Spillovers From Creditor Control

James Nordlund

Assistant Professor, Department of Finance
Email: nordlund@lsu.edu

Loan Covenants

- *Private* credit agreement
- Tripping a covenant accelerates the maturity of a loan
  - technical default rarely (1%) leads to bankruptcy (Nini, Smith, and Sufi 2012)
  - capex restrictions added in renegotiation (Nini, Smith, and Sufi 2009)
- Technical default is a *public* outcome

Example Covenant

Sample covenant

- (Interest Coverage Ratio) The Borrower will not permit the Interest Coverage Ratio on any Quarterly Date for the four fiscal quarters ended on or immediately prior to such Quarterly Date to be less than 2.25:1.
- (Leverage Ratio) The Borrower will not permit the Leverage Ratio on any Quarterly Date to be greater than 0.60:1.

Loan agreement between Brasil Telecom and Sumitomo Mitsui Banking Corp

Example Covenant

Sample covenant

(Consequences of Events of Default) ... (i) immediately suspend any Disbursement; and/or (ii) immediately cancel the undrawn portion of the Facility; and/or (iii) demand that all or part of the Loan be payable on demand, whereupon the Loan, together with all accrued interest, breakage costs, commitment charges, fees and other amounts due under this Agreement or in respect of the Loan shall become forthwith due and payable without presentment, demand, protest or other notice of any kind, all of which are hereby waived by the Borrower.

Reasons for Covenants

- Shareholder expropriation of creditors (Smith and Warner 1979)
  - Idiosyncratic
  - Violation $\Longrightarrow$ bad management
- Incomplete information at origination (Demerjian 2017)
  - Unknown parameters may be industry/market level
  - Violation $\Longrightarrow$ ambiguous parameter resolves to “bad news”

Covenant Violations

- Violating a covenant gives creditors bargaining power
- Direct effect: firm becomes more conservative

Is Peer Firm Violation Informative?

- If peer firms also in technical default...
  - Managers *aren't* misbehaving, help them
    - Extend liquidity, allow capex to re-tool
    - Giannetti and Saidi (2019)
  - Bad times are here, get really conservative
    - Hertzel and Officer (2012)
- Policy variables: debt issuance, investment

How Does This Shape the Competitive Environment?

- If peers in technical default...
  - Bad times are here... slow down, avoid the same fate
  - Prey on the violators
    (Poitevin 1989; Bolton and Scharfstein 1990)
- Depends on creditor reaction to peer firm covenant violation

Preview

- Outcomes for violators depend on violation rates of rivals
  - Policies become *more* conservative (parameter ambiguity at issuance)
- Stricter loans when industry uncertainty is higher
- Non-violators also affected by violation rates
  - Reduced financing/investment, slightly better sales growth

Potential Outcomes

- Covenant violation indicator: $\tau_{i,t}$
- Outcomes depend on peers: $y(\tau_{i,t}, \boldsymbol{\tau}_{-i,t})$
- Dimension of $y(\tau_{i,t}, \boldsymbol{\tau}_{-i,t})$ may be huge (avg. of 2^{33})

Hong and Raudenbush's (2006) Simplification

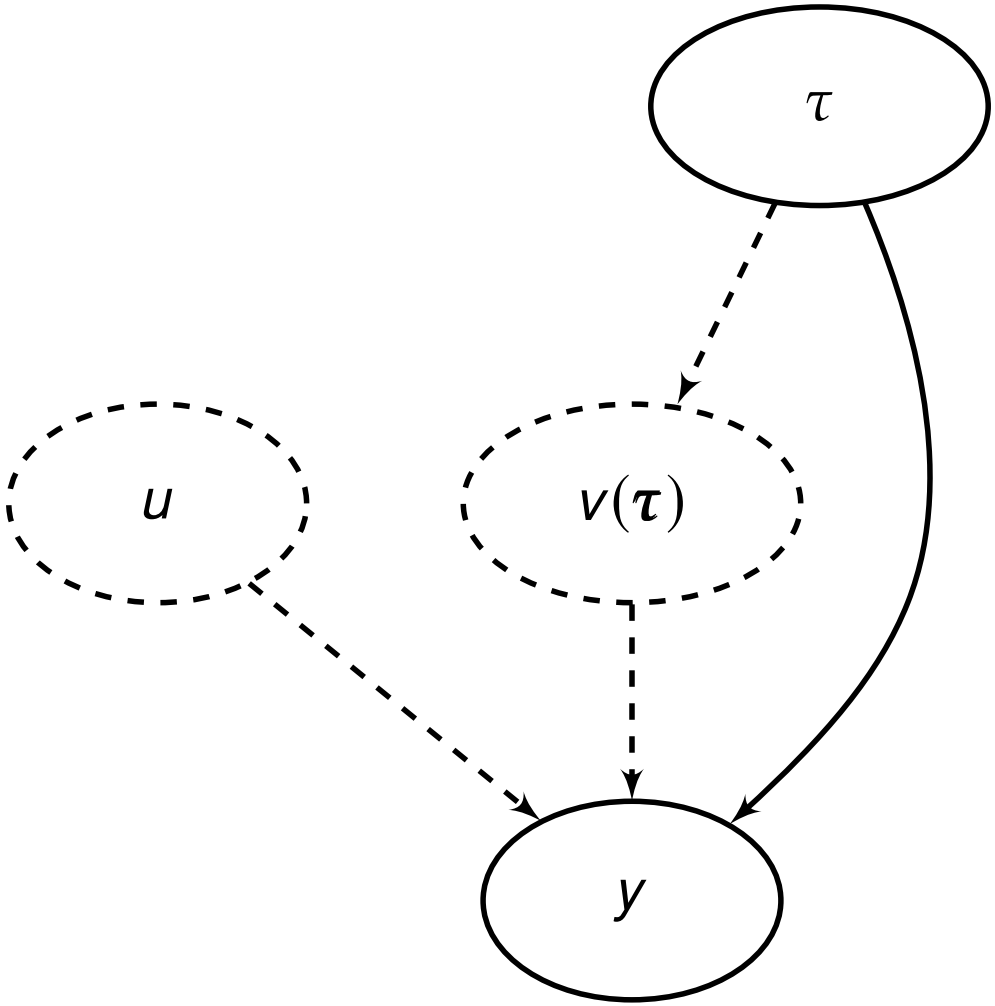
- $y(\tau_{i,t}, \boldsymbol{\tau}_{-i,t}) = y(\tau_{i,t}, v(\boldsymbol{\tau}_{-i,t}))$

