Carbon markets in Europe and outside Europe

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E·S·R·C Economic & Social Research Council

The Grantham Foundation for the Protection of the Environment

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Agenda

- International carbon markets
- Why linking?
  - Economic and political motivations;
  - Practical considerations.
- Carbon dating (based on work with Baran Doda, LSE)
  - Overview of the paper;
  - The key factors that determine when linking is beneficial;
  - Carbon dating in the real world.

International carbon markets

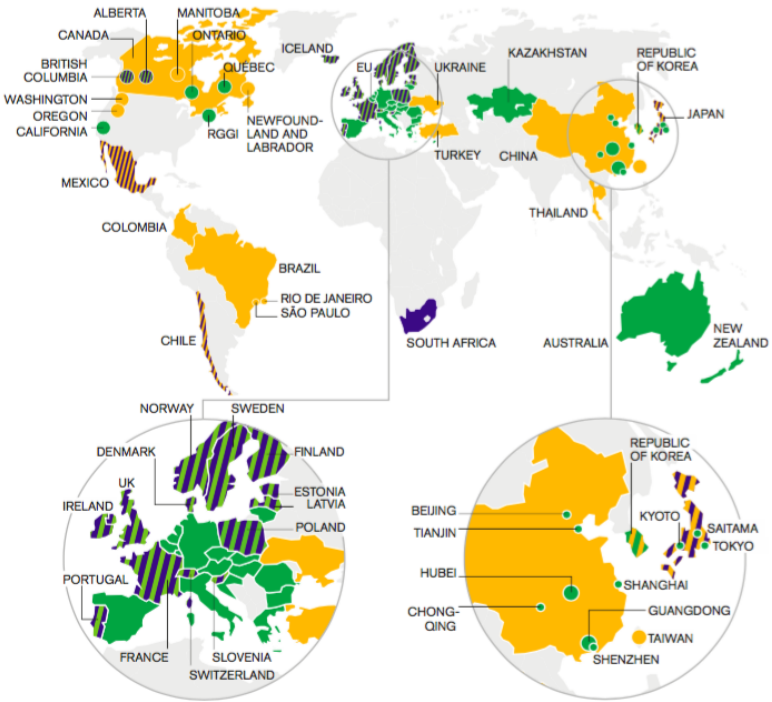
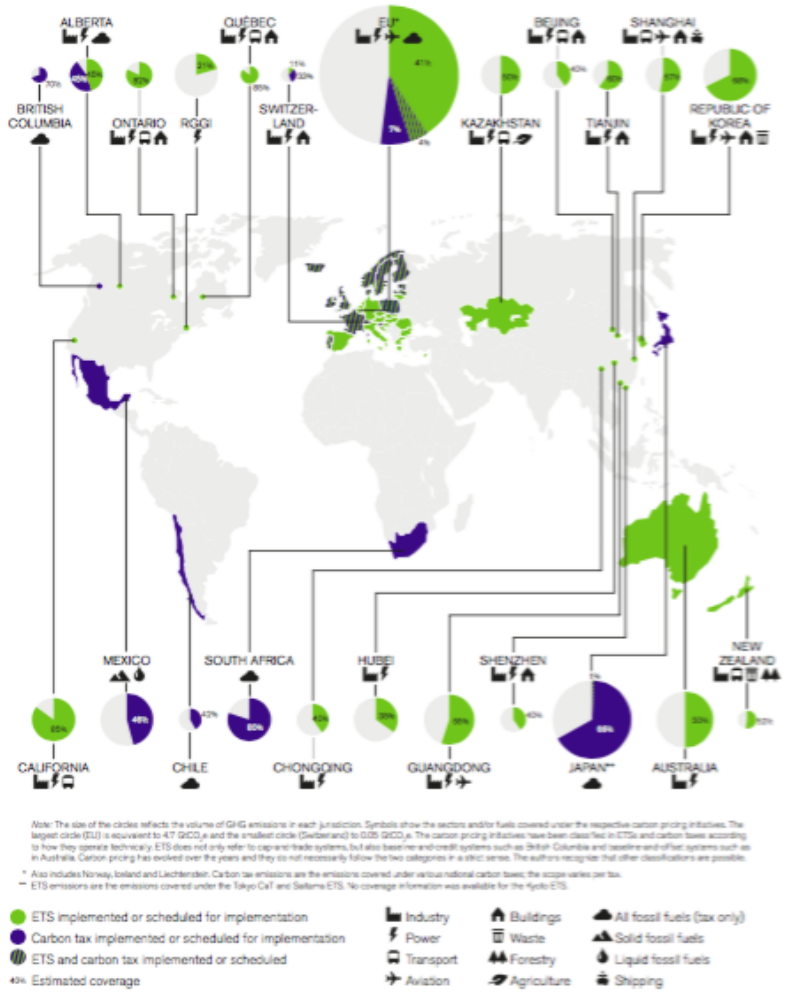


