

Environmental Covenants and Lenders' Economic Incentives

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Objective:

Use the details of borrower's pollution and of the environmental covenants in debt contracts to clarify lenders' concerns about pollution and the role of regulation in those concerns.

Why would a lender care about the borrower's pollution?

From *The Loan Syndications and Trading Association's (LSTA) Complete Credit Agreement Guide*:

*... even if liability is not direct to the lender itself, the lender could indirectly incur a loss if the values of the borrower's property decreased due to the presence of contamination. **If other collateral was not available, the cost to remediate the property would effectively be paid by the lender.***

Bellucci and McCluskey (2016)

The Atlas Mill (Moab, Utah): Someone eventually pays for cleanup.



Closed 1984, Cleanup done 2031 (Projected)

Examples of the Liabilities That Lenders are Trying to Manage:

Company	Year	Amount
Anaconda Smelter	2022	\$126M
U.S. Magnesium	2021	\$60M
Atlantic Richfield Company	2020	\$150M
Nuclear Metals	2019	\$125M
Doe Run	2018	\$80M
Freeport-McMoran, Inc.	2017	\$600M
Occidental Chemical	2016	\$165M
Mosaic Fertilizer	2015	\$2B
Tronox (Bankruptcy)	2014	\$5.15B
Transocean	2013	\$1B
Moex Offshore	2012	\$90M
BP America	2011	\$324M
General Motors (Bankruptcy)	2010	\$773M
ASARCO (Bankruptcy)	2009	\$1.79B
Lexington-Fayette	2008	\$290M

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Environmental Covenants in Debt Contracts

Three Types of Environmental Covenants

- ▶ **Compliance Covenants:**

- ▶ Require borrower to comply with environmental laws and regulations.
- ▶ These are in all contracts.

- ▶ **Information Covenants**

- ▶ Require the borrower to disclose information about pollution.

- ▶ **Action Covenants**

- ▶ Require the borrower to remediate pollution.

- ▶ *“Covenants” in debt contracts are commonly “free standing events of default”. So failure to act, inform, or comply allows the lender to call the loan.*

Compliance Covenant

*“The Borrower will, and will cause each of its Subsidiaries to, **comply with all laws**, rules, regulations and orders of any Governmental Authority applicable to it or its property (including, without limitation, ERISA and Environmental Laws)”*

All contracts in our sample have compliance covenants.

Information Covenant

*“The Borrower will, and will cause each of its Subsidiaries to, permit any representatives designated by the Administrative Agent or any Lender, upon reasonable prior notice, to **visit and inspect its properties**, to examine and make extracts from its **books and records, including environmental assessment reports and Phase I or Phase II studies,**”*

Other examples include reporting requirements.

- ▶ Our “Information Covenants” include both “Audit” and “Disclosure”.

Action Covenant

*“if the Administrative Agent or **any Lender has formed a reasonable belief** that **material violations** of Environmental Laws may exist or **Hazardous Materials may be present on the Real Property** in amounts or under circumstances which could reasonably be expected to result in a liability exceeding a Material Environmental Amount, then,”*

“[perform] any cleanup, remediation, containment, operation, maintenance, monitoring or restoration work, whether on or off of the Real Property”

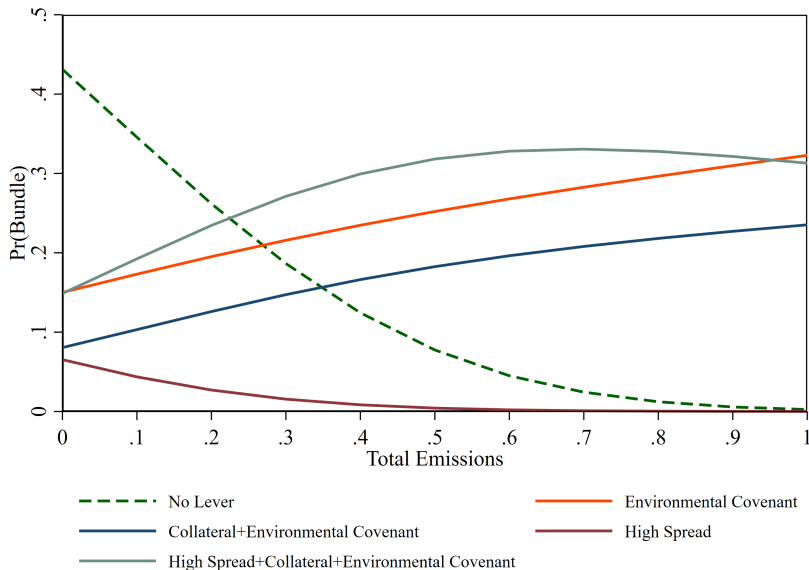
*“**restore the Real Property to the maximum extent practicable, which shall include, without limitation, the repair of any surface damage.**”*

RQ 1: What mechanisms do lenders use to manage borrower's pollution?