- Spillovers matter along a scalar dimension

Rubin's Potential Outcomes

- **SUTVA**: $y(\tau_{i,t}, \boldsymbol{\tau}_{-i,t}) = y(\tau_{i,t})$
- Diff-in-diff, RDD
- SUTVA estimators *assume* spillovers don't exist
- SUTVA estimators *estimate* treatments that (implicitly) include any/all spillovers

Model Ignoring Spillovers



Omitted Spillover Effects Creep In

- True model has spillovers

$$y_{i,t} = \beta_1 \tau_{i,t} + \beta_2 v(\boldsymbol{\tau}) 1_{\tau_{i,t}=1} + \beta_3 v(\boldsymbol{\tau}) 1_{\tau_{i,t}=0} + \epsilon_{i,t} \tag{1}$$

- SUTVA model assumes away spillovers

$$y_{i,t} = \theta_1 \tau_{i,t} + u_{i,t} \tag{2}$$

- The spillovers show up in the SUTVA estimates

$$\hat{\theta}_1 = \hat{\beta}_1 + \left(\hat{\beta}_2 - \hat{\beta}_3\right) \bar{v}(\boldsymbol{\tau}) \tag{3}$$

- Prior covenant papers estimate $\hat{\theta}_1$

Spillovers in SUTVA Parameter

$$\hat{\theta}_1 = \overbrace{\hat{\beta}_1}^{\text{direct effect}} + \overbrace{\left(\hat{\beta}_2 - \hat{\beta}_3\right)\bar{v}(\boldsymbol{\tau})}^{\text{avg. indirect effect}}$$

- **$\hat{\beta}_1$ is not always the most important term in $\hat{\theta}_1$**
- Decline in covenant usage (Griffin, Nini, and Smith 2019)
  - Lessons learned from older, SUTVA-based papers may no longer apply

The DiD Revolution

- 2020-2021: lots of important papers about DiD
- E.g., Chaisemartin and D'Haultfœuille (2020)

  Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects
- Limitation:
  - Lot's of work to re-weight obs. to get ATE
  - No idea *why* TEs are heterogeneous
  - My guess: significant spillover / GE effects

Potential Outcomes with Spillovers

- **SUT*N*VA**: Spillovers exist within a peer group
- $y(\tau_{i,t}, v(\boldsymbol{\tau}_{-i,t})) = y(\tau_{i,t}, \rho_{j,t})$

$$\rho_{j,t} := \frac{\sum_{\{k|k,i \in \textbf{Ind. } j\}} \omega_{k,t}\tau_{k,t}}{\sum_{\{k|k,i \in \textbf{Ind. } j\}} \omega_{k,t}}$$

