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Disclosure As a Regulatory Instrument for the Environment: A Study of the PCB Industry

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Successful Examples of Disclosure as a Regulatory Mechanism

- Food labeling
- Medical package inserts
- Securities laws

In each case, negative information can reduce firm profitability directly through reduced demand

Potential Difficulties Using Disclosure for Pollution Abatement

- The relationship between the agents who receive the information and firm profitability is not clear:
  - Consumers may not be aware of, understand, or care about, the pollution embodied within a good. (Green marketing has not always been so important.)
  - Households living near dirty plants do not necessarily value lower toxic releases; firms may benefit from having lower property values surrounding their facilities.
  - Liability issues are difficult to asses – particularly as many of the effects from toxic exposure are long-term.

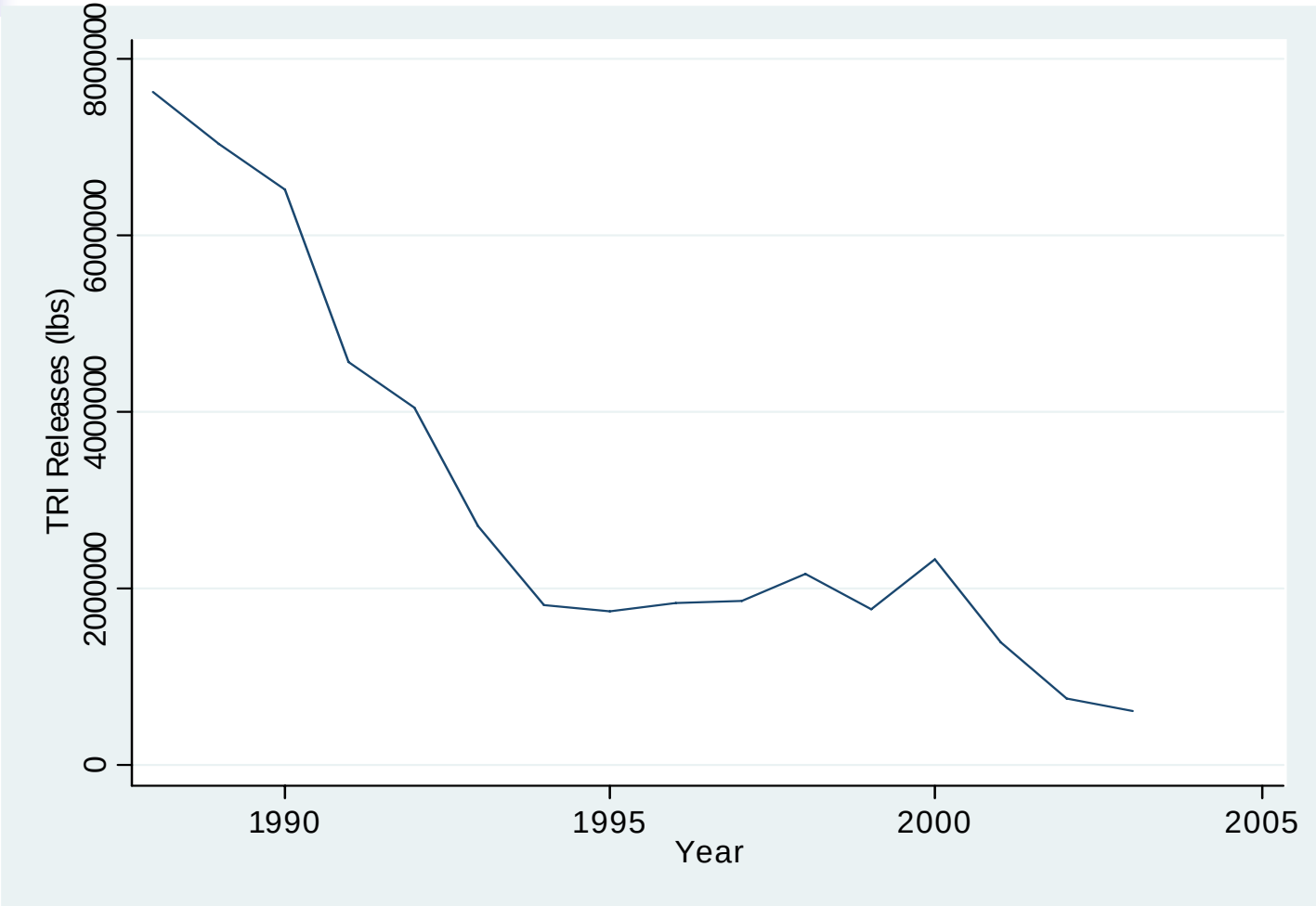
Why Study the PCB Industry?