Figure: World Bank Group (2016)

- World Bank identifies one region consisting of 31 nations, eight individual nations and 23 sub-national jurisdictions implementing ETSs.
- A bottom-up policy architecture where ETSs interact can be a significant element of the global climate change policy framework in the future.

Carbon pricing and ETSs' coverage

- The sectors and fuels covered by carbon pricing initiatives vary per jurisdiction.
- ETSs and taxes typically cover GHG emissions from power and industry sectors.
- Most carbon taxes cover all fossil fuels for energy use, with exemptions for companies already covered under an ETS.



Prices and abatement costs

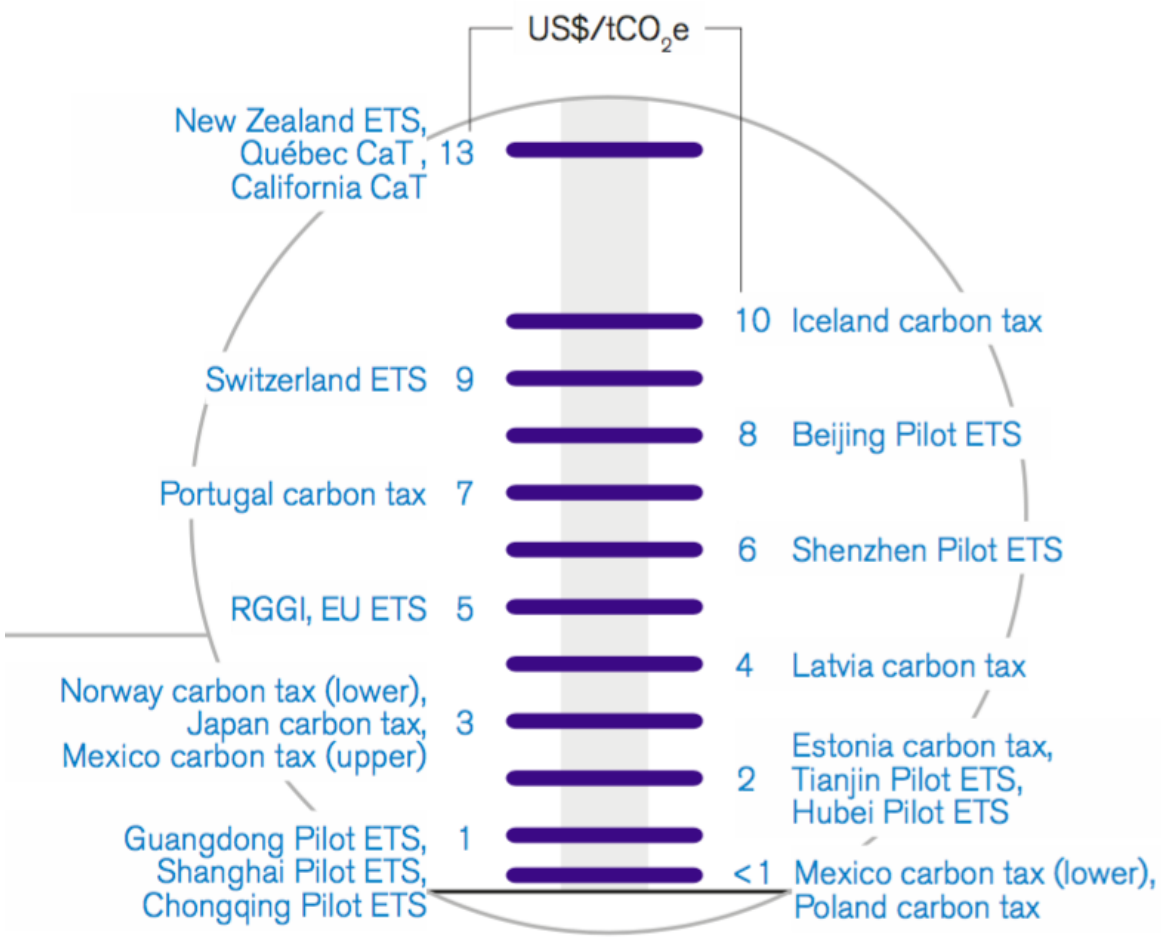


Figure: World Bank Group (2016)

Why linking?

- Economic motivations
  - Abatement costs being minimised across a larger pool of regulated firms;
  - Improved liquidity resulting in decreased transaction costs, and
  - Lower overall price variability and thus reduced price uncertainty (depending on who is the linking partner, more on this later).

- Political motivations
  - Linking locks-in ETS as (one of) the local regulatory choice(s) to control emissions
    - Thus the risk of regulatory capture (against ETS) is reduced;
  - Contributes to a level playing field that can facilitate international cooperation
    - Alleviates competitiveness concerns among economies;

Practical considerations

- Need for regulatory changes to ensure regimes are compatible:
