European emission trading system: EU-ETS
with focus on the reading "Industry Compensation under Relocation Risk, by Martin et al. 2014"

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Background: EU-ETS

Coverage

- Only certain sectors affected: iron, steel, cement, paper and pulp, ceramics, class, brick,..
- Defined by the usage of energy input ($> 20MW$)
- non-trading sector is regulated by other means

Phases I, II, III

- Phase I: Pilot
- Phase II: 2008-12
- Phase III: ongoing, to be discussed

Allocations

- Grandfathering in Phases I, II, and... also in Phase III!
- Differentiation between sectors will increase over time: open and vulnerable sectors more likely to receive allocations for free

Monitoring

- ▶ Based on input use
- ▶ Outside verifiers

Compliance

- ▶ Annual cycle
- ▶ Fixed penalties on noncompliance; much lower than in the SO2 program (prices cannot explode because of this)

Opt-in

- ▶ The linkage directive
- ▶ Emissions reductions from outside EU (JI and CDM projects defined by the Kyoto protocol)
- ▶ Very costly case-by-case verification
- ▶ Big adverse selection potential but also real cost savings
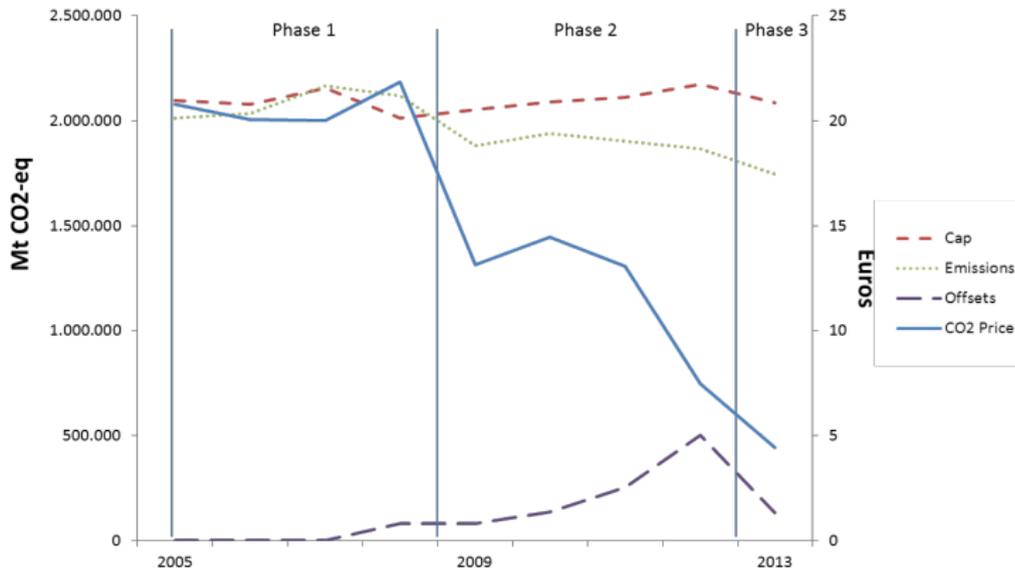
Short history:

Figure 1: Historical developments of EU ETS annual cap (Cap), annual verified emissions from sources covered by the EU ETS (Emissions), annual offsets surrendered for compliance (Offsets) and average December future prices (CO_2 price).

Figure: see the supporting reading folder, Euro-CASE Policy Position Paper.

Martin et al., 2014

Basic premise: Carbon leakage

- ideal case: permit allocations do not matter (as we have seen)
- because climate policies are not universal, firms may relocate to places with less stringent policies
- is grandfathering a good way to tackle the problem?

Carbon leakage:

1. Competitiveness: emission constraints increase the price of output worldwide and thereby encourage production in regions without climate policy (intensive margin)

2. Investments: return on investment in energy-intensive production is larger in regions without climate policy (extensive margin)

3. Energy prices: decrease in the price for fuels can lead to increase in demand in emissions elsewhere

According to IPCC 2007, the leakage rate could be $5 - 20\%$ of Kyoto reductions (AR4 WGIII Technical Summary). In computational models, average leakage rates range between $10 - 30\%$.

This paper:

Leakage risk is evaluated at the firm level

- ▶ Interviews, following a protocol developed in Bloom and Van Reenen (2007)
- ▶ elicit information on firms' propensity to downsize or relocate in response to climate change policy
- ▶ free permits should be given to those firms where they have the highest marginal impact on total relocation risk
- ▶ Counterfactual analysis: optimal allocation dramatically reduces relocation risk, even compared to the situation where all permits are handed out for free.

