Xu and Kim (2022); Bartram et al. (2022)
"Financial constraints and corporate environmental policies"

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Outline

Introduction

Xu and Kim (2022): financial constraints $\Rightarrow$ pollution$\uparrow$

- Optimal investment: marginal cost of abatement $=$ marginal reduction in legal liabilities
- Under-investment: financial constraints increase abatement costs
  - $\Rightarrow$ higher pollution

Bartram et al. (2022): financial constraints $\Rightarrow$ reallocation of CO_2

- Regulatory costs vs. Reallocation costs
- Non-FC firms: Regulatory costs $<$ Reallocation costs $\Rightarrow$ Stay
- FC firms: Regulatory costs $>$ Reallocation costs $\Rightarrow$ Reallocate

Xu and Kim (2022)
“Financial constraints and corporate environmental policies”

Data

- Pollution from EPA: establishment level, 1990–2014
- Investigation and legal enforcement from EPA's ECHO database: case level
- NETS: establishment info
- Other standard databases such as Compustat, CRSP, FHFA home price, SDC

Baseline results

$$\text{Toxic Releases}_{i,c,t} = \alpha + \beta \text{ Financial Constraints}_{c,t-1} + \gamma \text{ Firm Controls}_{c,t-1} + \kappa \text{ Establishment Control}_{i,c,t} + FEs + \epsilon_{i,c,t} \tag{1}$$

- Financial constraints: text base, not accounting based
  - Text FC from 10-K and bunch of indication words
  - HM Debt from MD&A section in 10-K of liquidity and financing source

	(1)	(2)	(3)	(4)	(5)	(6)
Text FC	0.221***	0.195***	0.160**			
	(0.073)	(0.070)	(0.065)			
HM debt				0.654*	0.631**	0.635**
				(0.360)	(0.312)	(0.303)

Identification: three experiments

Experiment 1: The 2004 American Jobs Creation Act (AJCA).

- Repatriation tax rate from 35% to 5.25%
- Windfall for multinational US firms if they repatriate foreign earnings
  - 132 firms repatriated foreign earnings in the sample

Some firms are likely to repatriate without AJCA, the residual likelihood of repatriation after AJCA is the windfall.

$$Pr(Repatriate)_{ct} = X_{ct}\beta + \varepsilon_{ct} \text{ for } t < 2004$$

Define $Residual_{ct} = Repatriate_{ct} - \widehat{Pr}(Repatriate)_{ct}$

Experiment 1: The 2004 AJCA

$$\begin{aligned} \text{Toxic Releases }_{I,c,t} =& \alpha + \beta_1 \text{ Residual }_{c,t} \times FC_{c,t} + \beta_2 \Pr(\text{ Repatriate })_{c,t} \\ & + \beta_3 \text{ Residual }_{c,t} + \beta_4 FC_{c,t} + \gamma \text{ Controls } + FE + \epsilon_{i,t}, \end{aligned} \tag{2}$$

	log(total release)			Dom inv
	(1)	(2)	(3)	(4)
Residual*FC	−0.544**	−0.731***	−0.500**	0.038***
	(0.234)	(0.243)	(0.222)	(0.015)
Pr(Repatriates)	−0.157	−0.128	−0.196	−0.027
	(0.250)	(0.265)	(0.246)	(0.017)
Residual	0.150	0.209**	0.147	−0.017**
	(0.096)	(0.099)	(0.095)	(0.007)
FC	−0.091	−0.206**	−0.114	−0.018***
	(0.095)	(0.100)	(0.092)	(0.006)

- A σ increase in the repatriation shock (0.27) $\Rightarrow$ 15%$\downarrow$ in total toxic releases

Identification: three experiments

Experiment 2: Collateral value of real estate assets

- Local real estate price drives firm's value of real estate assets
- Higher value of real estate assets reduces external financing frictions

Omitted variables may drive home price and firm's pollution simultaneously

- IV from Home Price Index (HPI): supply elasticity $\times$ mortgage rate

	(1)	(2)	(3)
RE value	−0.046**		
	(0.018)		
RE value IV		−0.053***	
		(0.017)	
Total debt			−0.299**
			(0.137)

- A σ increase in RE value IV $\Rightarrow$ 8%$\downarrow$ in total toxic releases

Identification: three experiments

Experiment 3: Mutual fund flow-induced price

- Investors inflow/outflow to mutual funds force fund managers to scale stock positions
- Price rises for buying stocks and drops for selling stocks: price deviates from fundamentals
- Induced higher price alleviate external equity financing

