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# Government-Firm Bargaining over Environmental Regulation: Evidence from the EU Emissions Trading Scheme

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# Research Question in Perspective

## RESEARCH QUESTION

Which “firms” get what in bargaining over the allocation of valuable emission permits?

- ▶ Research on the EU emissions trading scheme (EU ETS) so far:
  - ▶ Economic research on allocation rules, market efficiency, effects on competitiveness (Ellerman et al. 2007, 2010).
  - ▶ **No** research on **distributive politics** of the EU ETS.
- ▶ “The implementation of an emissions trading scheme is essentially a political process.” (Pinske, 2008, 195).

# What Is the EU ETS?

- ▶ The EU ETS was created as a policy response in the aftermath of the Kyoto Protocol and is operated since 2005.
- ▶ Single largest ETS worldwide, with more than 11,000 installations, 10 (aggregated) sectors in 31 countries.
- ▶ Annual regulated CO<sub>2</sub> emissions: 2 billion tons (market value of more than 10 billion euro).
- ▶ Permits are the **currency** of an emissions trading scheme.

# Sketching an (Informal) Argument

- ▶ **Claim 1:** Multinationals (=foreign) firms are more productive.
- ▶ **Claim 2:** Large multinationals face higher relocation costs.
- ▶ In a bargaining model, claim 1 strengthens and claim 2 weakens a multinational's outside option.

## Main Argument

On the margin, foreign firms obtain **more** permits, but this effect **decreases** with size.

# Simple Model of Relocation Risk

- ▶ Assume a firm  $i$  relocates if  $\pi_i(q_i) < \bar{\pi}_i + C_i$  where  $C_i = \kappa_i(s_i) + \epsilon_i$ .
- ▶ If  $\epsilon_i \sim F_i$ , expected relocation risk is

$$r_i = F_i\left(\bar{\pi}_i - \pi_i(q_i) - \kappa_i(s_i)\right) \cdot H_i$$

- ▶ Minimization problem

$$\min_{q_i} \sum_i^n r_i \quad \text{s.t.} \quad \sum_i^n q_i = \bar{Q}$$

$$f_i\left(\bar{\pi}_i - \pi_i(q_i) - \kappa_i(s_i)\right) \cdot \pi'_i(q_i) \cdot H_i = \lambda \quad \forall i \quad \text{FOC}$$

- ▶ With concavity of  $\pi_i$  and a negative cross-partial of  $F_i$ , comparative statics rationalize the bargaining logic from the informal argument.

# Novel Firm-Level Data

- ▶ Allocation and emissions data at **installation level** from EU ETS:
  - ▶ Coverage for up to 12,536 plants.
  - ▶ Installations across 11 sectors in 28 European countries.
  - ▶ Largest sectors: Combustion (32%), Power (30%), and Ceramics (11%).
- ▶ Match emissions data with **firm level** information:
  - ▶ Installations are owned by 3,567 firms.
  - ▶ Largest firms: E.ON (Germany, N=207), Veolia (France, N=202), Wienerberger AG (Austria, N=173), Suez (France, N=137), and Vattenfall (Sweden, N=113).
  - ▶ Median firm size is just one plant, with a mean of only 2.81 installations.
- ▶ Hierarchies at the installation, firm, sector, and country level.

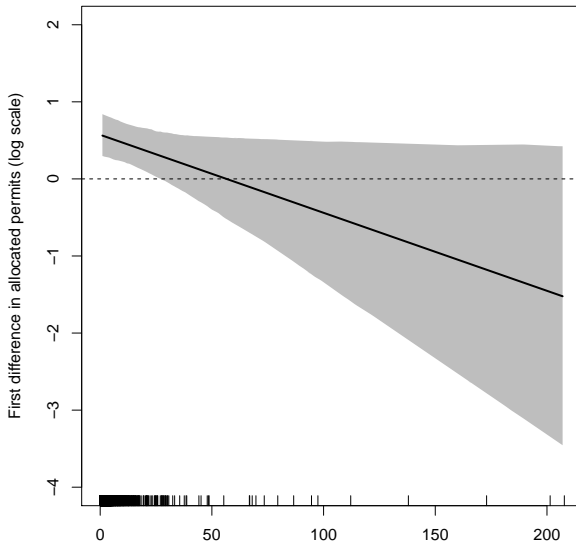
# Model Specification

- ▶ **Varying intercept, varying slope** model at firm-level with firm size as group-level predictor (3,222 firms).
- ▶ Two additional, **non-nested** hierarchies at country (28 countries) and sector level (11 sectors).
- ▶ Considerable variance at hierarchies.

| Level         | Variance | SE    | % Total |
|---------------|----------|-------|---------|
| Firm-level    | 10.219   |       | 37%     |
| Intercept     | 5.734    | 2.395 |         |
| Slope         | 4.485    | 2.118 |         |
| Country-level | 4.431    | 2.105 | 15%     |
| Sector-level  | 2.014    | 1.419 | 8%      |
| Plant-level   | 11.315   | 3.364 | 40%     |

# Estimation Results: Substantive Effects

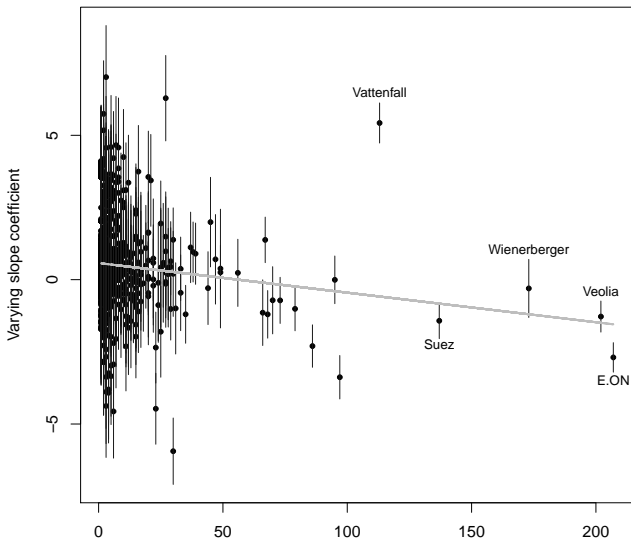
**First Difference in Allocated Permits  
Multilevel Model with Three Hierarchies**





# Estimation Results: Varying Slope Coefficients

Varying Slope Coefficients as a Function of Firm Size Group Level Predictor



# Conclusion & Contribution

- ▶ Theoretical argument about **conditional** relationship between foreign ownership and firm size.
- ▶ Advances understanding of **distributive politics** in new market-based regulation between governments and firms.
- ▶ Introduces a novel data set to test **firm-level** arguments with (verifiable) **firm-level** data.
- ▶ Ways forward:
  - ▶ Examine market structure more carefully (sectoral hierarchy).
  - ▶ Leverage country differences in allocation rules (country hierarchy).