Mechanisms:

- ▶ Spread
- ▶ Collateral
- ▶ Environmental Covenants

RQ 1: What mechanisms do lenders use to manage borrower's pollution?



Preview of Remaining Results (RQ 2 & 3)

- ▶ **Assertion:** Environmental covenant use is motivated by lenders direct economic incentives, and not general environmental concerns.

Preview of Remaining Results (RQ 2 & 3)

RQ 2: Does the use of environmental covenants vary with the type and location of the borrower's pollution? (Air, Land, Water, On-site, Off-site)

- ▶ **Conjecture:** Only on-site emissions of land and water pollution create the liabilities that environmental covenants are designed to manage.
- ▶ **Result:** Environmental covenant use is only associated with Land, Water, and On-site emissions.

RQ 3: How does the use of environmental covenants respond to the 2002 Brownfields act?

- ▶ **Brownfields act:** Allows owners of polluted properties to fund cleanup using proceeds from sales of assets. *Increased the economic benefit of monitoring environmental risks (Chen 2025).*
- ▶ **Conjecture:** The Brownfields act should be associated with increased environmental monitoring through environmental covenants.
- ▶ **Result:** The association between both land emissions and offsite emissions and environmental covenant use strengthens following the 2002 Brownfields Act.

Insight from RQ 2, and RQ 3:

Lenders' use of environmental covenants is driven by their direct economic incentives, and not by general concern for the environment.

Preview of Remaining Results (Mechanism)

RQ 4: Are environmental covenants associated with better credit outcomes after environmental violations?

- ▶ **Conjecture:** If environmental covenants are effective they should be associated with better credit outcomes after environmental violations.
- ▶ **Result:** Borrowers with environmental covenants experience fewer adverse credit events following environmental violations.

RQ 5: Does covenant type vary with the quality of lenders' information about borrower's pollution risk?

- ▶ **Conjecture:** Lenders with better information (or better ability to process information) should be more able to specify actions ex ante.
- ▶ **Result 1:** Use of covenants that require action is increasing in lender "brown" specialization.
- ▶ **Result 2:** After enforcement shocks:
 - ▶ Both relationship and non-relationship lenders increase their use of covenants that require information.
 - ▶ Only relationship lenders increase their use of action covenants.

Roadmap:

1. Framework and Data.
2. Details of main result (RQ 1).
3. Unpacking pollution (RQ 2).
4. Brownfields Act (RQ 3).
5. Unpacking credit outcomes (RQ 4).
6. Unpacking covenant types (RQ 5).
7. Related work and contribution.
8. Additional Analyses

Framework and Data

Our Framework:

- ▶ Pollution is an external cost.
 - ▶ To the managers and owners of a firm, polluting reduces production costs.
- ▶ What matters to lenders is how this external cost is internalized:
 1. Ineffectively (the costs stay external): Lenders may not care.
 2. Effectively and timely: Lenders care, but general contract terms are sufficient (i.e. spreads, collateral).
 3. Effectively but **not** timely: Lenders care, but general contract terms are not sufficient.

Enforcement in the US is (historically) often effective, but not timely.

Our Framework:

Pollution allows borrowers to reduce current costs while creating future environmental liabilities that are senior to the lender's claim.

i.e. Claim dilution (Smith and Warner, 1979)

Data

Sources:

- ▶ **Environmental Covenants:** EDGAR
 - ▶ We are the first to study Information and Action Covenants *separately*.
- ▶ **Loan Contract Details:** Dealscan
- ▶ **Borrower and Lender Fundamentals:** Compustat
- ▶ **Emissions:** US EPA TRI data.
 - ▶ We are the first to separate type and location of emissions (in this literature).
- ▶ **Environmental Violations:** Violation Tracker
- ▶ **Credit events:** Bankruptcy (Audit Analytics), and default and credit rating downgrades (S&P Capital IQ).
- ▶ **Specialization:** We adapt the Giometti & Pietrosanti (2022) approach to measure “Brown Industry Specialization” by banks.

Main sample: 2002-2022

Brownfields: 1997-2006

RQ 1: What mechanisms do lenders use to manage borrower's pollution?

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Does use of general monitoring mechanisms (spread, collateral, etc.) in combination with explicitly environmental covenants vary with borrower pollution?

