Emission Trading and Overlapping Environmental Support: Installation-level Evidence from the EU ETS

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To begin with

- This is a great paper with lots of new data and insights. I learned a lot from it.
- Construct a novel production-based measure of emission efficiency at the installation (plant) level
- Collect data on more than 24,000 state aid cases in the EU to create four granular measures of national support policy.
- Key question: how ETS and national policies interact?

Background

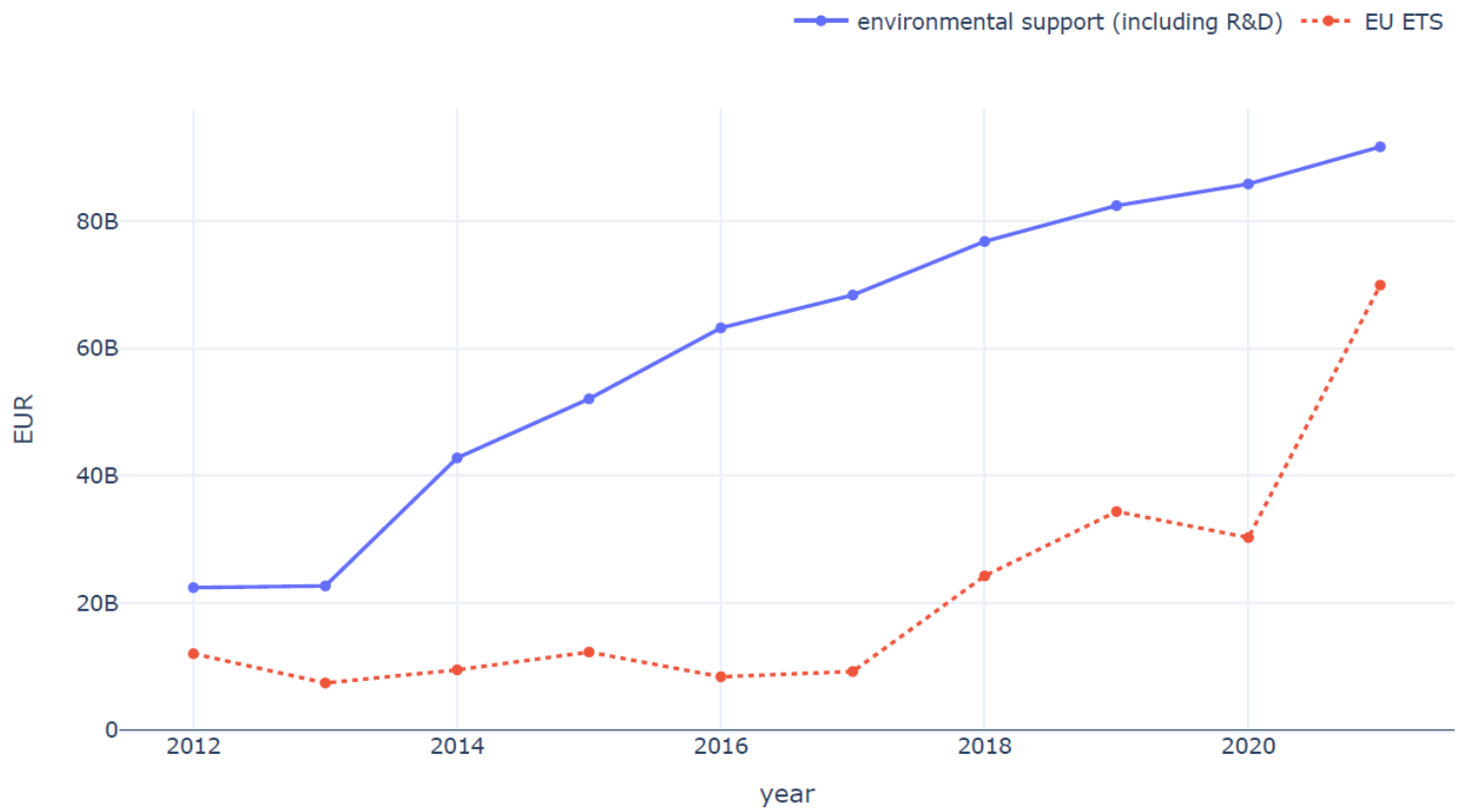


Figure 1: Total annual national environmental support by EU member states (blue) versus total annual value of the EU ETS (red; aggregate emissions in tCO_2 multiplied by the annual average EUA price in EUR/tCO_2).