- Proportion of violators in an industry-quarter: $\rho_{j,t}$

Toy Example

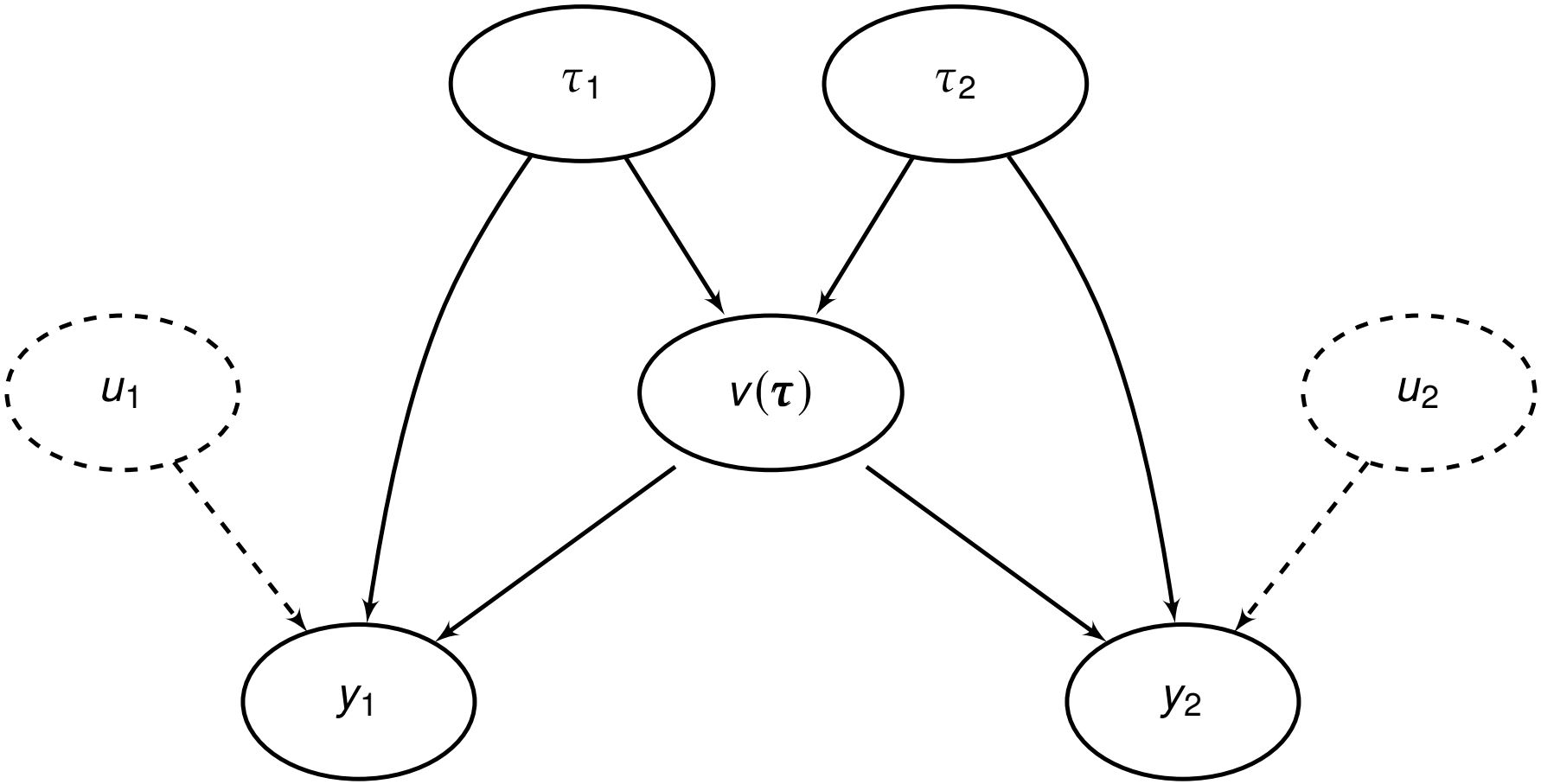
N firms in Cournot oligopoly

$p = a - b \sum_i q_i$

$\pi_i = pq_i - c_i q_i$

Counterfactual	**With Treatment**	
$c_i = c_L \ \forall i$	$c_i = c_L 1_{i \geq \rho N} + c_H 1_{i < \rho N}$	
$q_i^* = \frac{a - c_L}{b(N+1)} \ \forall i$	$q_i^* = \frac{a - c_L}{b(N+1)} + \frac{N}{N+1}(c_H - c_L)\rho$	if $i \geq \rho N$
	$q_i^* = \frac{a - c_L}{b(N+1)} + \frac{N}{N+1}(c_H - c_L)\rho - \frac{N}{N+1}(c_L - c_H)$	if $i < \rho N$

