

Going green by putting a price on pollution: Firm-level evidence from the EU

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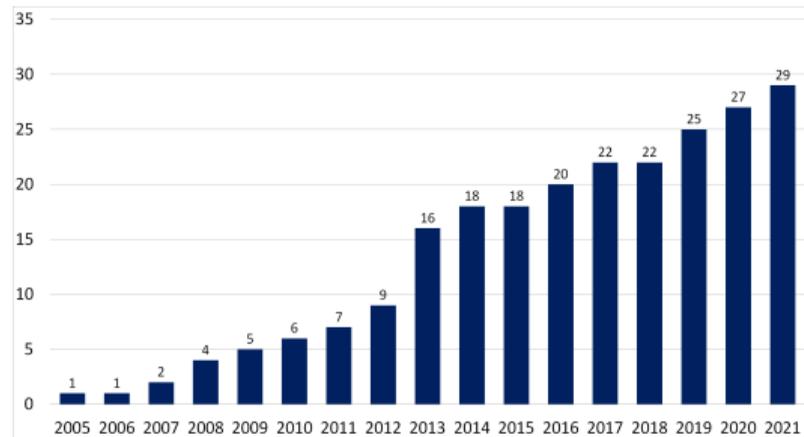
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Figure: # ETS globally

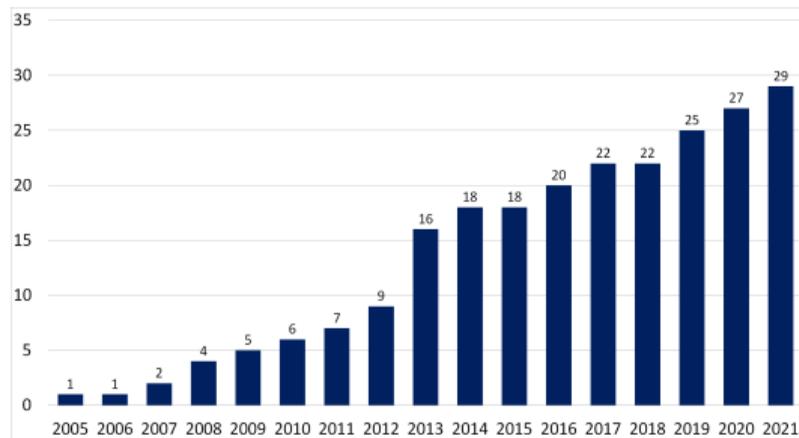


source: <https://carbonpricingdashboard.worldbank.org/>

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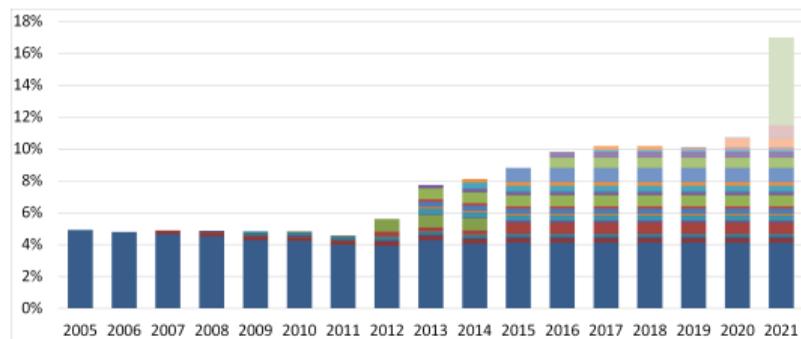


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Figure: % global GHG emission covered by ETS

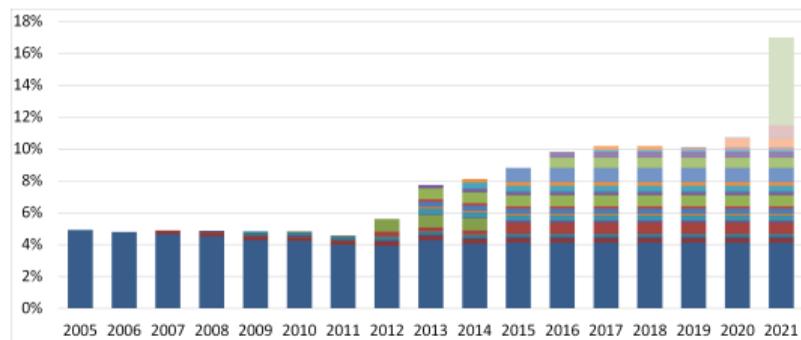


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- ▶ Largest and oldest ETS = EU ETS
 - ▶ Cap and trade system
 - ▶ Regulated firms: emit ± 50% of Europe's GHG

