



The EU ETS and Firm Profits:

An ex-post analysis in the Swedish Context

Haishan Yu

Department of Economics

Swedish Business School at Örebro University

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- **What** whether the EU ETS has impact on the profitability of Swedish regulated firms ?
 - **Why** (i) environmental issues are hotly debated
(ii) scarce econometric analyses of the EU ETS at firm level,
no empirical studies in the Swedish context
 - **How** take the policy intervention as a natural experiment
(consider treat/control, before/after structure)
apply difference-in-differences on a fixed effect model

Econometric Model

$$Y_{it} = \alpha + \delta_0 d_{2t} + \beta_1 ETS_{it} + a_i + u_{it}, \quad t = 1, 2$$

$$\Delta Y_i = \delta_0 + \beta_1 \Delta ETS_i + \Delta u_i$$

$$\downarrow \quad E(u_{it} | ETS_{it}) = 0$$

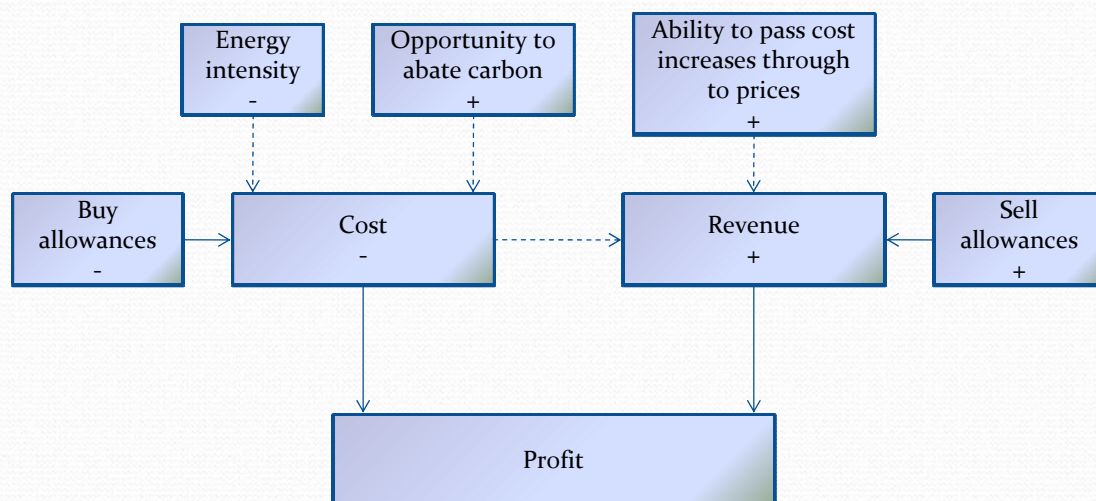
$$\hat{\beta}_1 = \Delta \hat{Y}_{treat} - \Delta \hat{Y}_{control}$$

$$ETS_{it} = \begin{cases} 1, & \text{if firm } i \text{ owns regulated installations.} \\ 0, & \text{otherwise.} \end{cases}$$

$$\Delta ETS_i = \begin{cases} 1, & \text{if firm } i \text{ owns regulated installations.} \\ 0, & \text{otherwise.} \end{cases}$$

$$\Delta Y_i = \delta_0 + \beta_1 \Delta ETS_i + \beta_2 \Delta TO_i + \beta_3 Y_{i,t=0} + \beta_3 TO_{i,t=0} + \Delta u_i$$

Factors that may determine the impact of the EU ETS on profit



Upper part of the figure is oriented from Oberndorfer and Rennings(2007)



Separated analysis

(Split the treatment group according to an allocation factor)

$$\text{Allocation factor} = \frac{\text{Allocated allowances}}{\text{Verified emissions}}$$

Firms with allocation factor larger than one are those under-cap firms.

(Allocated allowances > verified emissions)

Data_1

(i) Emissions data (installation level)

each regulated installation belongs to which firm, how many allowance allocated and how many verified emissions are.....

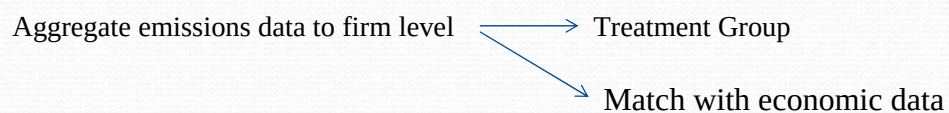
(ii) Economic data (firm level) from Statistics Sweden

we extract the (1) return on equity

$$\frac{\text{net profit after financial adjustment}}{\text{owners' equity} + 72\% \text{ of untaxed reserves}}$$