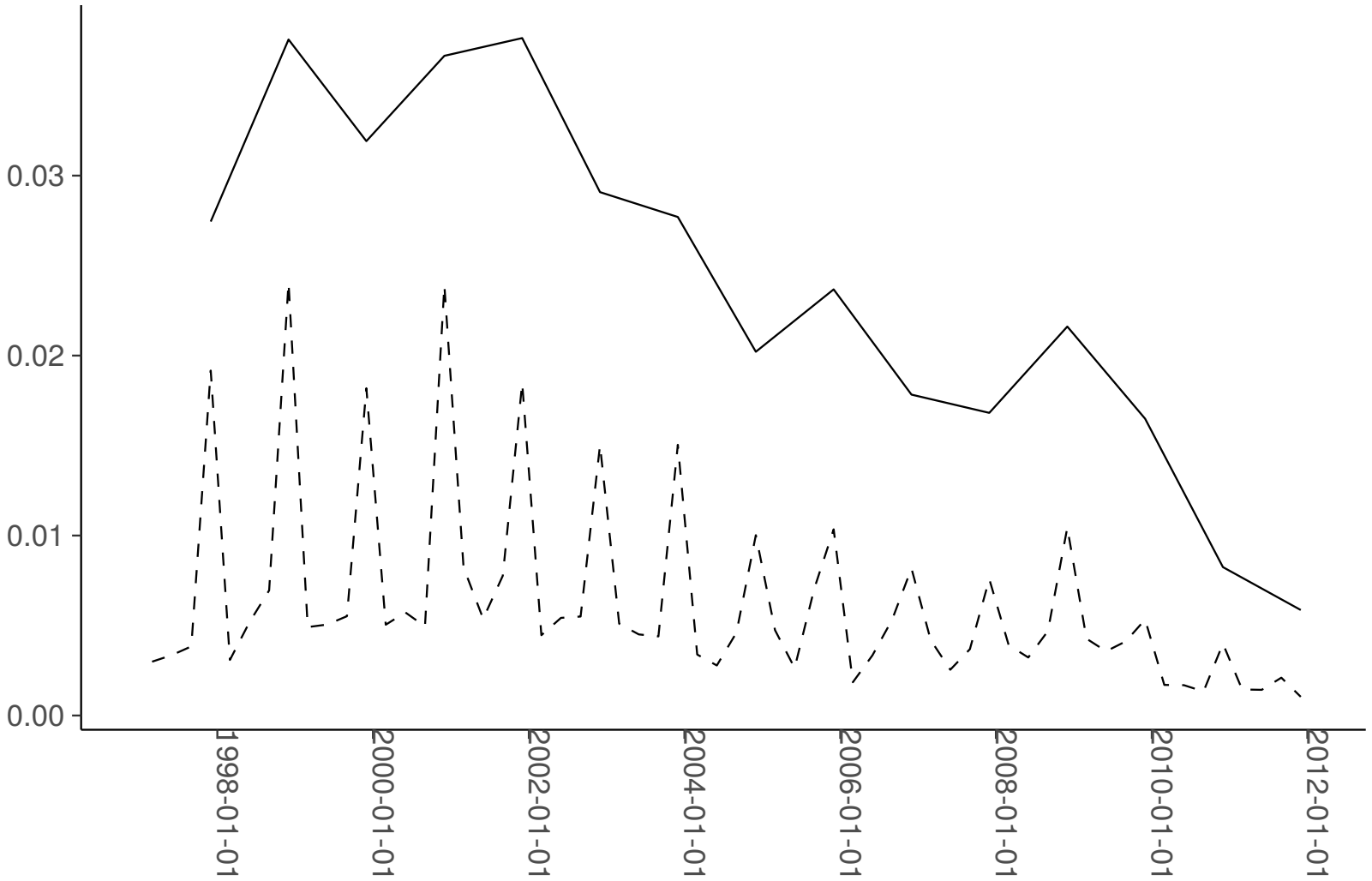
The Causal Model



Covenant Violation Data

- Nini, Smith, and Sufi (2012) [Amir Sufi's website]
- 1996:06 - 2008:04
- Textual analysis of 10-Ks and 10-Qs for mentions of covenant violation
- Focus on *new* violations

Covenant Violation Data



Descriptives

	Mean	Median	Std. Dev.
Net debt issuance (%)	1.55	-0.06	8.60
Investment (%)	0.08	0.03	0.92
Sales growth (%)	3.81	2.65	6.53
Gross margins (%)	-0.02	-0.04	6.59
New covenant violation	0.02	0.00	0.14
Industry rate of new covenant violation	0.02	0.01	0.03
N	67040		

Descriptives

	Mean	Median	Std. Dev.
Operating income / average assets	0.03	0.03	0.04
Leverage ratio	0.25	0.23	0.18
Interest expense / average assets	0.00	0.00	0.00
Net worth / average assets	0.48	0.48	0.21
Current ratio	2.47	1.91	2.16
Market / book	1.86	1.44	1.49
Cash / assets	0.13	0.05	0.17
Log(total assets)	6.16	6.17	1.80
PP&E / assets	0.29	0.23	0.22
HHI	0.12	0.08	0.11
Firm-level uncertainty	0.16	0.15	0.13
Firm default probability	0.02	0.00	0.10

Two-step Procedure

1. *Within* industry-quarters:
   - Estimate average effects for violators and for non-violators
2. *Across* industry-quarters:
   - Contrast average effects over industry rate of violation

- `nordlund.ai/SpilloverModeling`

Step 1 Estimates

- Predict y using τ, x, x^2 within an industry-quarter
- Weight regression by propensity of covenant violation
- Imposes CI assumption *weaker* than anything used in the prior literature
- Mean predicted values $\hat{E}[y(\tau, \rho_{j,t})]$ for $\tau \in \{0, 1\}$

Before First Stage Matching

	Means			Medians		
	Non-violator	Violator	*p*	Non-violator	Violator	*p*
Operating income / average assets	.023	.005	0	.029	.012	0
Leverage ratio	.201	.278	0	.167	.259	0
Interest expense / average assets	.004	.006	0	.002	.004	0
Net worth / average assets	.52	.446	0	.529	.445	0
Current ratio	2.909	2.136	0	2.076	1.66	0
Market / book	2.139	1.529	0	1.528	1.174	0
Cash / assets	.179	.102	0	.087	.042	0
Log(total assets)	5.537	5.138	0	5.565	5.081	0
PP&E / assets	.263	.275	.024	.198	.204	.216
HHI	.112	.116	.177	.081	.081	.771