  - Monitoring, reporting and verification (MRV) of emissions.
  - Enforcement and penalty mechanisms.
  - Registry system.
  - Cost containment mechanisms.
- You need to choose the right partner!
- May be easier to link systems which are designed from the start to be linkable (see CA and Quebec under the WCI platform).

Enter 'carbon dating'

- There is a missing opportunity when markets operate independently.
  - If companies in different markets were able to trade, they could make savings every time the price of permits varied across markets.
- In a recent paper we analysed the potential cost savings when previously isolated markets are linked.
  - *Carbon dating: When is it beneficial to link ETSs?*
- Our study examined how key factors characterizing the jurisdictions determine whether linking carbon markets, what we call *carbon dating*, is worth it.
- So, what does make a good carbon date?

Overview of the paper

- Evaluate economic advantage of linking over autarky

$$\mathbb{E}[\Delta] = \mathbb{E}[\delta_1] + \mathbb{E}[\delta_2]$$

  as a function of pair characteristics $\{(\psi_1, \sigma_1), (\psi_2, \sigma_2), \rho\}$ where $\psi_i =$ *size* , $\sigma_i =$ *variability* and $\rho =$ *correlation*
- Analytical results:
  - Explore the relationship between pair characteristics and jurisdiction-specific EAs
- Empirical application
  - Document the substantial empirical variation in aggregate and jurisdiction-specific EA

Two-jurisdiction model ($i = 1, 2$)