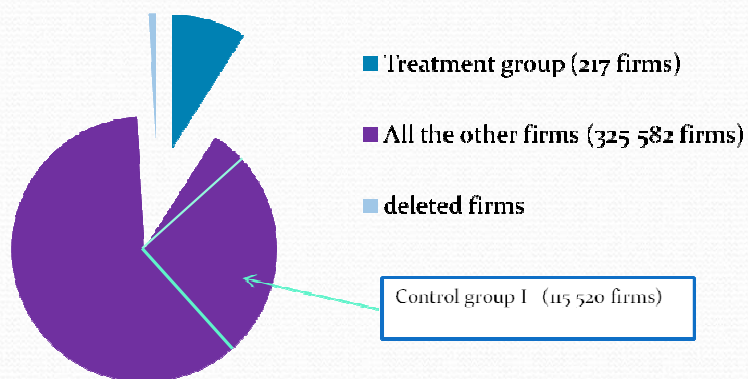
(2) return on capital:

$$\frac{\text{net profit after financial adjustment}}{\text{capitalstock(Machinery + Building + Land)}}$$



Data_2

All the firms



Sector distribution of treatment groups and control group I

	Control Group I	Treatment groups		
		As a Whole	Under-cap firms	Over-cap firms
SEC1 Manufacture of pulp, paper and paper product	371	38	31	7
SEC2 Manufacture of chemicals and chemical products	782	10	10	0
SEC3 Manufacture of other non-metallic products	888	13	11	2
SEC4 Manufacture of basic metals	381	11	9	2
SEC5 Electricity, gas and hot water supply	1 035	112	67	45
SEC6 Others	112 063	33	22	11
Total	115 520	217	150	67

Data_3

Descriptive Statistics

Variables	Year	Control Group I			Treatment Groups								
					As a whole			Under-cap firms			Over-cap firms		
		Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Net Profit (Before tax)	2 003	98 797	1 321.57	71 881.76	217	217 560.80	1 198 049	150	247 895.80	1 403 810	67	149 646.70	491 610
	2 004	105 518	2 005.66	74 682.03	216	323 747.70	1 577 547	150	402 132.70	1 849 569	66	145 599.90	586 117
	2 005	115 520	2 455.04	78 565.92	217	410 692.60	2 614 348	150	513 199.60	3 114 081	67	181 199.40	631 118
Turnover	2 003	98 797	20 381.18	275 355.00	217	2 192 515.00	6 662 446	150	2 367 987.00	7 487 634	67	1 799 668.00	4 298
	2 004	105 518	20 493.85	282 812.40	216	2 385 306.00	7 013 570	150	2 553 845.00	7 799 633	66	2 002 262.00	4 800 054
	2 005	115 520	20 303.94	297 496.00	217	2 535 278.00	7 368 189	150	2 731 363.00	8 165 355	67	2 096 281.00	5 184 073
Roe (no unit)	2 003	98 109	-0.18	349.85	217	0.42	2.51	150	0.54	3.01	67	0.14	0.34
	2 004	104 743	0.88	315.62	216	-0.49	7.40	150	-0.78	8.87	66	0.19	0.24
	2 005	114 351	1.21	284.25	217	0.04	1.98	150	-0.01	2.38	67	0.14	0.24
Roc (no unit)	2 003	85 874	4.71	398.22	212	1.30	16.97	147	1.81	20.38	65	0.15	0.79
	2 004	90 401	4.89	177.03	212	1.48	18.02	147	2.10	21.63	65	0.09	0.47
	2 005	96 433	8.59	811.18	213	0.47	3.67	147	0.59	4.34	66	0.22	1.25

* The regulated firms in Sweden are quite big firms compare to other firms.

Estimation Results

Table. Profitability for treatment groups related to Control Group I in 2005

		Return on equity			Return on capital		
		$\beta_1(\text{diff-in-diffs})$	Obs.	R-adj.	$\beta_1(\text{diff-in-diffs})$	Obs.	R-adj.
Treatment Groups	As a Whole	-0.36 (-1.38)	97 256	0.0824	-5.25 (-4.81)	79 653	0.7924
	Under-cap firms	-0.31 (-1.72)	97 190	0.0824	-7.53 (-6.28)	79 588	0.7924
	Over-cap firms	-0.44 (-1.81)	97 106	0.0824	-3.29 (-5.11)	79 507	0.7924

Conclusion

No statistically significant treatment effect is revealed in 2005 by the estimation

Explanations:

(i) design of the EU ETS in the first period:

generous (over-allocated), grandfathering, limited information on supply and demand of EUAs

(ii) Swedish situation:

existing important instruments of environmental regulation
(e.g. carbon taxes, Electricity etc.)

less cost pressure on electricity sector

Comments and Discussion

Thanks!