After First Stage Matching

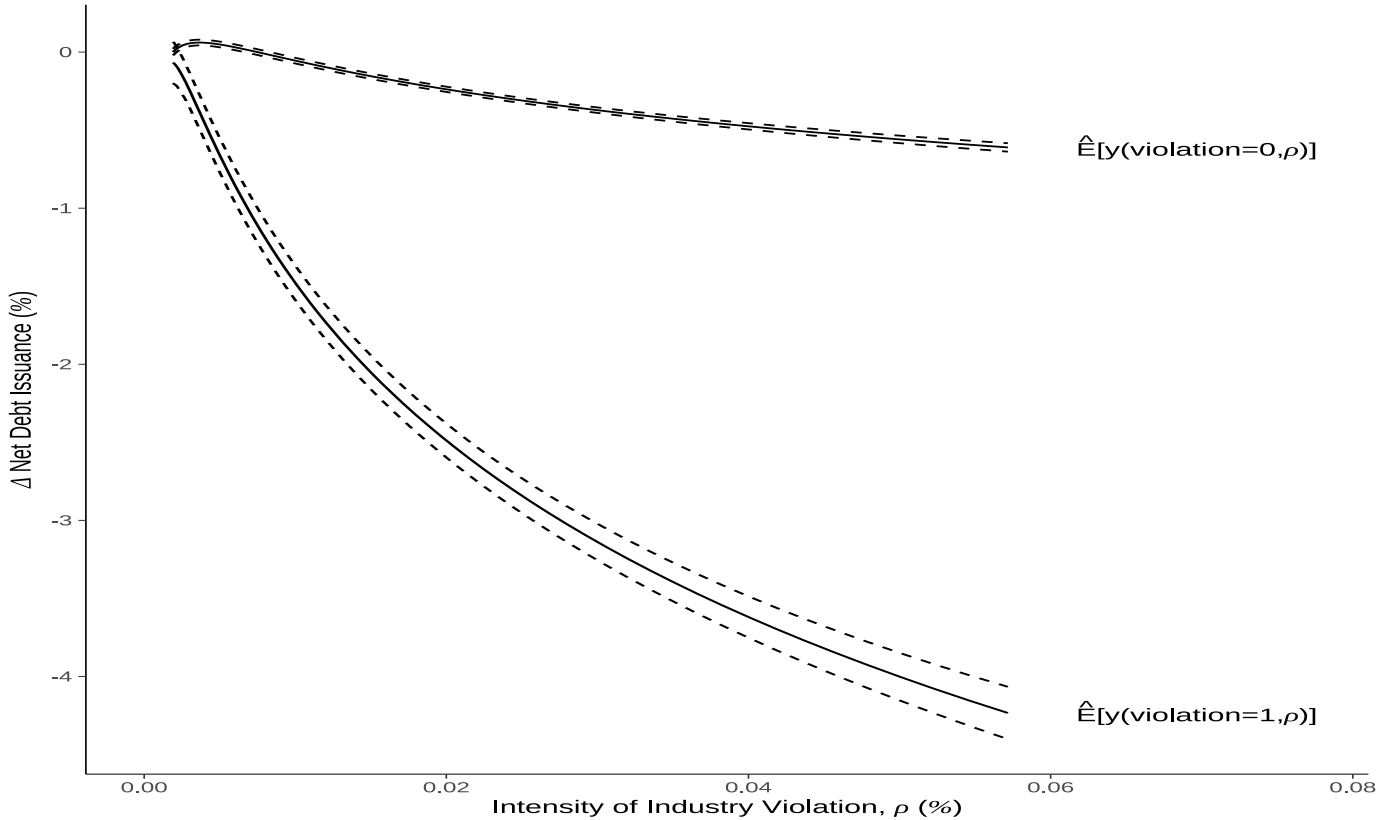
	Means			Medians		
	Non-violator	Violator	p	Non-violator	Violator	p
Operating income / average assets	.001	.001	.82	.014	.008	.004
Leverage ratio	.264	.27	.576	.248	.255	.681
Interest expense / average assets	.005	.005	.63	.004	.004	.192
Net worth / average assets	.467	.479	.341	.481	.478	.825
Current ratio	2.374	2.436	.589	1.888	1.86	.696
Market / book	1.695	1.681	.879	1.233	1.212	.52
Cash / assets	.116	.126	.212	.051	.066	.028
Log(total assets)	4.949	4.945	.968	4.953	4.962	.944
PP&E / assets	.246	.245	.892	.185	.179	.565
HHI	.066	.063	.124	.06	.052	.102