- Benefits of emissions

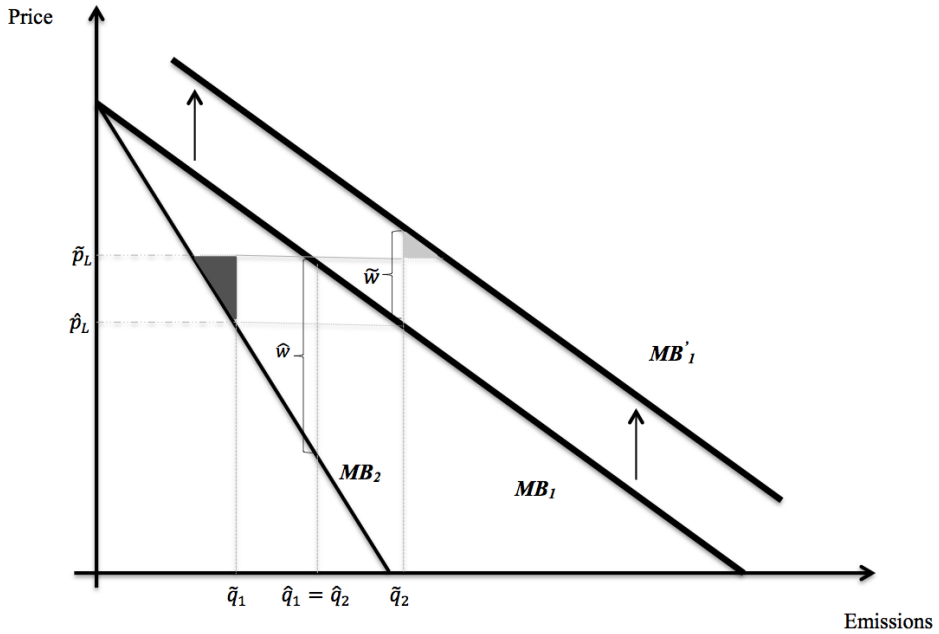
$$B_i(q_i, \theta_i) \quad = \quad b_0 + (b_1 + \theta_i)q_i - \frac{b_2}{2\psi_i}q_i^2$$

Shocks: e.g. business cycles, energy prices, weather, etc.

$$\mathbb{E}(\theta_i) = 0 \qquad \mathbb{V}(\theta_i) = \sigma_i^2 \geq 0 \qquad Corr(\theta_1, \theta_2) = \rho \in [-1, 1]$$

- Assume
  1. identical jurisdictions except in ψ_i and σ_i;
  2. same non-cooperative quotas under autarky and linking;
  3. sunk costs of linking are $(\psi_1 + \psi_2)\epsilon \geq 0$ and shared in proportion to size.

A simple example ($\psi_1 > \psi_2$)



1. Autarky prices may or may not be equal.
2. Ex post price differences is the source of EA.
3. Size matters for how EA is shared between jurisdictions.