Prediction:

- ▶ The use of general mechanisms alone should decrease, and the use of environmental mechanisms should increase, as pollution increases.

Empirical Approach:

- ▶ 3 Contract Term “Levers”: High Spread, Collateral, Environmental Covenants.
- ▶ Model how the combination of levers varies with pollution.
- ▶ Multinomial probit:
 - ▶ levers can be used in combination, and
 - ▶ the alternatives are not independent (IIA does not hold).

Figure 1. Panel B. Pr(Contract Term Bundle) across Total Emissions

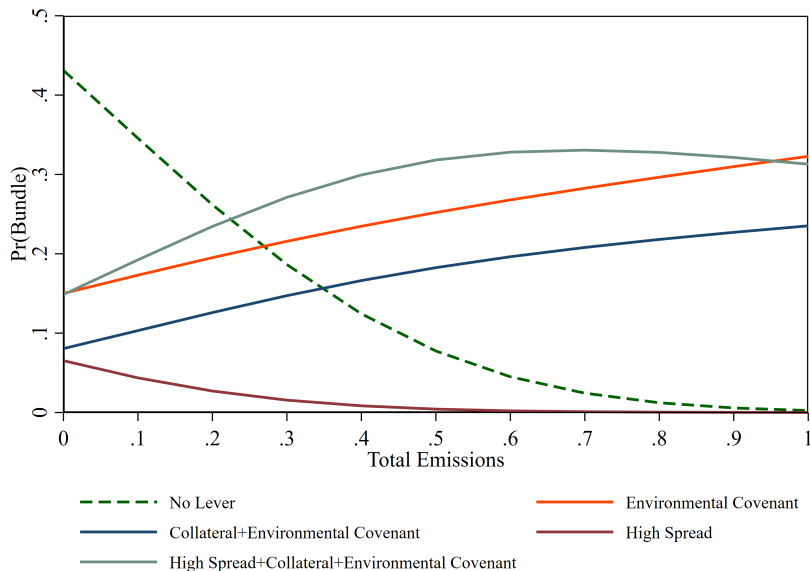


Table 3. Panel A.

Bundle ID	Bundle Name	N	%
1	No Lever	512	41.63%
2	High Spread + Collateral + Environmental Covenant	194	15.77%
3	Environmental Covenant	191	15.53%
4	Collateral + Environmental Covenant	104	8.46%
5	High Spread	73	5.93%
999	Other:	High Spread + Collateral	60
		Collateral	54
		High Spread + Environmental Covenant	42
			156
		156	12.68%
	Total	1,230	100%

Distribution of Bundles.

Table 3. Panel B.

Dep. Var.= Bundle ID	1	2	3	4	5	999
Total Emissions	-0.852*** (-3.04)	0.432** (2.06)	0.237** (2.05)	0.223*** (2.65)	-0.234** (-2.12)	0.193* (1.92)
Loan, Borrower, Lender Controls	Yes	Yes	Yes	Yes	Yes	Yes
Lender, Year, Ind FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1230	1230	1230	1230	1230	1230

Average Marginal Effects of Total Emissions.

RQ 2: Unpacking Pollution

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Does the use of environmental covenants vary with the type and location of the borrower's pollution?

Prediction:

- ▶ If the use of environmental covenants is motivated by the claim dilution problem we describe, then only on-site emissions of land and water pollution should be associated with their use.

Empirical Approach:

- ▶ Separate emission types into air, land, water, on-site, and off-site.
- ▶ Model covenant use as a function of each type and location.

Table 4.

Dep. Var. =	Environmental Covenant					
	(1)	(2)	(3)	(4)	(5)	(6)
Total Emissions	1.078*** (3.76)					
Land Emissions		1.423*** (4.03)				
Water Emissions			0.943*** (7.65)			
Air Emissions				-0.026 (-0.10)		
Onsite Emissions					1.398*** (3.96)	
Offsite Emissions						0.671 (1.29)
Loan Controls	Yes	Yes	Yes	Yes	Yes	Yes
Borrower Controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose Indicators	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Ind FEs	Yes	Yes	Yes	Yes	Yes	Yes
Lender FEs	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	1,230	1,230	1,230	1,230	1,230	1,230
Adj. <i>R</i> ²	0.24	0.24	0.24	0.22	0.25	0.23

Environmental Covenants and Borrower Emissions.

RQ 3: The Brownfields Act

- ▶ Brownfields Act: Increased incentives to monitor pollution (Chen 2025).
 - ▶ Makes it possible to sell land without transferring liability (i.e. with cleanup ongoing).
 - ▶ Primary effect is to facilitate redeployment of polluted sites, makes cleanup more economically feasible.