Stage 1, H_0: covariate balance, χ^2 statistic = 139.802 , p-value ≈ 1

Step 2 Estimates

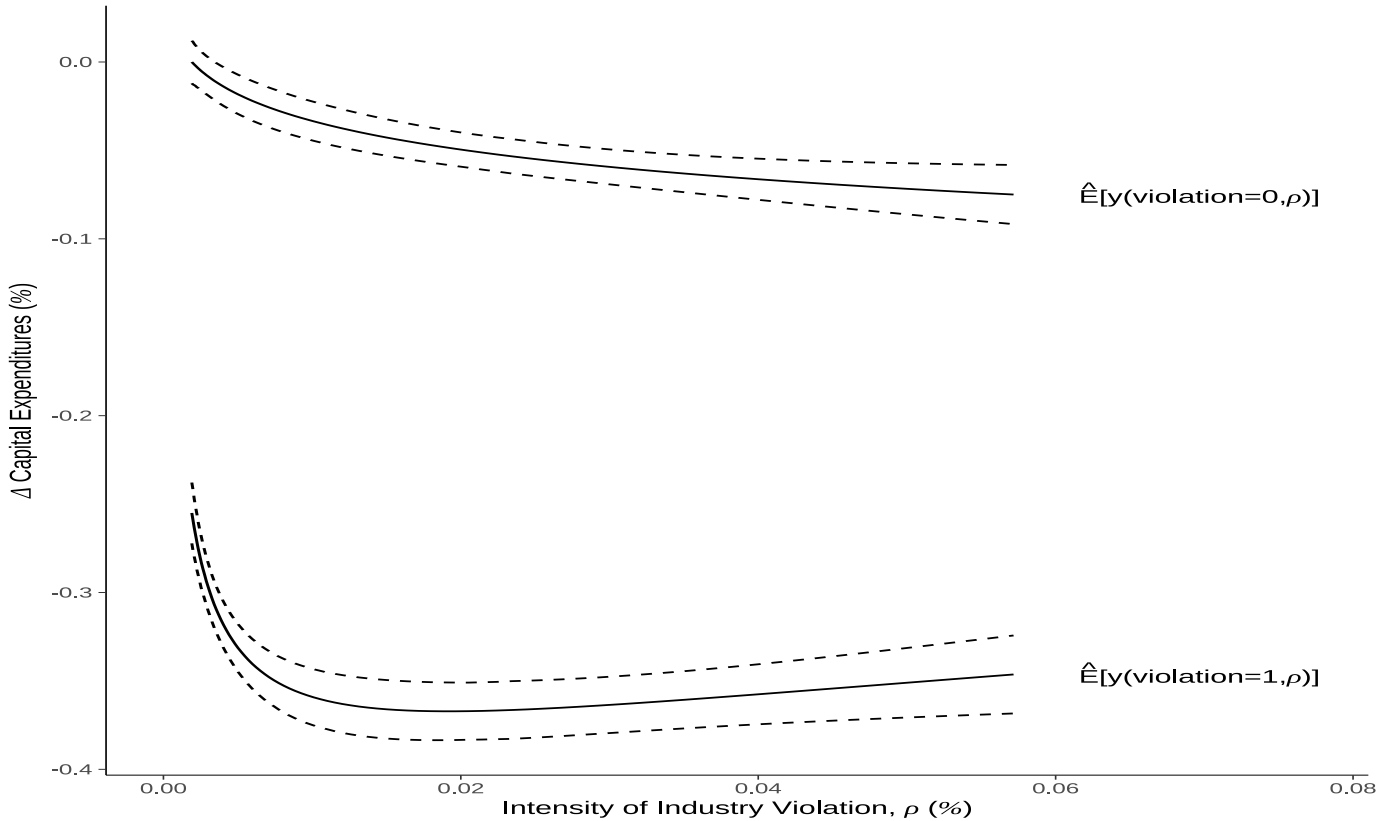
- Predict $\hat{E}[y(\tau, \rho)]$ using $\rho, \bar{x}, \bar{x}^2$
- Use generalized PS matching, nonparametric estimator
- Dose response function $y = \hat{f}^{(\tau)}(\rho)$ for $\tau \in \{0, 1\}$

Debt Issuance



Step 2 Bal.	ATE	Avg. Direct	Avg. Spill.: Vio.	Avg. Spill.: Non-Vio.
93.293 (.765)	-1.569	-.067	-1.644	-.142

Investment



Step 2 Bal.	ATE	Avg. Direct	Avg. Spill.: Vio.	Avg. Spill.: Non-Vio.
68.175 (.997)	-.304	-.255	-.084	-.035

Usefulness of Strict Covenants

- Industry violation rates inform ex post renegotiation
- Consistent w/ lack of info ex ante $\implies$ tighter covenants
- Check for internal consistency:

  Does uncertainty predict stricter covenants?
- Predict strictness in a Heckman-Tobit model

  (Selection into debt with covenant; strictness bounded $\in [0, 1]$)

Predicting Covenant Usage

Step 1: Probit regression

Industry-level uncertainty	0.036***		0.037***	
	(0.002)		(0.002)	
Change in industry-level uncertainty		0.026**		0.025**
		(0.011)		(0.016)
Rate of industry covenant violation	0.661***	0.587***	0.685***	0.607***
	(0.000)	(0.001)	(0.000)	(0.001)
In violation of covenant	0.162***	0.165***		
	(0.000)	(0.000)		
N	29751	29372	28034	27681

p values in parentheses (* p <0.10, ** p <0.05, *** p <0.01).