Things are going in the right direction

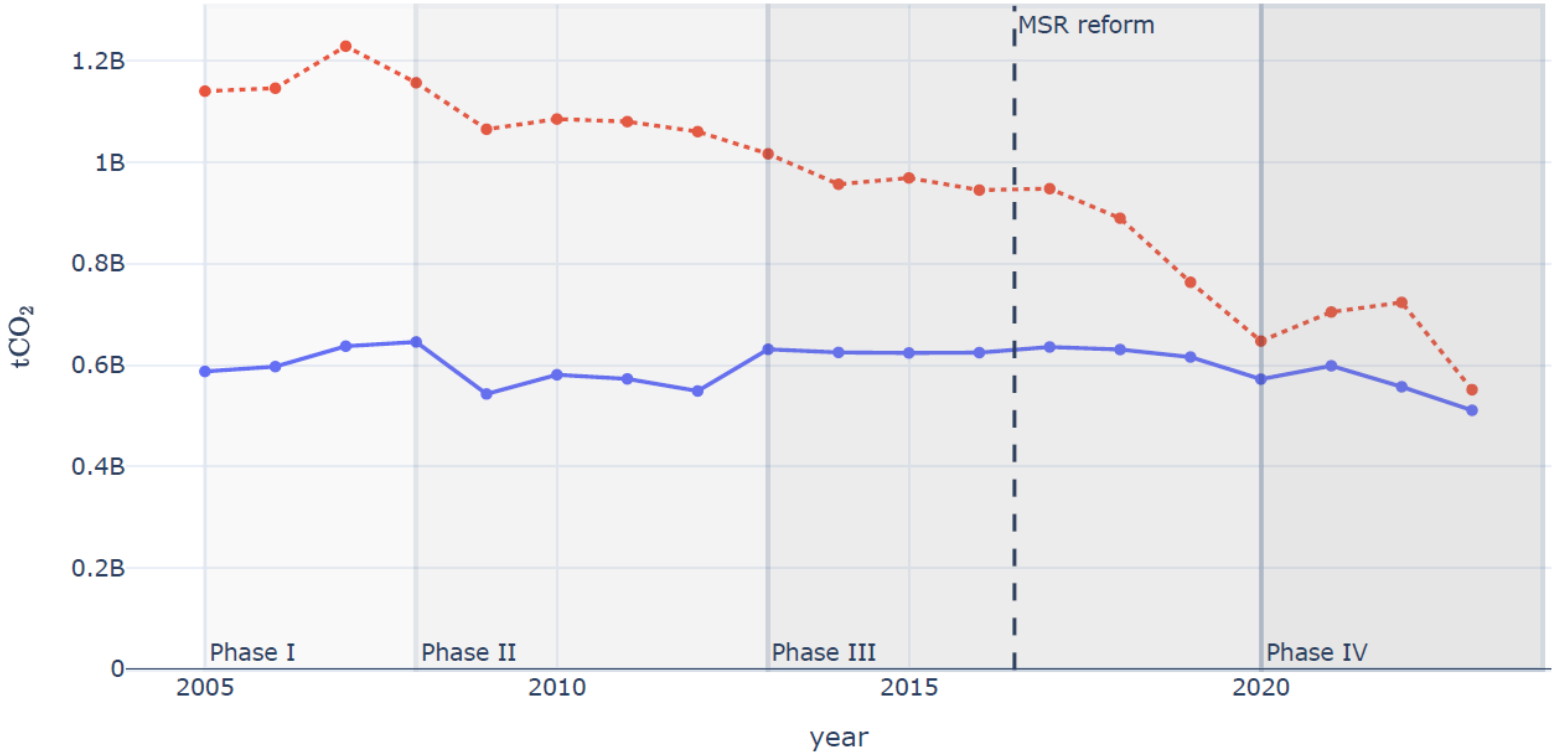


Figure 2: Aggregate annual emissions in the EU ETS of power producers and installations in the manufacturing sector (including mining and quarrying).