Analytical results when $\epsilon = 0$

1. Aggregate EA is the sum of volatility and dependence effects scaled by the pair size effect

$$\mathbb{E}[\Delta] = PSE(VE + DE)$$

2. The smaller jurisdiction receives a larger share of the EA according to

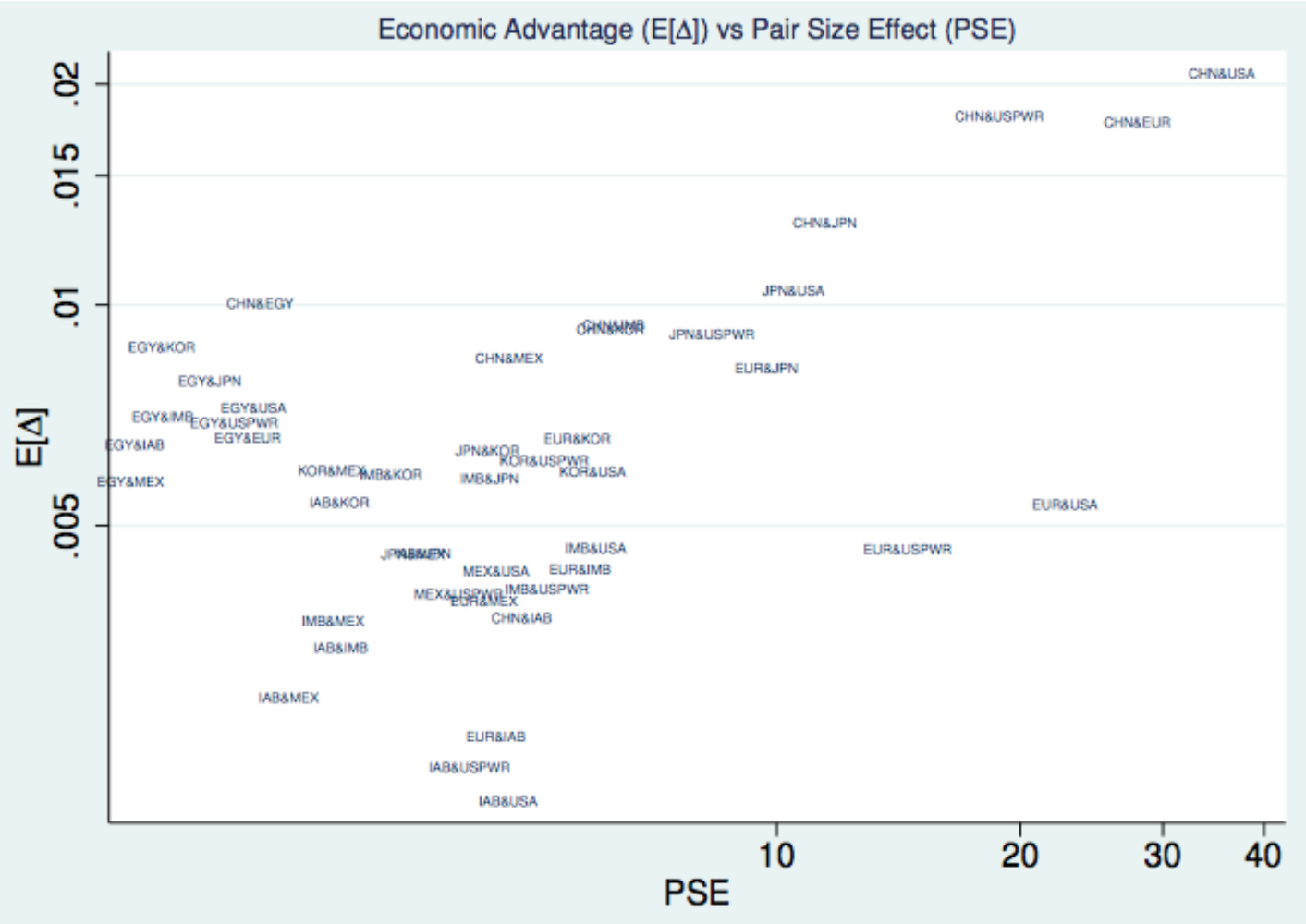
$$\mathbb{E}[\delta_i] = \frac{\psi_j}{\psi_i + \psi_j}\mathbb{E}[\Delta]$$

3. A jurisdiction can benefit from linking even if price volatility increases under linking relative to autarky.

REMARK: $\epsilon > 0$ is interesting and considered in detail in the paper.