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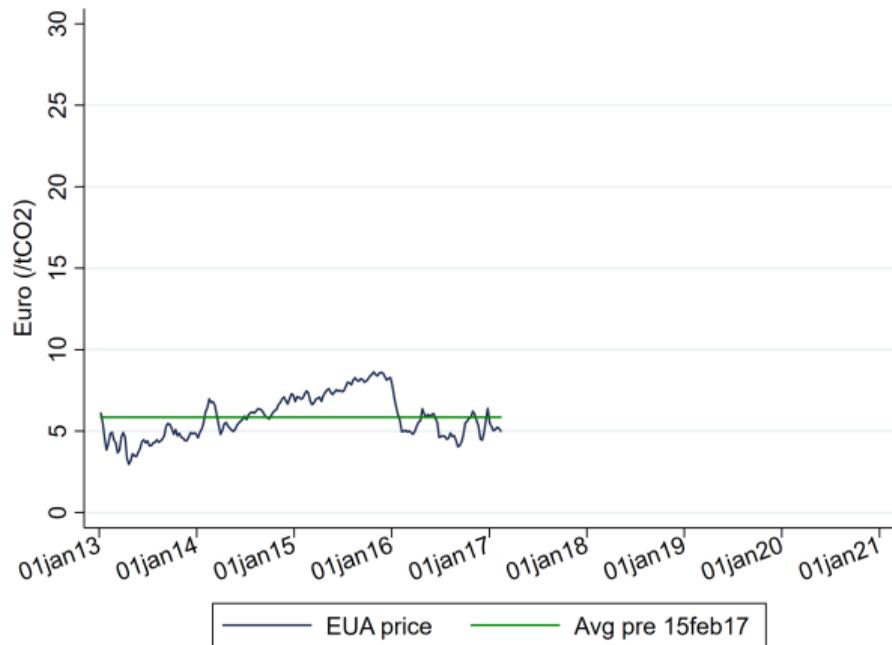
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 - ▶ Demand: ↓↓ after financial crisis
- ⇒ structural oversupply

Figure: EU's climate policy tightening and EUA price



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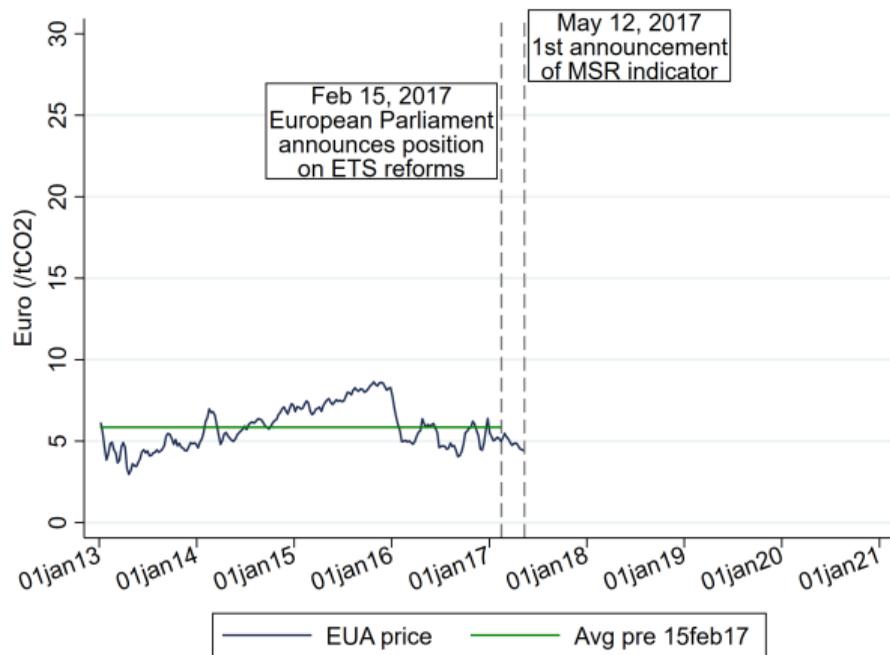
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- ▶ Market Stability Reserve
- ▶ Cancellation Mechanism
- ▶ Linear Reduction Factor ↑