Power Industry: a lot of progress by dirty firms

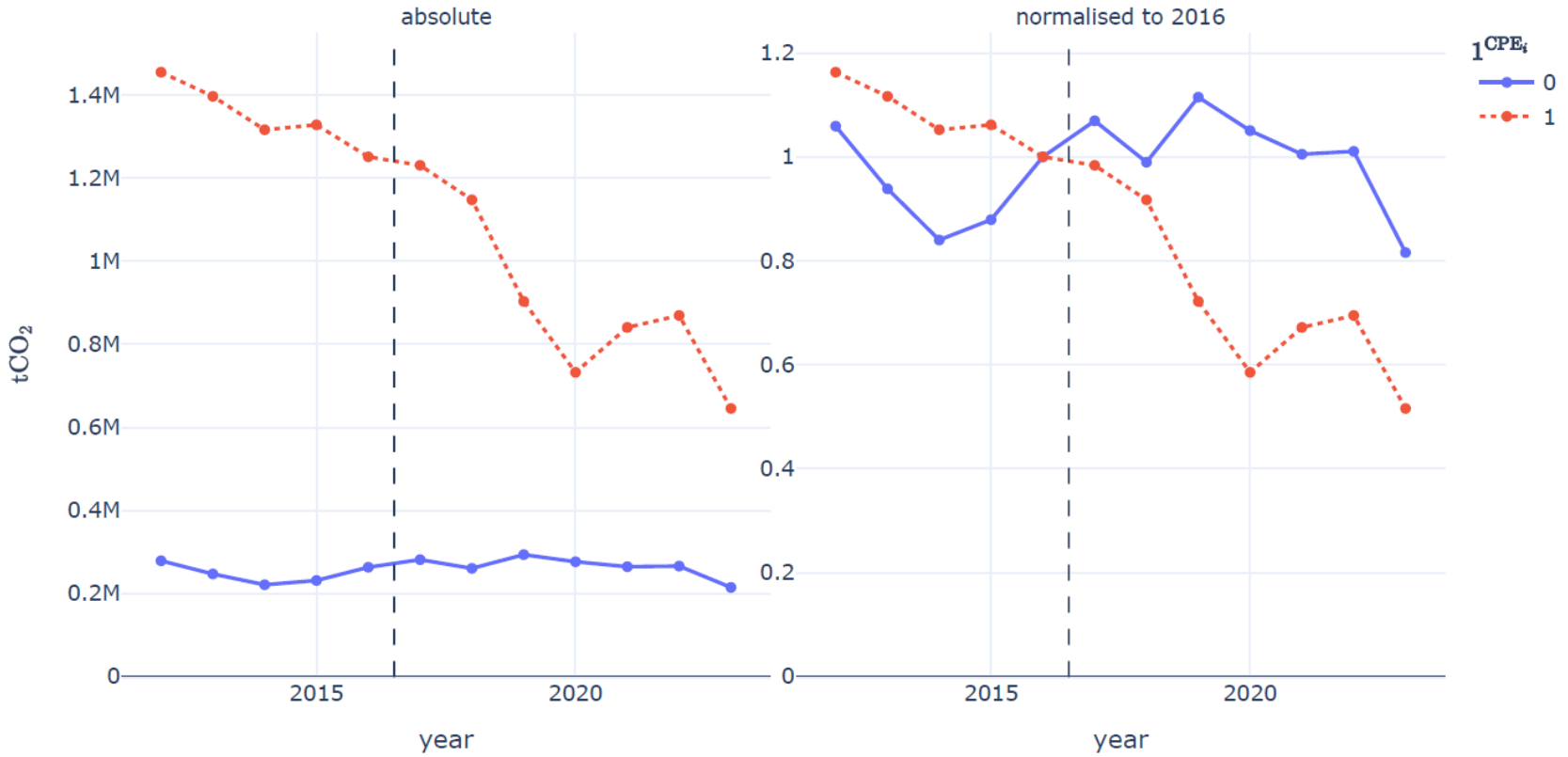


Figure 3: Annual average emissions of installations in the power sample. The left-hand side shows absolute values, while the right-hand side is normalised to 2016.