Empirical approach:

- ▶ 1997-2006 sample of loans.
- ▶ **POST**: Indicator equal to 1 for all observations after 2002, which we interact with emissions measures.
- ▶ **ARO**: Indicator variable equal to 1 if the 10-K includes an Asset Retirement Obligation. This should capture the effect of SFAS 143 (also 2002).

Table 5.

Dep. Var. =	Environmental Covenant					
	(1)	(2)	(3)	(4)	(5)	(6)
Emission Type =	Total	Land	Water	Air	Onsite	Offsite
Emissions $\times$ Post	-0.014 (-0.04)	0.594** (2.41)	-26.222 (-1.30)	0.434 (0.89)	0.412* (1.71)	2.779 (0.39)
Emissions	0.635* (1.78)	0.889*** (3.22)	29.675 (1.37)	-0.406 (-0.47)	0.721** (2.02)	-2.784 (-0.39)
ARO	-0.013 (-0.20)	-0.014 (-0.22)	0.002 (0.03)	0.001 (0.02)	-0.021 (-0.32)	-0.000 (-0.01)
Loan, Borrower & Lender Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year, Lender & Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
N	412	412	412	412	412	412
Adj. r^2	0.307	0.319	0.302	0.296	0.314	0.296

Environmental Covenants, Borrower Emissions, and the Brownfields Act of 2002.

This is consistent with the LSTA's concerns:

From *The Loan Syndications and Trading Association's (LSTA) Complete Credit Agreement Guide*:

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RQ 4: Unpacking credit outcomes.

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Are environmental covenants associated with better credit outcomes after environmental violations?

Dependent Variable:

- ▶ **Adverse Credit Events:** Indicator for: Bankruptcy (Audit Analytics), Default (Capital IQ), or Downgrade (Capital IQ)

Data structure and sample:

- ▶ **Environmental Violation:** Violation tracker violations where the primary offense is listed as “environmental”.
- ▶ **Sample and data structure:**
 1. All active loans in our sample that experience an environmental violation.
 2. We treat loans as “exposed” starting on the date of the violation.
 3. Model adverse credit events over the 4, 8, and 12 quarters after the violation.

Table 6 Panel A

	(1) Env. Cov. Borrowers	(2) Credit Events	(3) Event Rate	(4) No Env. Cov. Borrowers	(5) Credit Events	(6) Event Rate	(7) Diff. (pp)
4 Quarters	83	11	13%	127	22	17%	4
8 Quarters	83	16	19%	127	36	28%	9
12 Quarters	83	21	25%	127	50	39%	14

Frequency of Adverse Credit Events Following Environmental Violations. (210 unique borrowers)

Table 6 Panel B

Dep. Var. =	Adverse Credit Event		
	(1)	(2)	(3)
	4 Quarters	8 Quarters	12 Quarters
Env. Cov.	0.345 (-0.89)	0.209* (-1.65)	0.333* (-1.83)
Borrower Controls	Yes	Yes	Yes
Ind. FE & Year Strata	Yes	Yes	Yes
Observations	718	1323	1761

Hazard of Adverse Credit Events Following Environmental Violations. (210 unique borrowers)

RQ 5: Unpacking covenant types.

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Three Types of Environmental Covenants

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“[perform] any cleanup, remediation, containment, operation, maintenance, monitoring or restoration work, whether on or off of the Real Property”

*“**restore the Real Property to the maximum extent practicable, which shall include, without limitation, the repair of any surface damage.**”*

RQ 5: Does covenant type vary with the quality of lenders' information about borrower's pollution risk?

Empirical Approaches:

1. Does choice of covenant type vary with lender specialization in brown industries?
 2. Do relationship and non-relationship lenders respond differently to industry-level enforcement shocks?
- We model the use of Information Covenants and Action Covenants both alone and together as a function of:
- **Brown Industry Specialization** (i.e. lender portfolio concentration in a brown industry is an outlier).
 - **Industry Enforcement Shocks** (i.e. environmental violations in the borrower's industry).

Table 8.

Dep. Var. =	Info. Covenant (1)	Action Covenant (2)	Info. & Action (3)
Brown Specialization	-0.026 (-0.70)	0.006 (0.26)	0.068** (2.05)
Loan, Lender, Borrower Controls	Yes	Yes	Yes
Loan Purpose Indicators	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes
Lender FEs	Yes	Yes	Yes
N	3,770	3,770	3,770
Adj. r^2	0.09	0.02	0.11
Test of Difference in β_1:			
(2) - (1) (p -value)			0.43
(3) - (1) (p -value)			0.05
(3) - (2) (p -value)			0.09

Environmental Covenant Type and Brown Bank Specialization.