(other controls not reported)

Predicting Covenant Strictness

Step 2: Heckman-Tobit

Industry-level uncertainty	0.032***		0.031***	
	(0.007)		(0.010)	
Change in industry-level uncertainty		0.025**		0.022**
		(0.015)		(0.026)
Rate of industry covenant violation	0.619***	0.547***	0.608***	0.537***
	(0.001)	(0.004)	(0.001)	(0.004)
In violation of covenant	0.135***	0.136***		
	(0.005)	(0.005)		
N	29751	29372	28034	27681

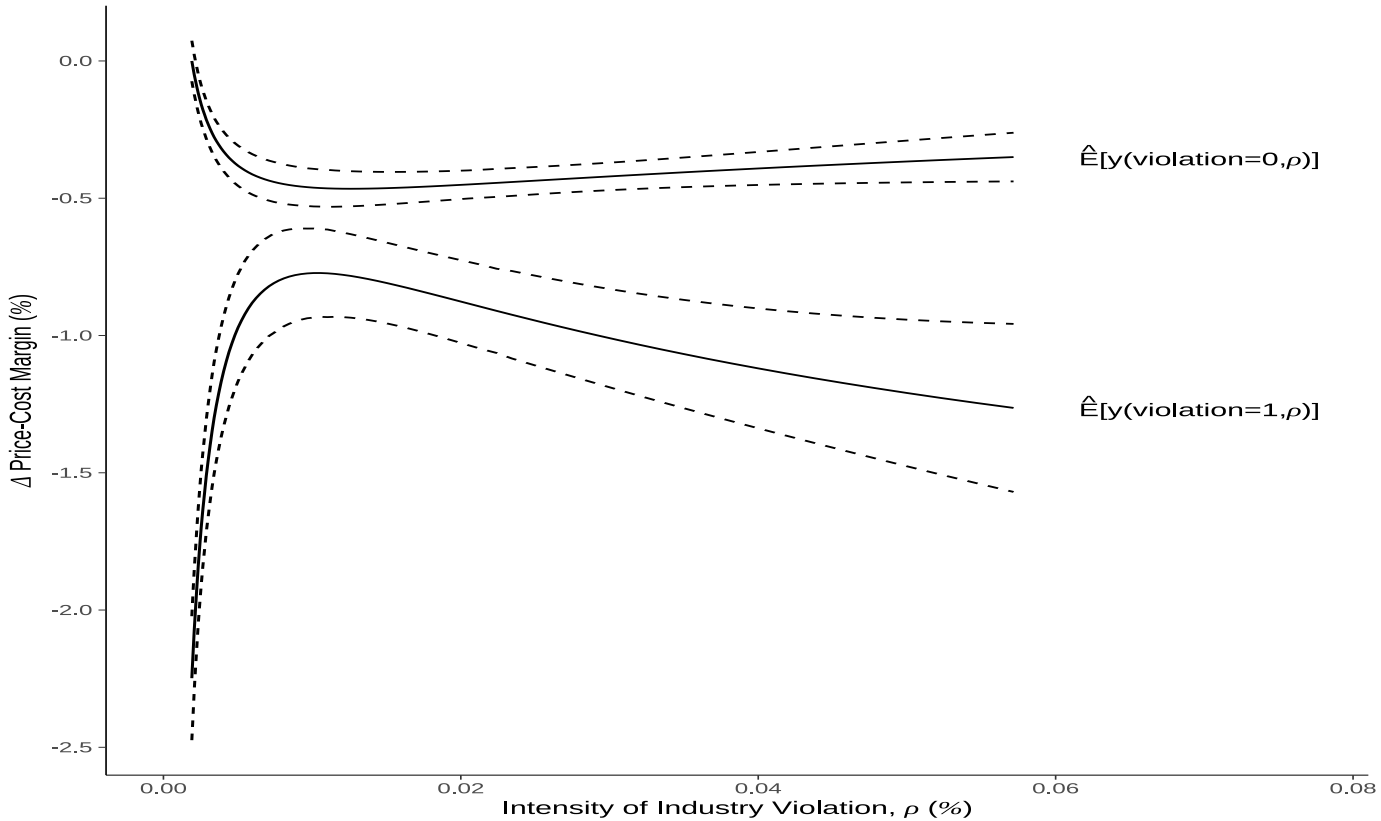
p values in parentheses (* p <0.10, ** p <0.05, *** p <0.01).