Manufacturing Industry: some progress by dirty firms

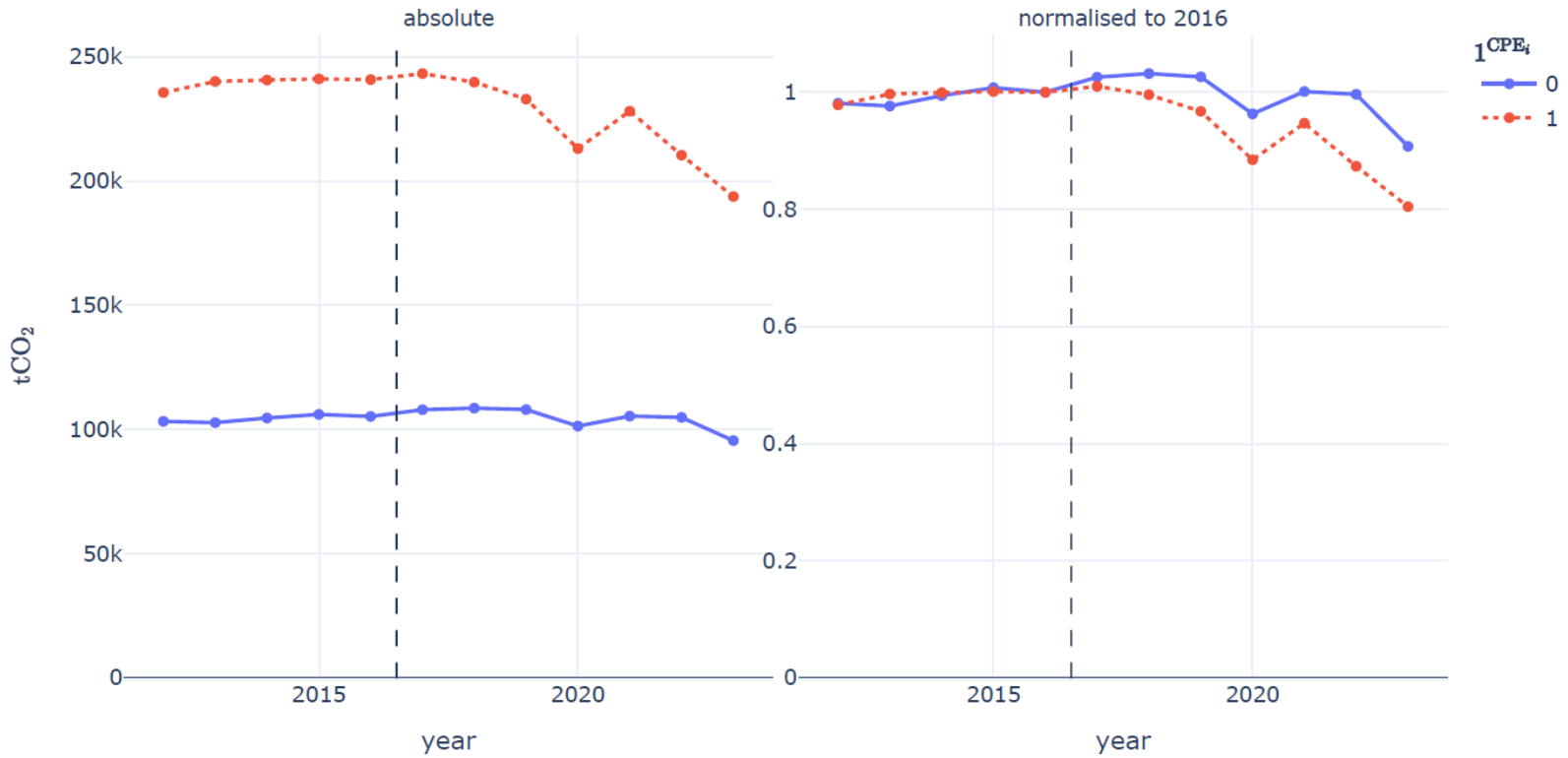
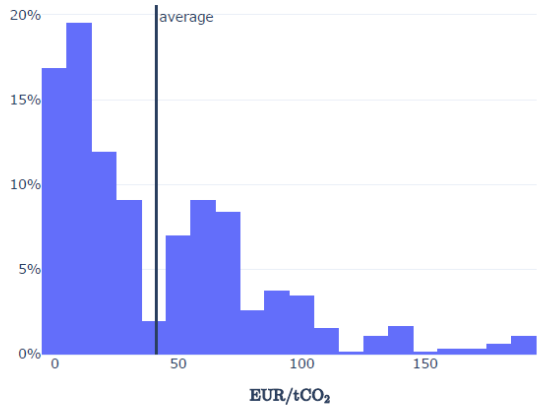
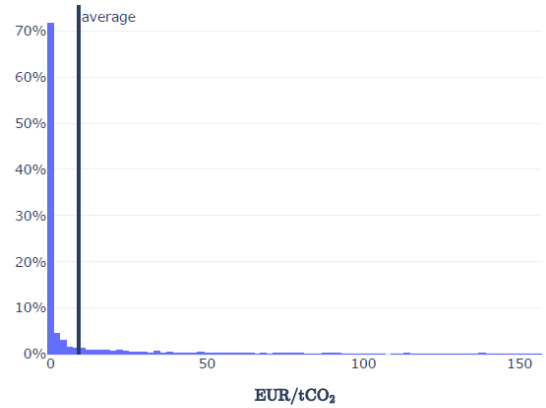