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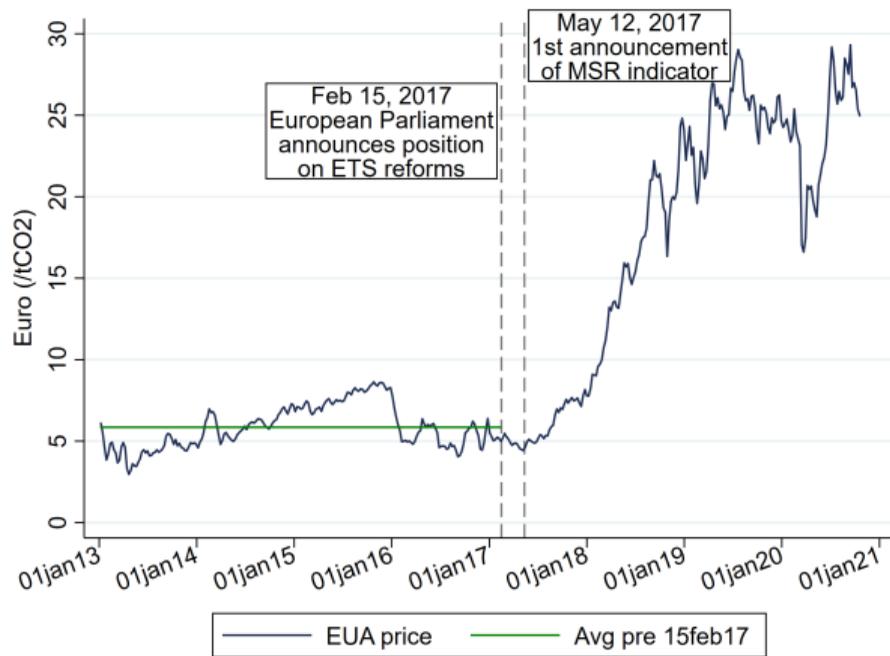
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YES. More free allowances = limited improvements.

Contribution to literature

- ▶ Literature on impact of EU ETS on firms focussing on early phases of ETS
 - ▶ ETS, emissions and firm performance: e.g. Abrell et al. (2011), Wagner et al. (2014), Petrick and Wagner (2014), Dechezleprêtre et al. (2018)
 - ▶ ETS and innovation: e.g. Martin et al. (2013), Caelal and Dechezleprêtre (2015)
 - ▶ See Martin, Muuls and Wagner (2016) for excellent overview of literature
- 1. First to focus on impact of 2017 regulatory tightening of EU ETS → firms' emission efficiency; and, on role of M&A in greening process
- 2. Identification fully based on firms *within* ETS
 - ▶ Existing work typically looks for control group outside ETS. But
 - ▶ Selection into ETS non-random
 - ▶ Limited data on emissions non-ETS firms: studies often limited to one country

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 - ▶ Global M&A deal information (ZEPHYR, BvD)
- ▶ Resulting in 20,095 observations for 3,952 firms, from 30 EU countries.
- ▶ Covering more than 70% of the GHG emissions covered by the EU ETS.