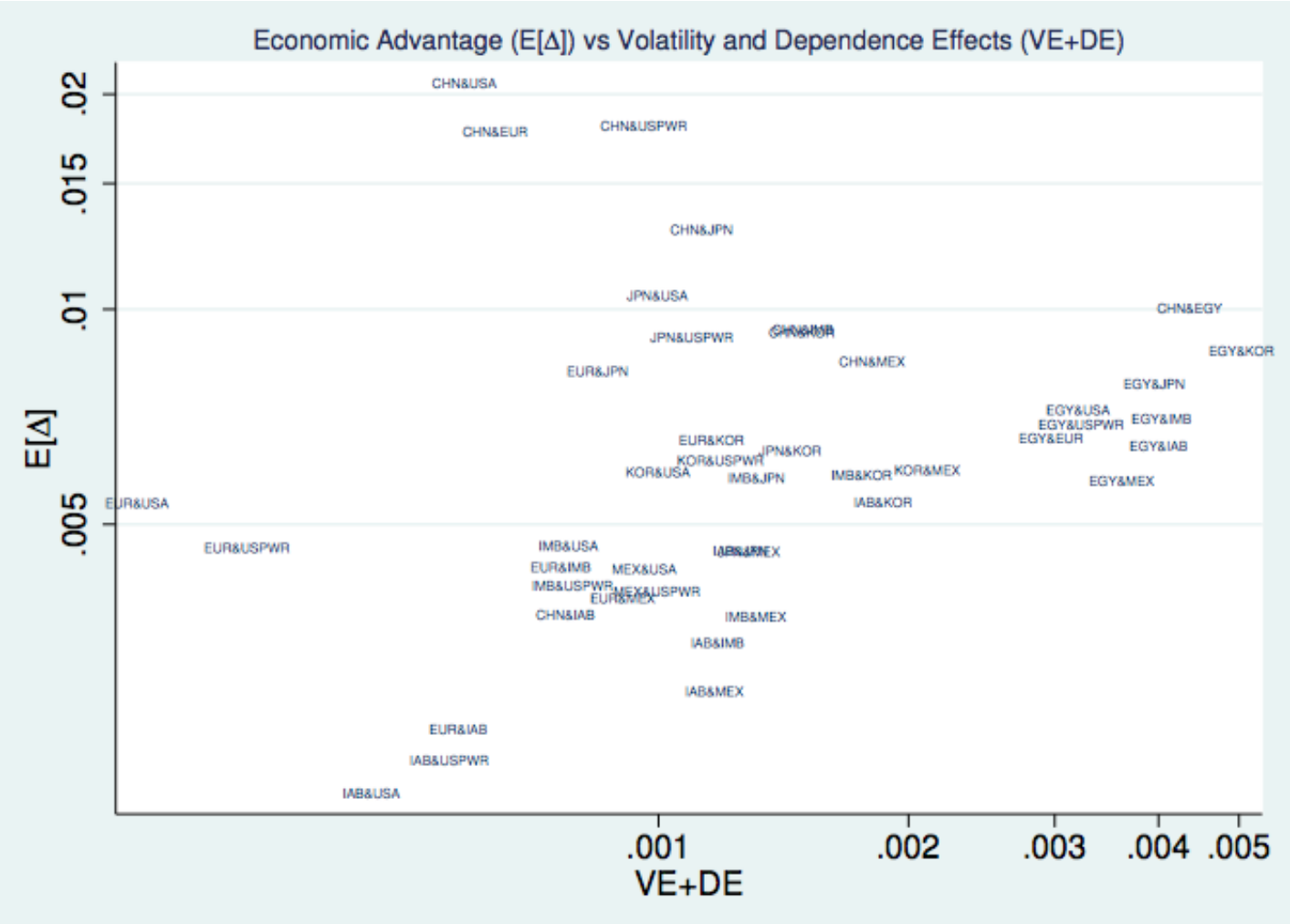
Empirical results: market size matters

- The smaller market tends to benefit most from cost savings.