Permit allocations in Phase III

NAP=National Allocation Plan

- ► country level and sectoral allocation
- ► most countries followed grandfathering

Benchmarking for installation i, product j:

- ► q(i,j,t)= benchmark(j) $\times$ historical activity level(i,j) $\times$ reduction(j,t) $\times$ correction(t)
- ► alternatively, the allocation could be based on output
- ► gradual reduction in free allowances from 80 percent to 30 percent

The Carbon Leakage Decision

- ► leakage risk of a sector based on its carbon intensity (CI) and/or trade intensity (TI)
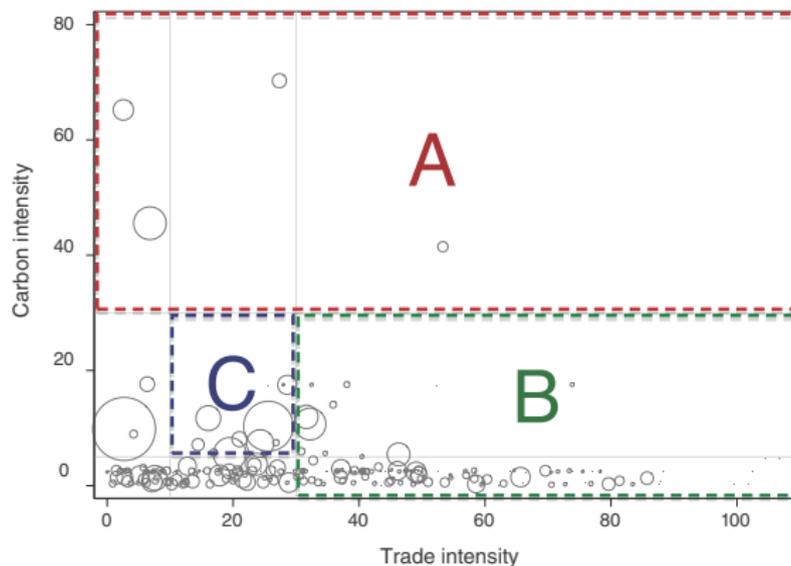
Sectors Exempt

FIGURE 1. SECTORS EXEMPT FROM PERMIT AUCTIONS

Notes: The figure shows a scatter plot of the carbon and trade intensities of four-digit (NACE 1.1) manufacturing industries, based on 9,061 EU ETS installations. The size of the circles is proportional to the number of firms in a given industry. Sectors in areas A, B, and C will continue to be exempt from permit auctions in EU ETS phase III.
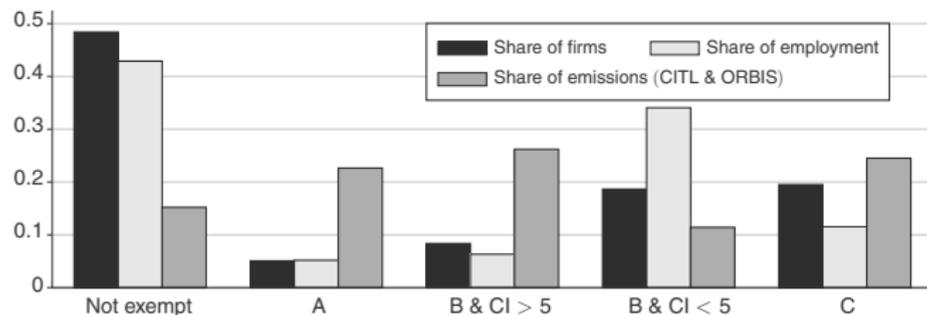
Size of Exemptions


FIGURE 2. RELATIVE SIZE OF THE EXEMPTION GROUPS

Notes: The figure displays the relative size of each group of NACE industries which are defined by the exemption criteria. Category B (very trade-intensive sectors) is subdivided into low and moderate carbon intensity. The sample includes the 3,247 manufacturing firms participating in the EU ETS and matched to ORBIS. The first bar indicates a group's share in the total number of firms, the second bar its share in employment, and the third bar its share in CO_2 emissions, based on the number of surrendered permits recorded in the CITL (Community Independent Transactions Log). To compute CI and TI figures at the NACE four-digit level, we follow the methodology and databases used by the European Commission (2009).