Figure 3. $\text{pr}(\text{Covenant Bundle})$ across Brown Specialization Level

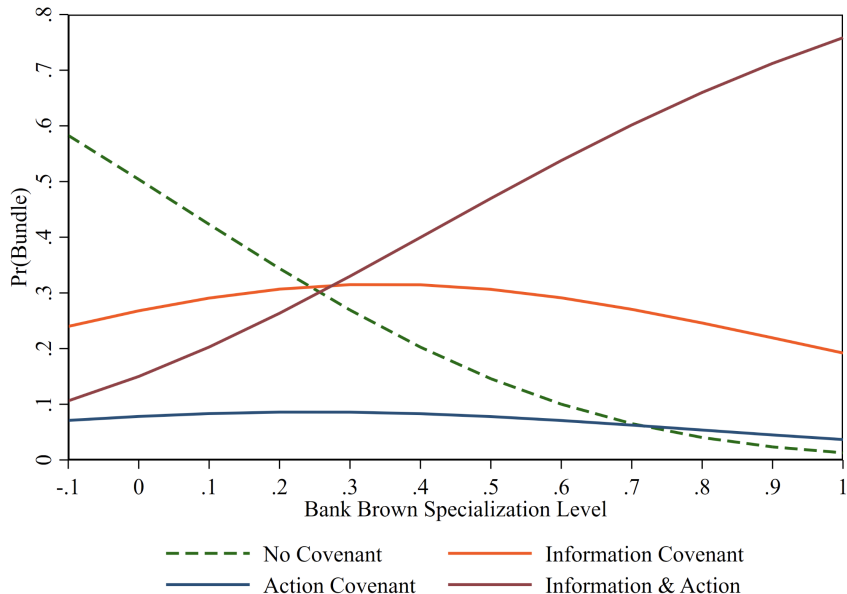


Table 9 Panel A

Dep. Var. =	Info. Covenant		Action Covenant		Info. & Action	
	(1)	(2)	(3)	(4)	(5)	(6)
Violation $\in [-360, 0]$	0.001** (2.29)		-0.001** (-2.25)		0.001* (1.77)	
Violation $\in [-180, 0]$		0.003** (2.38)		-0.001** (-1.98)		0.002** (1.96)
Loan, Lender, Borrower Controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose Indicators	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Lender FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	3,770	3,770	3,770	3,770	3,770	3,770
Adj. r^2	0.09	0.09	0.02	0.02	0.11	0.11

Environmental Covenant Type and Industry Violations.

Table 9 Panel B

Dep. Var. =	Info. Covenant		Action Covenants		Info&Action	
	(1)	(2)	(3)	(4)	(5)	(6)
Violation $\in [-360, 0]$	0.002* (1.91)		-0.000 (-1.20)		0.002** (2.45)	
Violation $\in [-180, 0]$		0.003* (1.93)		-0.001 (-1.13)		0.003** (2.45)
Loan, Lender, Borrower Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Lender FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	1,664	1,664	1,664	1,664	1,664	1,664
Adj. r^2	0.09	0.09	0.01	0.01	0.11	0.11
pr(Coef. Diff.=0)	0.390	0.370	0.120	0.180	0.010	0.020

Environmental Covenant Type and Industry Violations: Sample of Relationship Lenders.

Table 9 Panel C

Dep. Var. =	Info. Covenant		Action Covenants		Info&Action	
	(1)	(2)	(3)	(4)	(5)	(6)
Violation $\in [-360, 0]$	0.001** (2.15)		-0.001** (-2.53)		0.000 (0.52)	
Violation $\in [-180, 0]$		0.003** (2.19)		-0.002** (-2.25)		0.001 (0.74)
Loan, Lender, Borrower Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Lender FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	2,096	2,096	2,096	2,096	2,096	2,096
Adj. r^2	0.09	0.09	0.03	0.03	0.11	0.11

Environmental Covenant Type and Industry Violations: Sample of Non-Relationship Lenders.

Related Work

Summary of related work

Very brief summary of key research questions that the literature has addressed:

1. Is public environmental enforcement a complement or substitute for private monitoring (i.e. Environmental Covenants)?
 - ▶ Choy et al. (2023): Positive association between enforcement and environmental covenants. (*ex post*: complements)
 - ▶ Demerjian et al. (2025): Negative association between regulatory commitments (State GHG Targets) and environmental covenants. (*ex ante*: substitutes)
2. Are environmental covenants associated with lower emissions?
 - ▶ Yes: Choy et al. (2023), Demerjian et al. (2025), Lee and Zakota (2024).