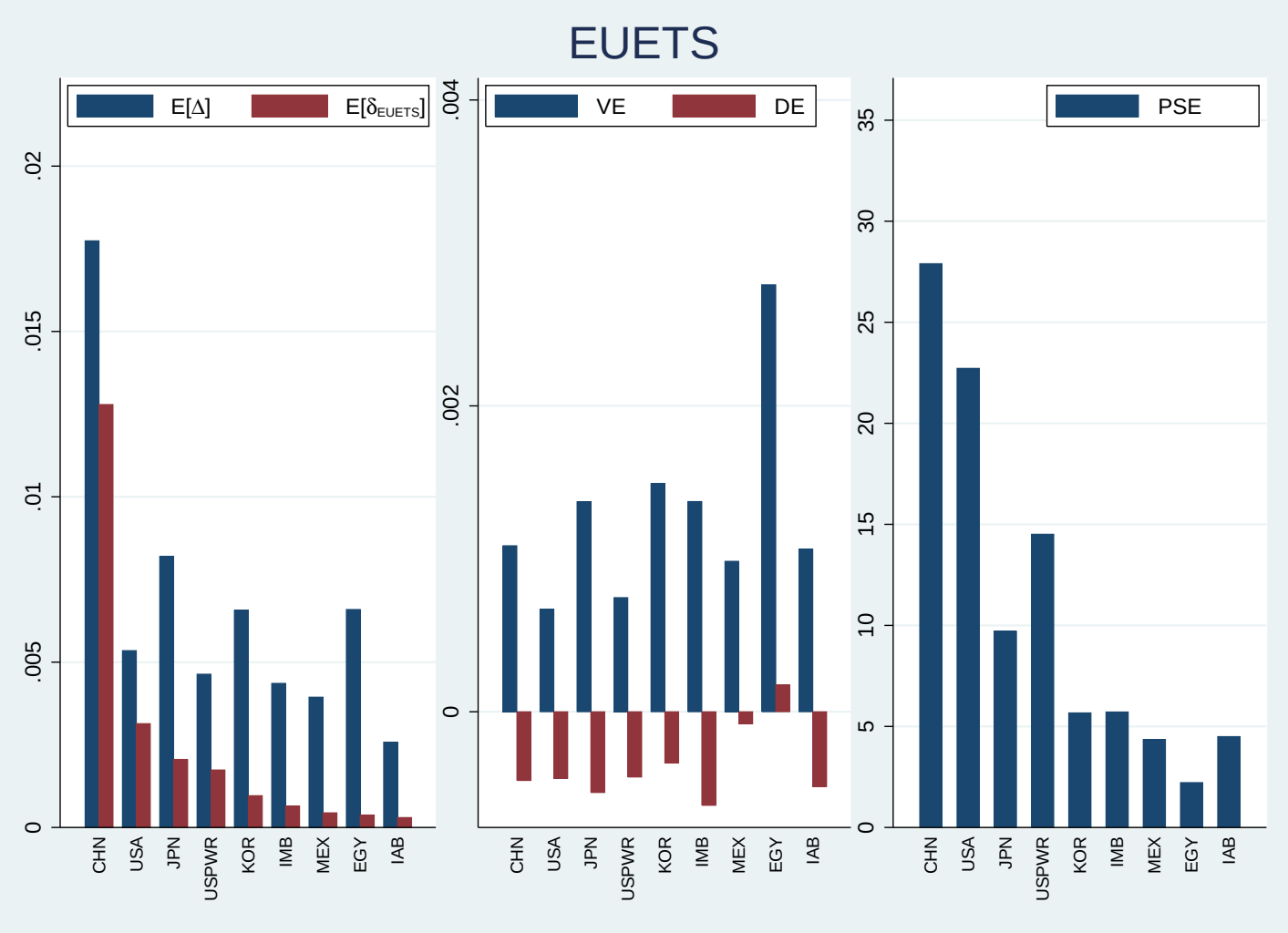


Empirical results: Opposites attract

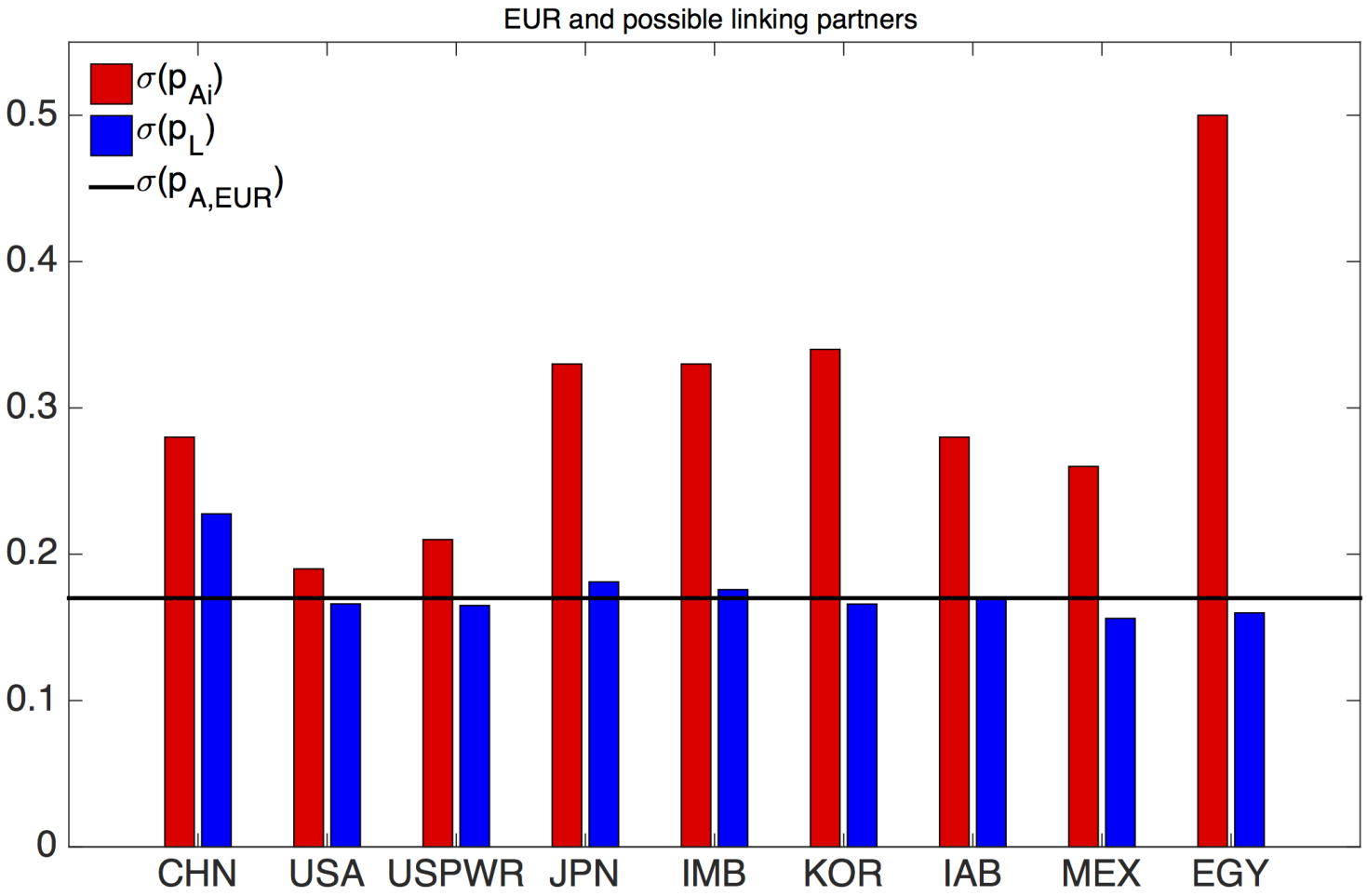
- A country prefers the demand in its partner's market to be more variable and inversely related to its own.



Empirical results: Countries participating in EUETS



Empirical results: Price volatility in EUR



Conclusions

- There is a missing opportunity when markets operate independently.
- The Paris Agreement opens a new era in international climate action with much stronger support for ETSs.
- Linking is always beneficial; what makes a good 'carbon date'?
  - Larger, volatile and negatively correlated partners are preferred.
  - Variation in the data makes 'linking partner match' exercise worthwhile.
  - Sunk costs can kill a carbon date.
- We are investigating:
  - distortions on international permit transactions, e.g. unilateral taxation
  - multilateral linking
  - differences in jurisdictions' ETS design elements

Contact details

Thank you very much for your attention.

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