Methodology

- ▶ A difference-in-differences estimation strategy
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- ▶ $Y_{i,t} = \beta_1 Post_t + \beta_2 High Exposure_i + \beta_3 High Exposure_i \times Post_t + \beta_4 X_{i,t} + \epsilon_{i,t}$
 - ▶ $Post_t=1$ if year ≥ 2017
 - ▶ $High Exposure_i=1$ if firm i above median of *Allowance Shortage_i* (nace 2-digit lvl)
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▶ $Allowance\ Shortage_i = \frac{1}{4} \sum_{y=2013}^{2016} \frac{emissions_{i,y} - free\ emission\ allowances_{i,y}}{total\ assets_{i,y}}$

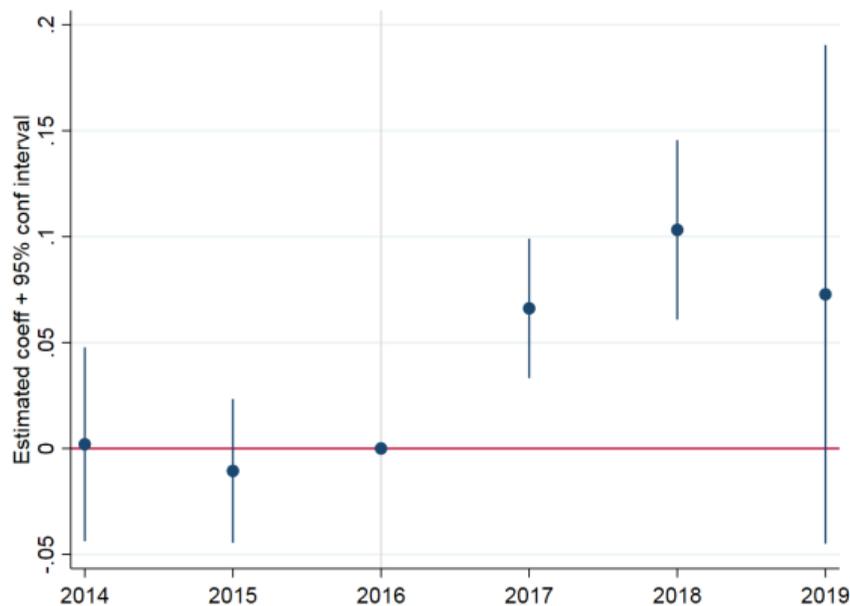
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Dep. var. =	Ln(operating revenue/emission)			
	(1)	(2)	(3)	(4)
Post _t	0.082*** (0.009)			
High exposure _i		-1.359*** (0.065)		
High exposure_i × Post_t			0.049*** (0.017)	0.087*** (0.019)
Observations	20,095	20,095	20,095	18,778
R-squared	0.954	0.078	0.963	0.968
Firm FE	Y	N	Y	Y
Year FE	N	Y	Y	N
Ind-country-year FE	N	N	N	Y
N. of firms	3,952	3,952	3,952	3,706
Sample period	2014-2019	2014-2019	2014-2019	2014-2019

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Dep. var. =	Ln(emissions)		Ln(operating revenue)	
	(1)	(2)	(3)	(4)
High exposure_i × Post_t	-0.072*** (0.039)		0.012 (0.014)	
High exposure _i × D _{Year=2017}		-0.045*** (0.017)		0.021 (0.013)
High exposure _i × D _{Year=2018}		-0.094*** (0.020)		0.010 (0.016)
High exposure _i × D _{Year=2019}		-0.113** (0.049)		-0.060 (0.054)
Observations	18,778	18,778	18,778	18,778
R-squared	0.975	0.975	0.983	0.983
Firm FE	Y	Y	Y	Y
Ind-country-year FE	Y	Y	Y	Y
N. of firms	3,706	3,706	3,706	3,706

Free emission allowances mitigate policy impact

Dep. var. =	Ln(operating revenue/emission)			
	On carbon leakage list	Not on carbon leakage list		
	all	all	electricity producers	all, except electricity producers
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High exposure_i × Post_t	0.048 (0.033)	0.107*** (0.024)	0.157** (0.072)	0.098*** (0.024)
Observations	5,727	12,672	2,091	10,546
R-squared	0.965	0.969	0.940	0.977
Firm FE	Y	Y	Y	Y
Ind-country-year FE	Y	Y	Y	Y
N. of firms	1136	2503	407	2091

How have these firms become more efficient?

- ▶ Potentially important channel: market for corporate control (M&A's)
 - ▶ Least-cost & fast option if large shock (Mitchell and Mulherin, 1996; Harford, 2005)
 - ▶ Acquire firms that allow to produce in a more efficient/cleaner way.
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- ▶ M&A greenness
 - ▶ Textual analysis of dealeditorial, dealrationale, and dealcomments in Zephyr.
 - ▶ Measured as % of words in the text that are part of our 'green' dictionary.