What determines vulnerability?

Is substitution of inputs easy? How is the cost of the policy divided between consumers and producers?

- ▶ if demand is elastic relative to the supply, producers cannot easily pass through the costs
- ▶ industries differ considerably in this dimension, compare electricity vs. airliners
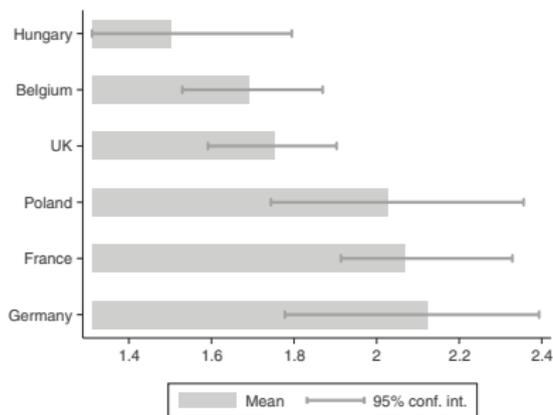
(a) Elastic supply, inelastic demand
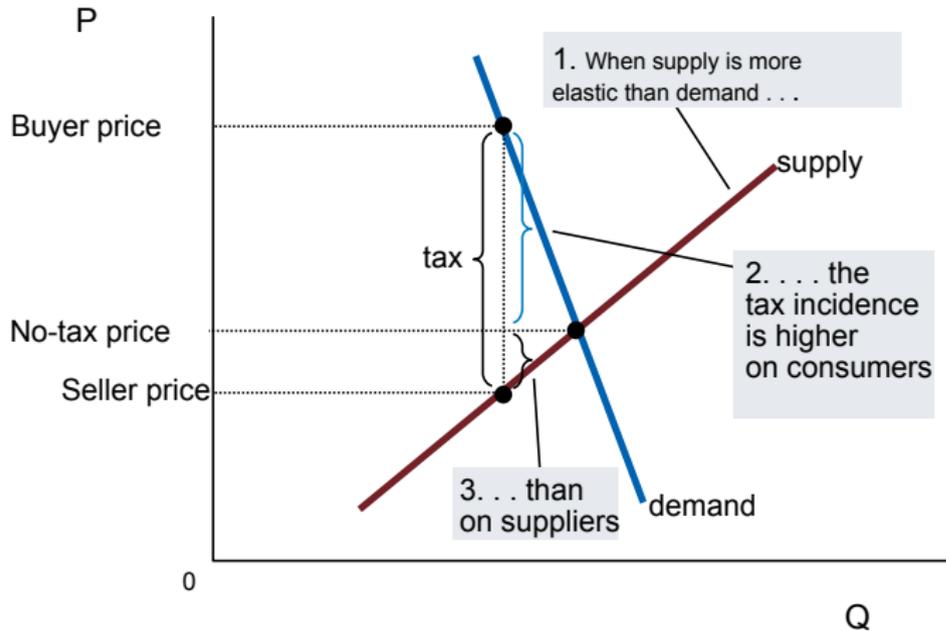
(b) Inelastic supply, elastic demand
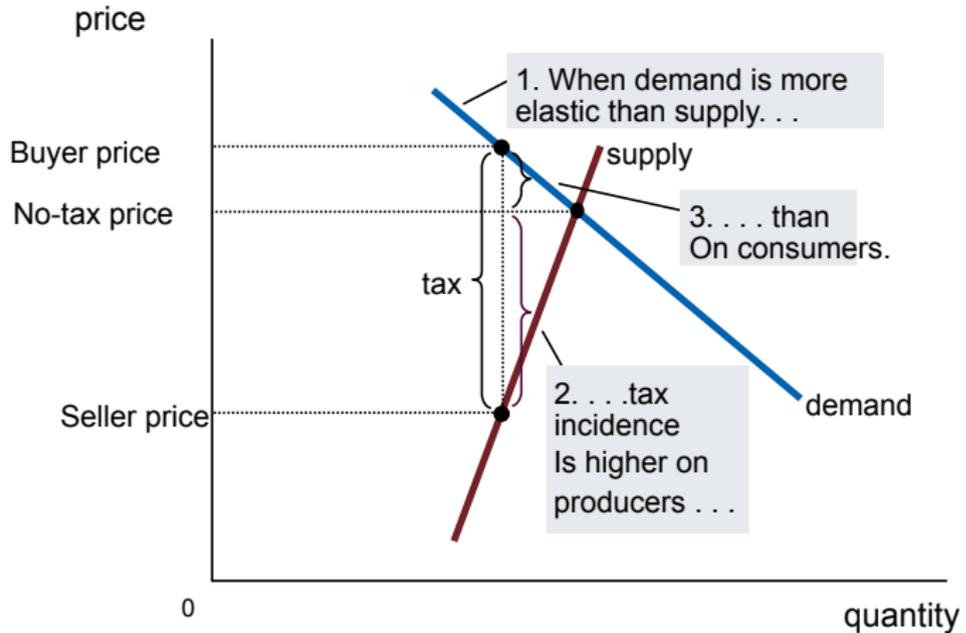
Interview-Based Measure of Vulnerability to Carbon Leakage