Contribution

1. We argue that the first order motivation for environmental covenants is the claim dilution problem created by pollution, and not emissions per se.
2. First to consider:
 - ▶ The bundling of environmental covenants with other contract terms.
 - ▶ Pollution by type and location.
 - ▶ Information and action covenants as separate commitments.
3. Impact of covenants on post-violation credit outcomes.

Additional Analyses

Additional Analyses

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Environmental Covenant Use Over Time

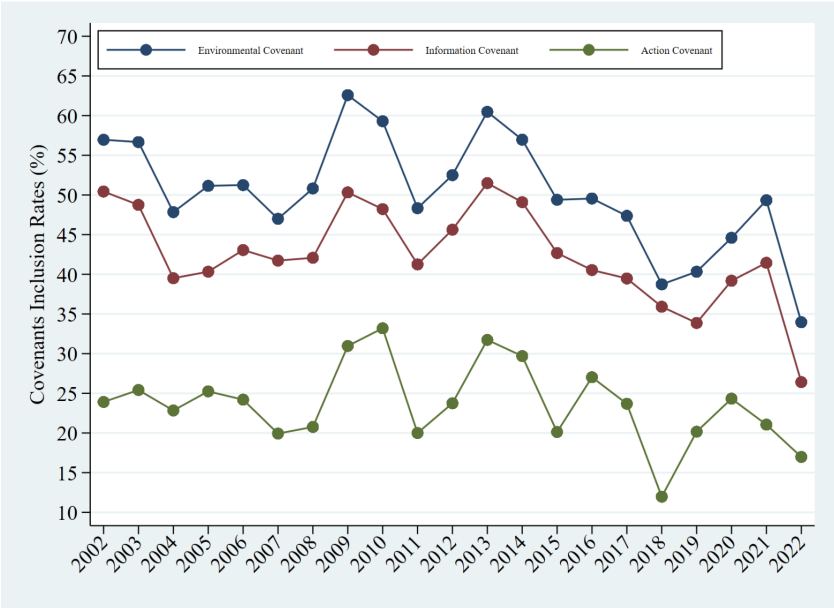


Table 7: Alternate Explanations

1. Lender Environmental Reputation (Table 7 Panel A)
2. Syndicate Size (Table 7 Panel B)
3. Non-Investment Grade Borrowers (Table 7 Panel C)
4. Lending during credit expansions (Table B6)

Table 7 Panel A: Lender Environmental Reputation

<i>Panel A: Lender Environmental Reputation (MSCI E-score)</i>						
Emission $\times$ High Lender E-score	-0.488*	-0.633	0.022	-0.142	-0.671**	-1.259**
	(-1.82)	(-1.46)	(0.09)	(-0.26)	(-1.98)	(-2.08)
Emission	1.489***	1.556**	1.037***	0.311	1.908***	2.004***
	(4.34)	(2.53)	(9.27)	(0.91)	(3.75)	(5.22)
High Lender E-score	-1.717	-2.103	-1.769	-1.949	-1.882	-1.706
	(-0.65)	(-0.79)	(-0.66)	(-0.73)	(-0.71)	(-0.65)
Loan, Borrower & Lender Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls $\times$ High Lender E-score	Yes	Yes	Yes	Yes	Yes	Yes
Year, Lender & Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
N	780	780	780	780	780	780
Adj. r^2	0.284	0.265	0.286	0.258	0.283	0.268
pr(Emission + + Emission $\times$ High Lender E-score = 0)	0.005	0.007	0.000	0.722	0.002	0.235

Environmental Covenant Use and Lender Environmental Reputation.

Table 7 Panel B: Syndicate Size

<i>Panel B: Large Syndicate</i>						
Emission × Large Syndicate	0.362 (1.00)	1.063*** (3.18)	-0.330* (-1.69)	0.598* (1.71)	0.845** (2.38)	-1.388 (-1.43)
Emission	0.826*** (2.63)	0.870*** (2.83)	1.154*** (5.88)	-0.419 (-1.10)	0.884** (2.51)	1.929** (2.54)
Large Syndicate	-0.403 (-0.30)	-0.375 (-0.27)	-0.270 (-0.20)	-0.353 (-0.26)	-0.195 (-0.15)	-0.491 (-0.36)
Loan, Borrower & Lender Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls × Large Syndicate	Yes	Yes	Yes	Yes	Yes	Yes
Year, Lender & Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	1,230	1,230	1,230	1,230	1,230	1,230
Adj. <i>r</i> ²	0.249	0.246	0.245	0.231	0.252	0.234
pr(Emission + Emission × Large Syndicate = 0)	0.000	0.000	0.000	0.590	0.000	0.302

Environmental Covenant Use and Syndicate Size.