Figure 4: Annual average emissions of installations in the manufacturing sample. The left-hand side shows absolute values, while the right-hand side is normalised to 2016.

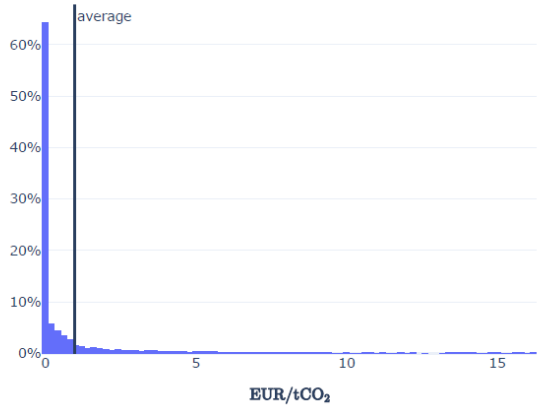
Industry-country support: a lot of variation



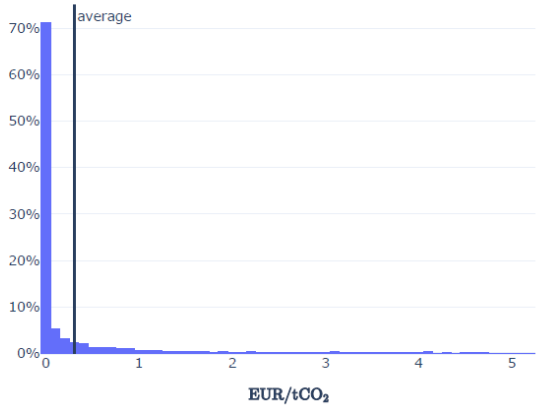
(a) renewable energy support



(b) Compensation for energy-intensive industries



(c) R&D support



(d) investment aid for energy efficiency

Figure 8: The histograms show the distribution of annual country-industry expenditures on environmental support normalised by the country-industry's total EU ETS emissions over the period 2012–2021. Expenditures are aggregated at the NACE 4-digit. To improve readability the histograms' x-axes are truncated at the 95%-tile.