	(1)	(2)	(3)	(4)
Inflow*Post	−0.167**	−0.177**		
	(0.082)	(0.086)		
SEO*Post			−0.213**	−0.163*
			(0.101)	(0.097)
Inflow	0.252**	0.244**		
	(0.099)	(0.099)		
SEO			0.676*	0.595*
			(0.380)	(0.312)
Post	0.089	0.101	0.078	0.088
	(0.082)	(0.082)	(0.072)	(0.066)

- Large inflow shocks $\Rightarrow$ 18%$\downarrow$ in total toxic releases

Mechanism

- Pollution induces higher legal liabilities
- Firms reduce pollution if they face higher investigation
  - firms in nonattainment county $\Rightarrow$ higher investigation
  - large polluters $\Rightarrow$ higher investigation

	Pr(investigation)%		Pr(legal_liab>0)%		log(legal_liab)
	(1)	(2)	(3)	(4)	(5)
log(total release)	1.064***	0.800***	0.793***	0.547***	0.062***
	(0.055)	(0.040)	(0.048)	(0.032)	(0.004)
log(sales)	0.453***	0.601***	0.249***	0.315***	0.038***
	(0.083)	(0.088)	(0.071)	(0.068)	(0.007)
Observations	85,096	92,746	78,012	92,746	92,746
Adj. R-squared		.05		.04	.05
Industry-year FE	Yes	Yes	Yes	Yes	Yes
Model	Logit	OLS	Logit	OLS	OLS

Mechanism

	(1)	(2)	(3)	(4)
Nonattainment=1	−0.306***	−0.253***	0.159	0.017
	(0.074)	(0.072)	(0.106)	(0.070)
Nonattainment=1 × Text FC			−0.215**	
			(0.107)	
Nonattainment=1 × HM debt				−0.867*
				(0.481)

	70th percentile		75th percentile		80th percentile	
	(1)	(2)	(3)	(4)	(5)	(6)
Large polluter=1 × Text FC	−0.283***		−0.247***		−0.283***	
	(0.086)		(0.087)		(0.091)	
Large polluter=1 × HM debt		−0.913**		−0.728*		−0.770*
		(0.401)		(0.398)		(0.411)

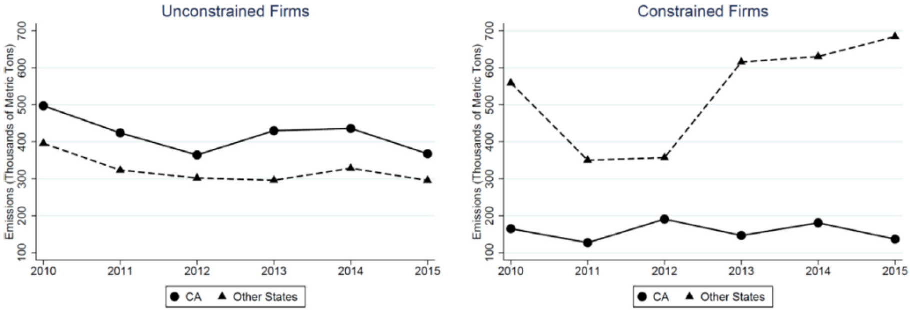
Bartram et al. (2022)
"Real effects of climate policy: Financial constraints and spillovers"

Research design: DiD

- In 2013, California introduces its Cap-and-Trade program: huge rise in emission costs
- Compare California vs. non-California plants, pre vs. post 2013

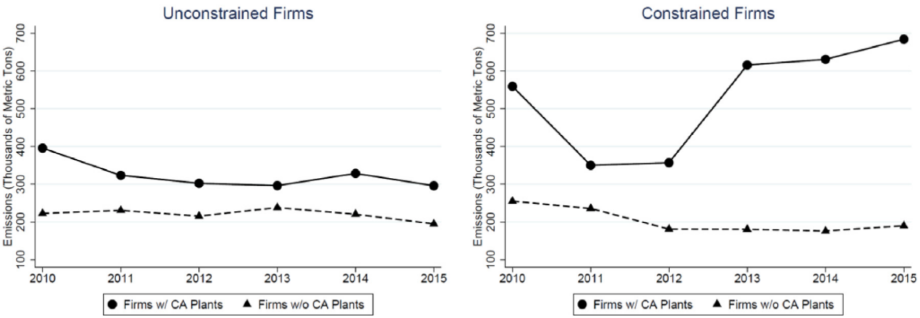
$$\log(1+\text{Emission}_{i,j,t}) = \alpha + \beta \text{ CalPlant }_j \times \text{ After }_t + \gamma' X_{i,t} + a_j + b_{k,t} + \varepsilon_{i,j,t} \tag{3}$$