Table 7 Panel C: Non-Investment Grade Borrowers

<i>Panel C: Non-Investment Grade (LPC Segment)</i>						
Emission $\times$ Non-Investment Grade	-0.761** (-2.11)	-0.431 (-1.13)	-0.688*** (-3.31)	-0.485 (-0.78)	-0.999** (-2.58)	0.268 (0.37)
Emission	1.464*** (3.95)	2.114*** (8.40)	1.131*** (5.99)	0.217 (0.63)	2.018*** (5.52)	0.588 (1.06)
Non-Investment Grade	-1.197 (-0.73)	-1.331 (-0.81)	-0.664 (-0.40)	-0.885 (-0.52)	-1.379 (-0.84)	-0.813 (-0.48)
Loan, Borrower & Lender Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls $\times$ Non-Investment Grade	Yes	Yes	Yes	Yes	Yes	Yes
Year, Lender & Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1,176	1,176	1,176	1,176	1,176	1,176
Adj. r^2	0.267	0.263	0.259	0.243	0.272	0.245

Environmental Covenant Use and Non-Investment Grade Borrowers.

Table B6: Credit Expansions

Dep. Var. =	Environmental Covenant					
Emission =	(1) Total	(2) Land	(3) Water	(4) Air	(5) Onsite	(6) Offsite
Emission $\times$ Credit Expansion	0.291 (0.78)	0.224 (0.68)	0.142 (1.03)	-0.080 (-0.24)	0.343 (0.94)	0.220 (0.29)
Emission	0.978*** (3.38)	1.370*** (3.73)	0.845*** (6.74)	-0.010 (-0.03)	1.283*** (3.68)	0.611 (1.09)
Credit Expansion	-0.307 (-0.24)	-0.670 (-0.52)	-0.172 (-0.14)	-0.551 (-0.43)	-0.396 (-0.31)	-0.421 (-0.33)
Loan, Borrower & Lender Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls $\times$ Credit Expansion	Yes	Yes	Yes	Yes	Yes	Yes
Year, Lender & Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1,230	1,230	1,230	1,230	1,230	1,230
Adj. r^2	0.243	0.238	0.240	0.224	0.245	0.227
pr(Emission + Emission $\times$ Credit Expansion = 0)	0.003	0.000	0.000	0.799	0.000	0.060

Environmental Covenant Use and Credit Expansions.

Table B7: Violations and Amendments

	Amendment _{<i>t</i>+1}	
	(1)	(2)
Violation Shock	0.002** (2.07)	0.002* (1.77)
Environmental Covenant × Violation Shock		-0.0001 (-0.04)
Borrower Controls	Yes	Yes
Tranche FE	Yes	Yes
Quarter FE	Yes	Yes
<i>N</i>	16,420	16,420
Adj. <i>r</i> ²	0.12	0.12

Environmental Covenant Use and Amendments Following Environmental Violations.

Table B8: Pricing of Emissions

Dep. Var. =	ln(Spread)		
	(1)	(2)	(3)
Sample	Full	Brn. Spe.	Non-spe.
Total Emissions $\times$ Environmental Covenants	-0.492 (-1.01)	-8.201** (-2.05)	-0.044 (-0.10)
Environmental Covenants	0.054 (1.62)	0.131 (1.41)	0.033 (0.93)
Total Emissions	0.564 (1.16)	8.474** (2.06)	0.230 (0.53)
Loan Controls	Yes	Yes	Yes
Borrower Controls	Yes	Yes	Yes
Lender Controls	Yes	Yes	Yes
Loan Purpose Indicators	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes
Ind FEs	Yes	Yes	Yes
Lender FEs	Yes	Yes	Yes
N	1,230	115	1,107
Adj. r^2	0.65	0.75	0.65
$\text{pr}(\beta_1 \text{ Diff.}=0)$		0.04	
$\text{pr}(\beta_2 \text{ Diff.}=0)$		0.19	
$\text{pr}(\beta_3 \text{ Diff.}=0)$		0.03	

Environmental Covenant Use and the Pricing of Emissions.