Basic regression framework

$$Y_{it} = \beta_0 + \beta_1 \times \text{Post}_t \times \mathbb{1}^{\text{CPE}_i} + X_{it} + \lambda_i + \tau_t + \epsilon_{it},$$

$$Y_{it} = \beta_0 + \sum_{s=2012}^{2023} \beta_1^s \times \mathbb{1}_{t=s} \times \mathbb{1}^{\text{CPE}_i} + \lambda_i + \tau_t + \epsilon_{it},$$

$$\begin{aligned} Y_{it} = \beta_0 + X_{it} + \lambda_i + \tau_t + \epsilon_{it} \\ + \beta_1 \times \text{Post}_t \times \mathbb{1}^{\text{CPE}_i} \\ + \beta_2 \times \text{Post}_t \times \mathbb{1}^{\text{LSP}_{cj}^{\alpha}} \\ + \beta_3 \times \text{Post}_t \times \mathbb{1}^{\text{CPE}_i} \times \mathbb{1}^{\text{LSP}_{cj}^{\alpha}}. \end{aligned}$$

Even study results

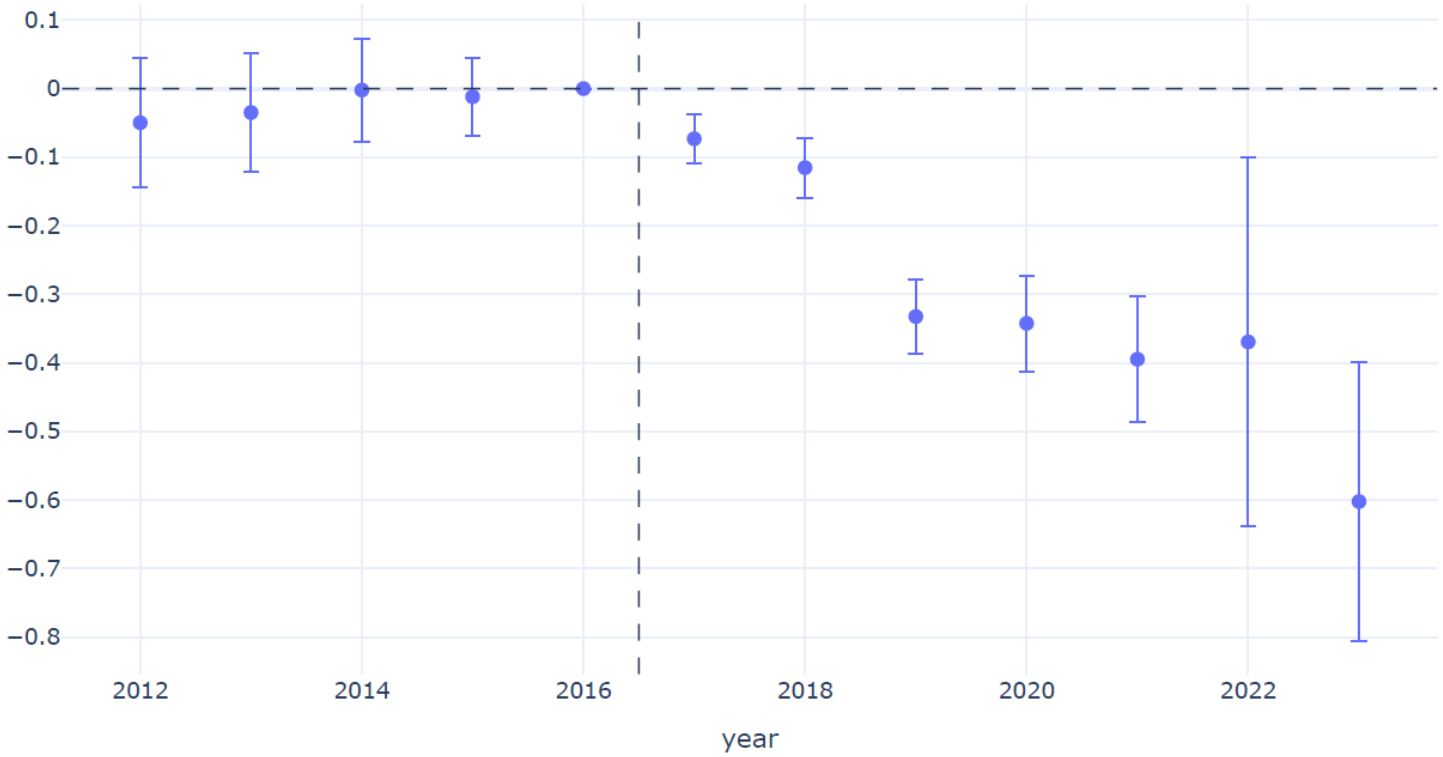


Figure 11: Estimates of the event study specification (9). Each dot represents the point estimate of β_1^s for a given year s. The coefficient β_1^{2016} is normalised to zero. Standard errors are clustered at the installation level and vertical bars show 95% confidence intervals.

Key regression

	(1)	(2)
$\text{Post}_t \times \mathbb{1}^{\text{CPE}_i}$	-0.086***	-0.416***
	(0.026)	(0.060)
$\text{Post}_t \times \mathbb{1}^{\text{CPE}_i} \times \mathbb{1}^{\text{LSP}^{\text{eff}}_{cj}}$	-0.017	-0.246
	(0.048)	(0.229)
$\text{Post}_t \times \mathbb{1}^{\text{CPE}_i} \times \mathbb{1}^{\text{LSP}^{\text{eiu}}_{cj}}$	0.086***	
	(0.033)	
$\text{Post}_t \times \mathbb{1}^{\text{CPE}_i} \times \mathbb{1}^{\text{LSP}^{\text{res}}_{cj}}$		-0.448***
		(0.100)
$\text{Post}_t \times \mathbb{1}^{\text{CPE}_i} \times \mathbb{1}^{\text{LSP}^{\text{rnd}}_{cj}}$	-0.089	0.227
	(0.069)	(0.260)
Sample	Manufacturing	Power
Fixed effects	λ_i, τ^3_{tjac}	λ_i, τ^3_{tjac}
Energy price controls	Yes	Yes
Cluster variable	Installation	Installation
Clusters	2,872	1,247
Observations	33,200	14,727

Lots of robustness

- Alternative sets of fixed effects.
- Energy price controls.