- PCB production is one of the largest contributors to pollution in the micro-electronics industry. (Primarily water pollution.)

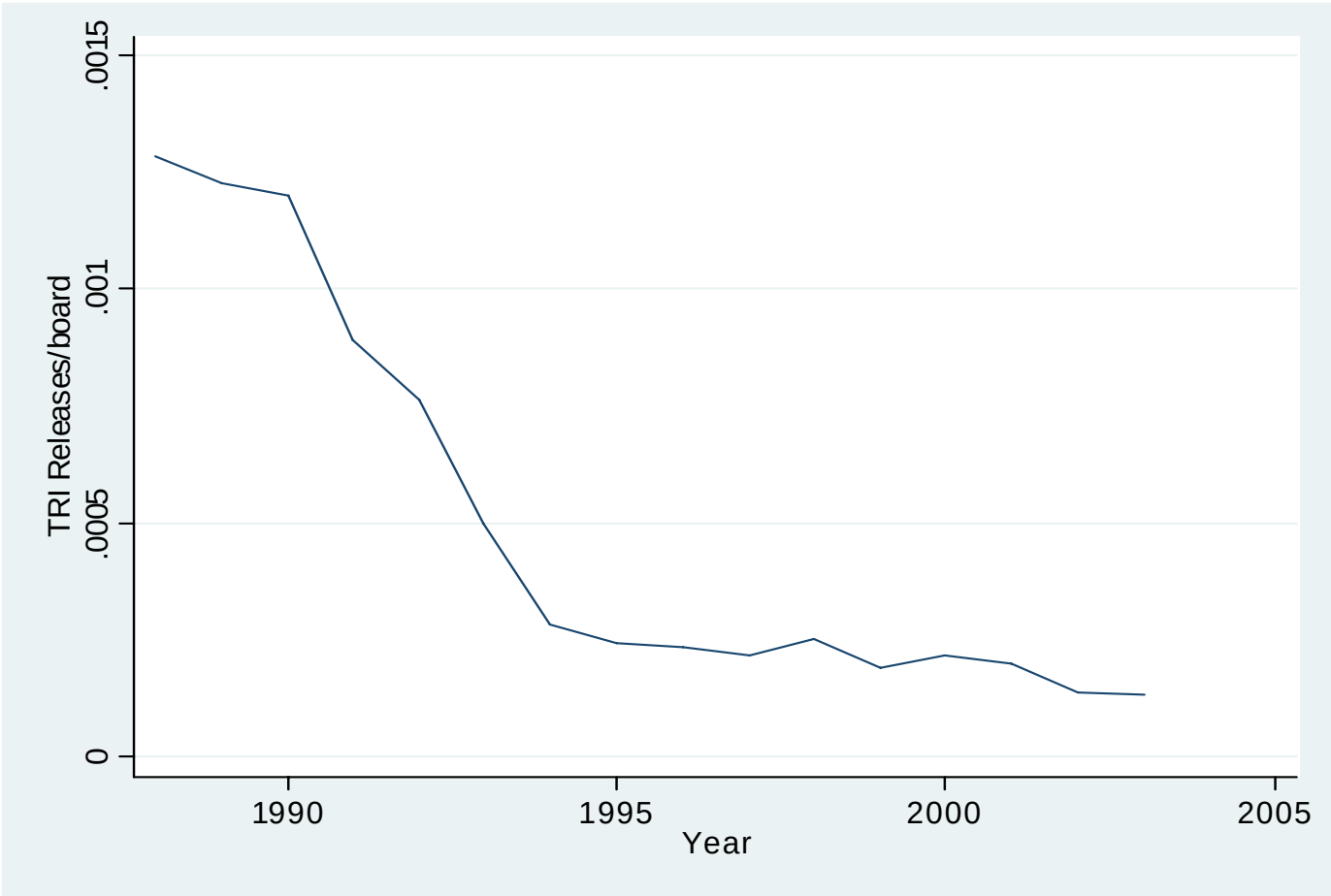
- Significant changes in market structure over the past 50 years make it less likely for the industry to respond to voluntary pollution abatement programs (decreasing concentration; increasing foreign competition on cost).