Spillover of emissions I



- Constrained firms reallocate CO_2 emission from CA to other states
- No allocation for unconstrained firms

Spillover of emissions II



For plants in other states,

- NonCA plants increase CO_2 emission if they are from financially constrained firms and related to a CA plant

Mechanism: reallocation

	Horizontal (1)	Vertical or unrelated (2)	Horizontal (3)	Vertical or unrelated (4)	Horizontal (5)	Vertical or unrelated (6)	Horizontal (7)	Vertical or unrelated (8)
CalPlant × After × Const.	−0.359***	−0.154*	−0.359***	0.030	−0.351***	0.011	−0.370***	−0.005
	(0.103)	(0.078)	(0.105)	(0.142)	(0.109)	(0.125)	(0.102)	(0.152)
p: Hor<Ver	[0.06]		[0.01]		[0.01]		[0.02]	

	Horizontal (1)	Vertical or unrelated (2)	Horizontal (3)	Vertical or unrelated (4)	Horizontal (5)	Vertical or unrelated (6)	Horizontal (7)	Vertical or unrelated (8)
DivFirm × After × Const.	0.332**	0.073	0.315**	0.026	0.316**	0.017	0.318**	0.038
	(0.154)	(0.141)	(0.148)	(0.133)	(0.149)	(0.131)	(0.149)	(0.130)
p: Hor>Ver	[0.11]		[0.07]		[0.07]		[0.08]	

- CA-plants reallocate CO_2 emissions to more similar plants in other states.

Mechanism: reallocation to excess capacity

	Excess capacity at target non-California plant	
	High	Low
	(1)	(2)
CalPlant × After × Const.	−0.457***	−0.021
	(0.147)	(0.189)
p: High<Low	[0.03]	

	Excess capacity at target non-California plant	
	High	Low
	(1)	(2)
DivFirm × After × Const.	0.409**	0.137
	(0.185)	(0.272)
p: High>Low	[0.20]	

- CA-plants reallocate CO_2 emissions to plants that have excess capacity in other states.

Mechanism: efficiency vs. production

	Log(1+Emissions) (1)	Log(1+Emissions/Sales) (2)	Log(1+Sales) (3)	Log(1+Employment) (4)	Log(1+Excess capacity) (5)
CalPlant × After × Const.	−0.390***	0.118	−0.491***	−0.165***	−0.237
	(0.094)	(0.092)	(0.080)	(0.037)	(0.154)
CalPlant × After	0.075	0.051	0.044	0.079***	0.354***
	(0.073)	(0.086)	(0.071)	(0.021)	(0.085)

- CA-plants reallocate through production reduction, not emission efficiency improvement.

Firm outcome

	Log(1+Firm total emissions)			Operational efficiency	
			Placebo sample	ROA	Tobin's q
	(1)	(2)	(3)	(4)	(5)
After × Constrained	0.293**	0.300***	−0.053	0.015	−0.041
	(0.114)	(0.108)	(0.088)	(0.013)	(0.057)

- At the firm level, California's Cap-and-Trade increases overall CO_2 emissions, especially for constrained firms.

Conclusion

- Financial constraint causes the firm to emit more pollution (Xu and Kim, 2022)
  - on average 14% rise
- Firms trade off the marginal costs of emission reduction and the marginal costs of legal liabilities
  - Financial constraints increase the cost of abatement, inducing underinvestment in abatement.

- Rising regulation costs force financially constrained companies to reallocate emissions (Bartram et al., 2022)
  - Emission costs to constrained firms under the California cap-and-trade rule is 9% (4%) increase in tax expenses (interest expenses).
- Firms trade off emission costs and reallocation costs
  - Financial constraints induce emission reallocation due to incompetence in paying additional emission costs by FC firms.

References

Bartram, S. M., K. Hou, and S. Kim (2022). Real effects of climate policy: Financial constraints and spillovers. *Journal of Financial Economics 143*(2), 668–696.

Xu, Q. and T. Kim (2022). Financial constraints and corporate environmental policies. *The Review of Financial Studies 35*(2), 576–635.