- Alternative measure of support intensity.
- OLS instead of Poisson estimator.

Some remarks

- The paper has the right data to look at the issue of whether or not the tightening of ETS caused a differential reduction of emissions between low and high exposed installations.
- The result is positive and very significant (different also between energy and manufacturing). However:
  1. The regression design does not allow to tell what is the *overall level* of the impact because all is normalised with respect to the response of low exposed installations.
  2. Yet my feeling from the descriptive stats is that not much happened for low exposed firms with the tightening of ETS so we may be close to the overall effect.

Some remarks

- The paper also benefits from extremely rich data on State-level support policies
- The analysis on the energy sector makes a lot of sense. When polluting is becoming very costly firms reduce emissions and the more so where State support to finance the transition is generous.
- However, and for the same reasons, the result on manufacturing does not make much sense. The authors need to think more carefully and work out some concrete examples of how this happened if anything.
  1. The elephant in the room could be the war between Ukraine and Russia and the availability (not just the price) of alternatives to Russian gas.

A few more things

- The paper is well written and enjoyable to read also for a non-expert like me but sometimes you need to provide more explanations (for example, initial free allocations).
- Some of the material in the Appendix is not exploited/discussed in the main body of the paper.
- As far as I understand, for energy producers you do not have actual emissions and cite Nicholson and Heat (2021). This needs more explanation.
- I wonder to what extent the exit of the UK from the EU has affected the functioning of ETS for other EU countries.