration through interconnections

# The renewable auction revolution




**Global Tendered Projects by Bid Price and Capacity, 2014-2016**

Source: GTM Research

# The design of auctions for renewables can have a strong impact on competition

Auction design choices impact competition both in the auction as well as when bidding in the wholesale market

1. Which **contract** for renewables?
- Feed-in-tariffs versus fee-in-premia
- Differences in price exposure imply differences in:
  - cost of capital, types of bidders, impact on wholesale bidding…
2. Which **technologies** should compete? Technology neutrality?
3. Which **auction format**?
4. Which **participation requirements**?
5. Which **penalties** for default?

# Regulation and Competition

- Market design decisions typically adopted by regulators
- Sub-optimal focus on competition concerns
- If design flaws lead to weak competition (e.g. markets in congested areas), competition authorithies can do little to limit abuse

This calls for a **closer interaction between regulatory and competition agencies** when desigining markets

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