- Yet, we see in this industry that reported releases fell by more than 96% between 1988-2003.

Aggregate TRI Releases in the PCB Industry: 1988-2003



TRI Releases Per Board: 1988-2003



Issues of Concern

- Correct normalization of releases?
  - By number of boards?
  - By size of boards?
  - By TVS?
- Plant exit.
- Reduction of toxic releases due to other Federal regulations or policies.
- State-level programs.

The Basic Model

$$TRI_{it} = \beta_0 + \beta_1 public_{i,t} + \beta_2 pc3350_{i,t} + \beta_3 post3350_{i,t} + \beta_4 NON_{i,t} + \beta_5 SRANK_{i,t-2} + \beta_6 SREG1_{i,t} + \beta_7 SREG2_{i,t} + \delta_t + \epsilon_{it} \quad (1)$$

$$\Delta TRI_{it} = \alpha_0 + \alpha_1 public_{it} + \alpha_2 pc3350_{i,t} + \alpha_3 post3350_{it} + \alpha_4 NON_{i,t} + \sum_{j=0}^{2} \Gamma NONCH_{i,t-j} + \alpha_5 SRANK_{i,t-2} + \alpha_6 SREG1_{i,t} + \alpha_7 SREG2_{i,t} + \delta_t + \psi_{it} \quad (2)$$

where:

public = 1 if the parent company is publicly traded at time t;
pc3350 = 1 if the parent company is a TRI 33/50 participant at time t;
post3350 = 1 if the parent company is a TRI 33/50 participant and the year > 1995;
NON = 1 if the facility is located in a non-attainment county at time t;
NONCH = 1 if the facility is located in a county that has changed from attainment to non-attainment status at time t-j (in the current year, 1 year ago, or 2 years ago);
SRANK2 = the facility's state ranking within the PCB industry in year t-2;
SREG1 = SRANK2 X REG1, where REG1 =1 if in state with TRI reduction goals;
SREG2 = SRANK2 X REG2, where REG2 =1 if in state with additional TRI regulations, but no numeric reduction goals.

Possible Modifications to the Model

- Break down releases into different pollution media (eg. air, water)
  - Note that not all facilities report toxic releases in all forms
  - Take into account ratio of hazardous air pollutants in air model
  - Take into account ratio of CWA pollutants in water model

Descriptive Statistics on the Sample

Variable	Mean	Standard Deviation
Total TRI Releases (lbs)	11348.01	38748.07
Initial Reported Release		
- Total	59050.82	222048.5
- Air	35005.38	134097.6
- Water	967.15	10691.31
One-Time Release (lbs)	14.95	333.36
33/50 Participants	0.07	0.26
Publicly Traded Company	0.24	0.43
State TRI Program:		
- REG1	0.48	0.50
- REG2	0.08	0.27
Non-Attainment County	0.77	0.42
Number of Observations: 1939		