(other controls not reported)

Industry-Level Information

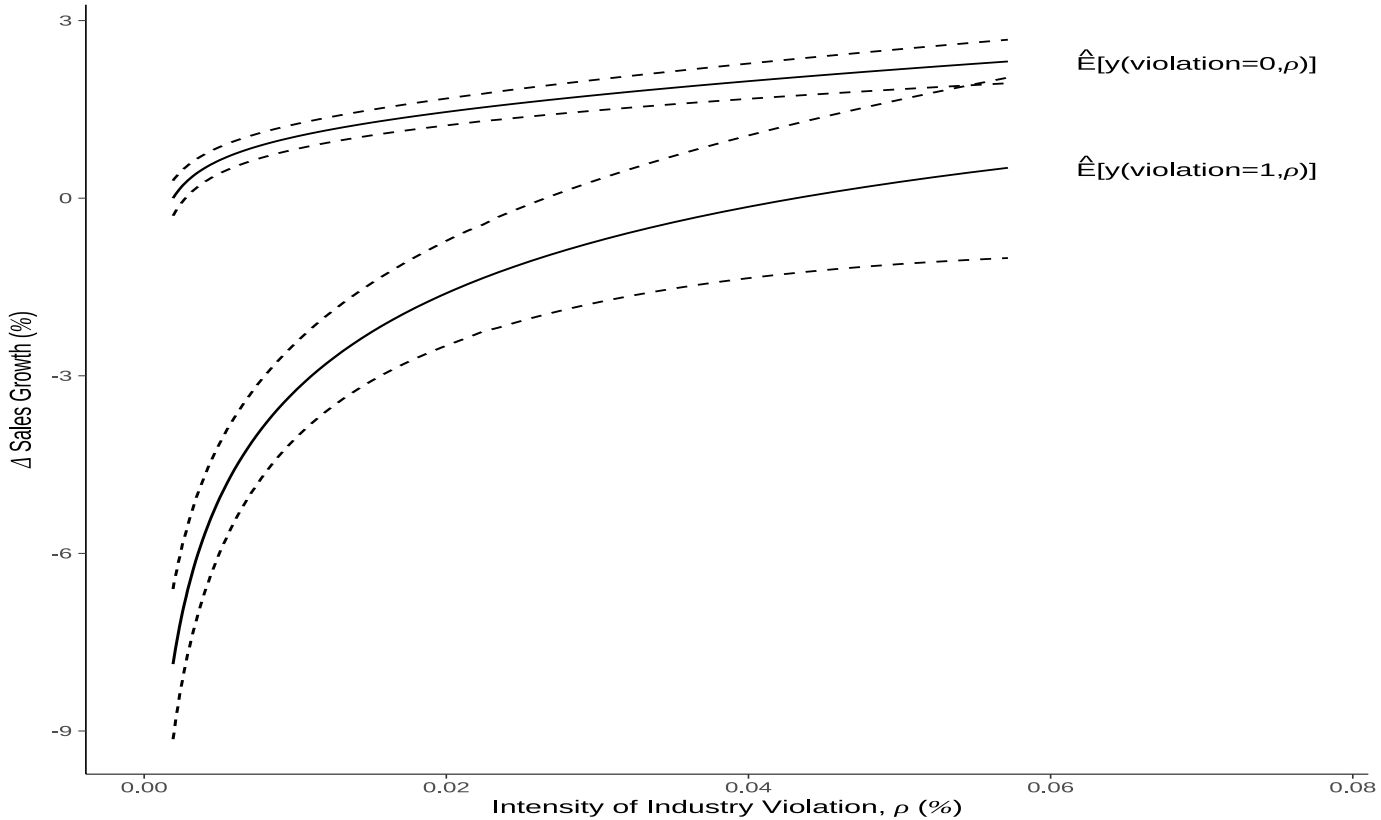
- Industry-level information (or lack thereof) predicts contract design
- Industry-level information used in contract renegotiation
- How does this shape the competitive environment?

Gross Margins



Step 2 Bal.	ATE	Avg. Direct	Avg. Spill.: Vio.	Avg. Spill.: Non-Vio.
112.665 (.264)	-.733	-2.248	1.149	-.366

Sales Growth



Step 2 Bal.	ATE	Avg. Direct	Avg. Spill.: Vio.	Avg. Spill.: Non-Vio.
99.426 (.609)	-4.457	-7.87	4.492	1.079

Do NOT Industry Adjust

ϱ_R	ϱ_H	ϱ_L
Pct. risky vio.	Pct. endog. viol.	Pct. endog. non-viol.

- $\rho := \varrho_R/(1 - \varrho_L - \varrho_H)$

ind.-adj. outcome	$\ddot{y}(\tau, \rho) =$
firm-level outcome	$y(\tau, \rho)$
risky non-violator	$- (1 - \varrho_R - \varrho_L - \varrho_H) y(0, \rho)$
risky violator	$- \varrho_R y(1, \rho)$
endog. non-violator	$- \varrho_L y^{(L)}(0, \rho)$
endog. violator	$- \varrho_H y^{(H)}(1, \rho)$

- Impossible to identify functions: $y^{(L)}(0, \rho)$ and $y^{(H)}(1, \rho)$

Conclusion

- Outcomes for violators depend on violation rates of rivals
  - Policies become *more* conservative when violation rates are higher
- Non-violators *also* affected by violation rates
  - Reduced financing/investment, slightly better sales growth