M&A greenness

▶ Example 1 (green):

*"...On 04/06/19 Mr Frank Mastiaux, EnBW CEO, said: The acquisition of VALECO marks a significant step forward in the rigorous expansion of EnBW in **renewable energy** to make them one of the main pillars of the company. In addition, the target of reaching 1,000 MW of installed capacity in the **onshore wind** sector by 2020 has now nearly been achieved. With VALECO, we now have one of the most experienced players on the French **renewable energy** market at our side. We will exploit the growth opportunities together and become one of the Top 5 players on the French **wind** and **solar** market..."*

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- ▶ Example 2 (not green):

"...On 11/01/17 Mr Finn Klostermann, CEO of Danish Crown Beef, said: We are convinced that we can generate further growth by integrating the German business. We will have access to larger supplies of German raw materials, and the German company will be able to access Danish Crown Beef's markets worldwide..."

High exposed firms acquire greener targets

Dep. var. =	M&A greenness _{<i>i,t</i>}			
	Full sample		On carbon leakage list	Not on carbon leakage list
	(1)	(2)	(3)	(4)
Post _{<i>t</i>}	-0.126 (0.111)			
High exposure _{<i>i</i>}	-0.230** (0.116)			
High exposure_{<i>i</i>} × Post_{<i>t</i>}	0.350** (0.150)	0.480** (0.200)	0.273 (0.261)	0.644** (0.294)
Observations	806	500	242	258
R-squared	0.017	0.536	0.631	0.487
Firm FE + Year FE	N	Y	Y	Y
N. of firms	481	175	82	93

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 - ▶ Takeover targets in which they had no prior stake
- ⇒ Indicating a strategic change in M&A decisions after tightening in climate policy!

Work in progress: Price pass-through

- ▶ Increasing carbon prices are an increase in marginal production costs for regulated firms, that they partly offset by becoming more energy efficient
- ▶ Other potential reaction: price pass-through to customers
 - ▶ Likely to depend per sector on market structure, international competition, etc.
 - ▶ Important for debate on free allowances and leakage list

⇒ We combined our data with

- ▶ Product-level information on pricing for each **Belgian** firm in our sample
- ▶ Before and after the regulatory tightening

⇒ Results coming soon.

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 - ▶ Polluting firms become more energy efficient
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 - ▶ (Part of) improvement driven by acquisition of green firms
2. Initial allocation of free emission allowances matters (policy cost-efficient?)
 - ▶ In theory, allocation shouldn't matter from an efficiency perspective (Coase, 1960)
 - ▶ In practice, we observe limited impact for firms receiving many free allowances
 - ▶ Rethink system of free allowance allocation? (EU Court of Auditors, 15 Sep 2020)

Thank you for your attention!!

Summary statistics

	Mean	SD	All firms		N
			P1	P99	
Panel A					
Operating revenue (EUR th.) / emissions (ton CO ₂ eq.)	50.45	235.85	0.05	1949.78	20,095
Operating revenue (EUR th.)	689,111	4,103,388	962	12,230,222	20,095
Emissions (ton CO ₂ equivalent)	314,398	1,571,594	41	6,481,606	20,095
Ln(operating revenue)	18.15	1.94	13.78	23.01	20,095
Ln(Emissions)	10.19	2.25	3.74	15.51	20,095
Ln(Total assets)	18.43	1.93	14.32	23.67	20,087
P/L before tax / sales	-0.03	7.20	-0.65	0.59	18,233
Return on assets (%)	4.58	10.03	-33.57	38.81	19,996
Fixed assets / total assets (%)	56.67	23.35	0.31	95.86	20,077
Leverage	0.54	0.23	0.07	0.99	19,231
Cash holdings / total assets (%)	5.77	8.88	0.00	46.45	18,470
Panel B					
M&A greenness _{<i>i,t</i>}	0.67	1.12	0.00	4.64	500
M&A within the EU ETS _{<i>i,t</i>}	0.86	0.35	0.00	1.00	492
M&A new target _{<i>i,t</i>}	0.70	0.46	0.00	1.00	500