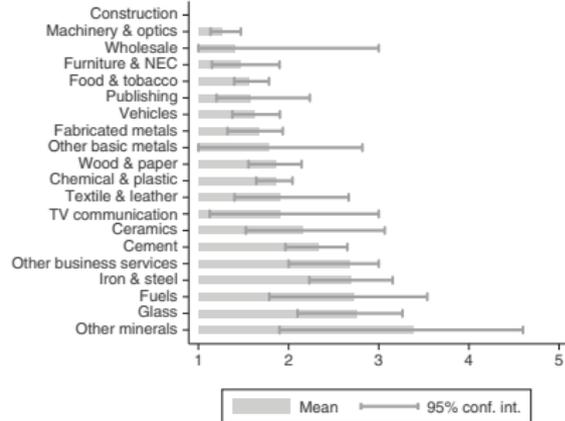Panel A. By country

Panel B. By sector

FIGURE 3. AVERAGE VULNERABILITY SCORE BY COUNTRY AND INDUSTRY

Notes: The bars show the average score in a given country (panel A) or three-digit sector (panel B). Bootstrapped confidence bands are calculated at the 95 percent level. NEC: Not elsewhere classified.

How to minimize risk?

TABLE 4—RISK OF JOB LOSS AND CARBON LEAKAGE

Reference scenario	Actual risk (1)	Minimized risk (2)	(3)	Change in risk (4)	(5)
Panel A. Percentage share of ETS employment at risk					
Grandfathering	4.16	2.93	3.23	−1.23	−0.93
		[4.66]	[5.03]	[−0.56]	[−0.37]
Benchmarking	6.92	2.94	4.51	−3.98	−2.41
		[4.66]	[6.54]	[−1.92]	[−0.46]
Panel B. Percentage share of ETS emissions at risk					
Grandfathering	15.66	13.15	14.34	−2.51	−1.32
		[23.88]	[24.16]	[−0.36]	[−0.22]
Benchmarking	22.79	13.20	21.91	−9.59	−0.88
		[23.89]	[31.80]	[−4.45]	[3.18]
Optimized over	—	Firms	Sectors	Firms	Sectors

Notes: Shares of jobs (panel A) or CO_2 emissions (panel B) at risk of relocation are expressed relative to total employment or emissions at all ETS firms in the sample. Column 1 reports actual risk associated with a given reference scenario (grandfathering or benchmarking) whereas columns 2 and 3 report minimal risk subject to the constraint that the total number of free permits not exceed the amount allocated under the reference scenario. Permit allocation is optimized across firms (column 2) or across sectors (column 3). Columns 4 and 5 report the change in risk after optimization. In addition to the point estimates, columns 2 through 5 report the ninety-fifth percentiles in brackets, obtained from a nonparametric bootstrap with resampling.

How well is the current allocation scheme doing?

TABLE 5—PERMITS ALLOCATED FOR FREE (*in percent of total emissions*)

Scenario	Actual		Minimized allocation	
	(1)		(2)	(3)
Grandfathering	100.0		14.3	24.5
			[31.4]	[39.2]
Benchmarking	52.3		1.6	13.0
			[7.0]	[22.3]
Risk constraint	—		Jobs	CO_2

Notes: Column 1 reports the share of free permits in total emissions under different scenarios. Minimal permit allocations are calculated subject to the constraint that the total relocation risk not exceed the one under the scenario considered, where relocation risk is measured in terms of either job loss ($\alpha = 1$) or CO_2 emissions leakage ($\alpha = 0$). The ninety-fifth percentile of the permit share, obtained from a nonparametric bootstrap with resampling, is reported in brackets.