Table B12: Brown Borrower and Lender Selection

Dep. Var. = Loan	PPML (1)	OLS (2)
Brown Specialized Lender	0.003*** (5.47)	0.002* (1.83)
Lender Market Share	0.004*** (14.08)	0.039*** (28.41)
Same State	0.004*** (4.74)	0.030*** (3.77)
Loan, Lender, Borrower Controls	Yes	Yes
Loan Purpose Indicators	Yes	Yes
Year Effects	Yes	Yes
Ind FEs	Yes	Yes
N	68,011	68,011
Adj. R^2		0.09
Pseudo R^2	0.26	

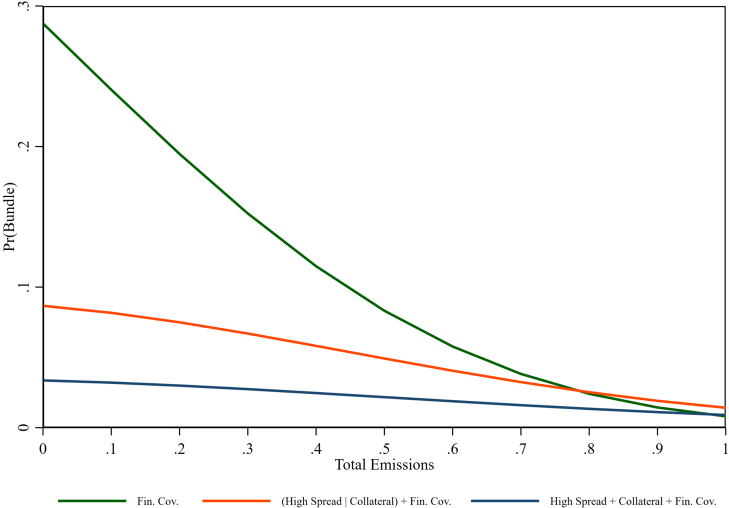
Brown Borrower and Lender Selection.

Table B13: Analysis of Selection on Unobservables

Result Description	Baseline Effect (<i>Std. Error</i>)[R^2]	Controlled Effect (<i>Std. Error</i>)[R^2]	$\tilde{\delta}$ for $\beta=0$ [$R_{max} = 1.3 \tilde{R}$]	Identified Set $\tilde{\beta}, \beta^* (1.3 R_{max}, 1)$
Total Emissions	0.780 (0.300)[0.126]	1.078 (0.287)[0.299]	-6.26	[1.078, 1.232]
Land Emissions	1.205 (0.331)[0.126]	1.423 (0.353)[0.294]	-8.37	[1.423, 1.580]
Water Emissions	0.727 (0.103)[0.125]	0.943 (0.123)[0.295]	-8.28	[0.943, 1.045]
Onsite Emissions	1.036 (0.364)[0.127]	1.398 (0.353)[0.300]	-6.15	[1.398, 1.595]

Analysis of Selection on Unobservables.

Figure B1: Financial Covenants.



Pollution and Contract Term Bundles including Financial Covenants.

Table B1: Persistence.

Current Loan (l)	Next Loan ($l+1$)		Loan After Next ($l+2$)	
	Has Env. Cov.	No Env. Cov.	Has Env. Cov.	No Env. Cov.
Has Env. Cov.	86.81%	13.19%	82.71%	17.29%
No Env. Cov.	12.77%	87.23%	14.79%	85.21%

Persistence of Environmental Covenant Use.

Table B2: Off-site Land/Water.

Dep. Var. =	Environmental Covenant	
	(1)	(2)
Onsite Land Emissions	1.377*** (3.80)	
Offsite Land Emissions	0.602 (1.31)	
Onsite Water Emissions		0.955*** (7.91)
Offsite Water Emissions		-0.087 (-0.83)
Loan, Lender, Borrower Controls	Yes	Yes
Loan Purpose Indicators	Yes	Yes
Year Effects	Yes	Yes
Ind FEs	Yes	Yes
Lender FEs	Yes	Yes
<i>N</i>	1,230	1,230

Table B3: Contract Term Bundle Choice and Bank Specialization.

Panel A. Distribution of Bundles				
Bundle ID	Bundle Name	N		%
1	No Covenant	1863		49.42%
2	Info. Covenant	1021		27.08%
3	Info. & Action	589		15.62%
4	Action Covenant	297		7.88%
Total		3770		100.00%
Panel B. Average Marginal Effects of Bank Brown Specialization				
Dep. Var.= Bundle ID	1	2	3	4
Bank Brown Specialization Level	-0.803*** (-3.18)	0.250 (1.29)	0.493*** (4.38)	0.060 (0.53)
Loan, Borrower, Lender Controls	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes
Observations	3770	3770	3770	3770