Aggregate TRI Releases: Levels and First-Differences

Variable	TRI	Δ TRI	Δ TRI
PC 33/50	38,054.45*	-35361.98***	-35,211.17**
	(20,661.97)	(15232.42)	(15,063.69)
PC 33/50 Post 1995	5,737.39	26657.04	26,644.81
	(25,518.74)	(16670.73)	(16,631.37)
Public	9,554.37**	-135.96	-40.63
	(4,541.00)	(2371.12)	(2,352.96)
State Rank	-2,130.56***	586.028***	542.01***
	(376.53)	(193.04)	(189.15)
State Rank X REG1	1,808.82***	-471.03***	-418.58**
	(360.48)	(183.61)	(181.60)
State Rank X REG2	604.92	-224.54	-248.22
	(438.97)	(245.30)	(243.51)
Non-Attainment	-10,664.42**	2951.78	3,326.92
	(4,242.58)	(2407.76)	(2,380.72)
Δ to NA (t)			-5,211.48
			(5,553.47)
Δ to NA (t-1)			-32,390.80
			(25,003.36)
Δ to NA (t-2)			2,986.72
			(4,491.90)
Year Indicators	X		X
Constant	40,932.42***	-27514.98***	-27,132.11**
	(14,077.81)	(11060.11)	(10,862.11)
Observations	1939	1939	1939
R-squared	0.12	0.06	0.07

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

TRI Air Releases for Facilities Reporting Non-Zero Air

Variable	TRI Air (lbs)
PC 33/50	11501.17
	(9439.71)
PC 33/50 Post 1995	30244.84***
	(11937.52)
Public	5098.16**
	(2536.85)
Non-Attainment	-4745.55*
	(2239.66)
RatioH	-9875.75**
	(4218.57)
H	27822.81**
	(12243.32)
State Rank	-1198.29***
	(264.40)
State Rank X REG1	991.38***
	(251.93)
State Rank X REG2	435.14
	(320.06)
Year Indicators	X
H X Year Indicators	X
Constant	16127.37***
	(3587.91)
R-Squared	0.29
Observations	1510

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

TRI Water Releases for Facilities Reporting Non-Zero Water

Variable	TRI Water (lbs)
PC 33/50	-1641.40
	(1512.78)
PC 33/50 Post 1995	-5012.14
	(4678.11)
Public	869.28
	(1368.47)
Non-Attainment	-2655.64
	(2171.64)
RatioW	-5644.30**
	(2850.33)
W	2818.72
	(2092.25)
State Rank	-602.59*
	(360.56)
State Rank X REG1	588.63*
	(352.19)
State Rank X REG2	278.52
	(352.85)
Year Indicators	X
W X Year Indicators	X
Constant	3931.39**
	(2057.11)
R-Squared	0.20
Observations	240

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Explaining Toxic Releases in the PCB Industry, Part I

- 1. Exit from industry by the dirtiest facilities led to part of the over-all reduction in industry level releases.

- 2. Facilities located in non-attainment counties have significantly lower levels of releases. We find some evidence that changes in attainment status also are associated with larger reduction in toxic releases.

  We estimate that TRI levels would be between 125%-245% higher than current levels if no facilities were located in non-attainment counties.

- 3. Federal regulations for water pollution (CWA) and for hazardous air pollutants (HAPS) also play an important role in the reduction of toxics.

Explaining Toxic Releases in the PCB Industry, Part II

- 4. Although facilities located in attainment counties start out being significantly dirtier than facilities located in non-attainment counties, all other things being equal, attainment facilities reduced their toxic releases more rapidly than non-attainment facilities such that by 2003, the facilities were not significantly different from one another.

- 5. State-level TRI programs make a difference. Facilities located in states with specific reduction targets for TRI substances showed significantly compressed distributions of releases of all types. We find evidence that states only with out-reach programs for TRI polluters have compressed distributions of air releases.

Policy Implications/Recommendations

- 1. State level policy that is perceived as being a potential “threat” of future formal regulation, if not met voluntarily, may induce firms to abate.

- 2. Outreach programs that provide information to polluters on pollution prevention or pollution reduction methods may also have a beneficial effect on releases. This may be especially true for industries that are dominated by small and medium sized polluters who do not have the resources to carry out research and development on PPP.

- 3. A better understanding of the mechanism through which public disclosure affects firm behavior is extremely important if policy makers wish to rely upon it as a regulatory tool.