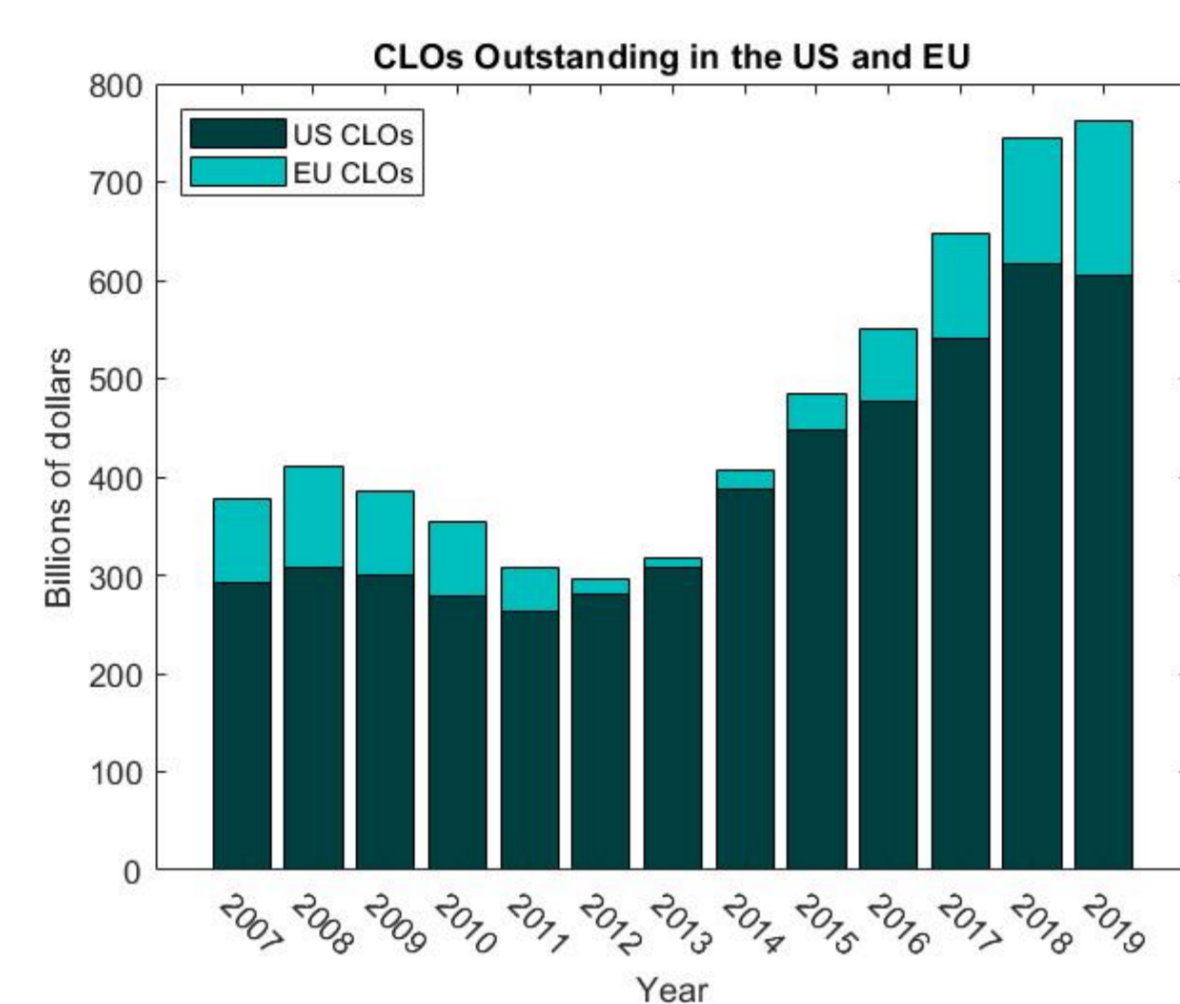
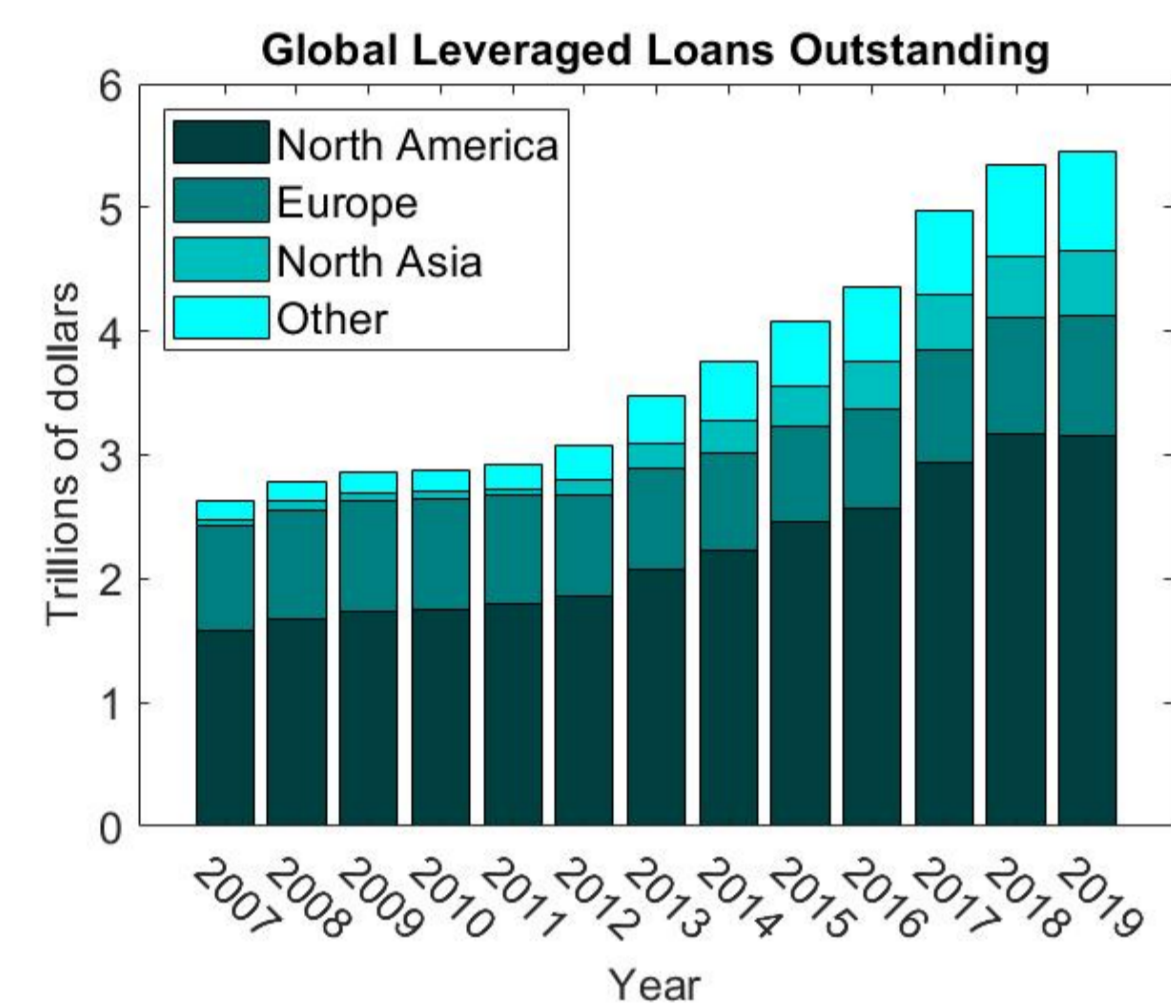


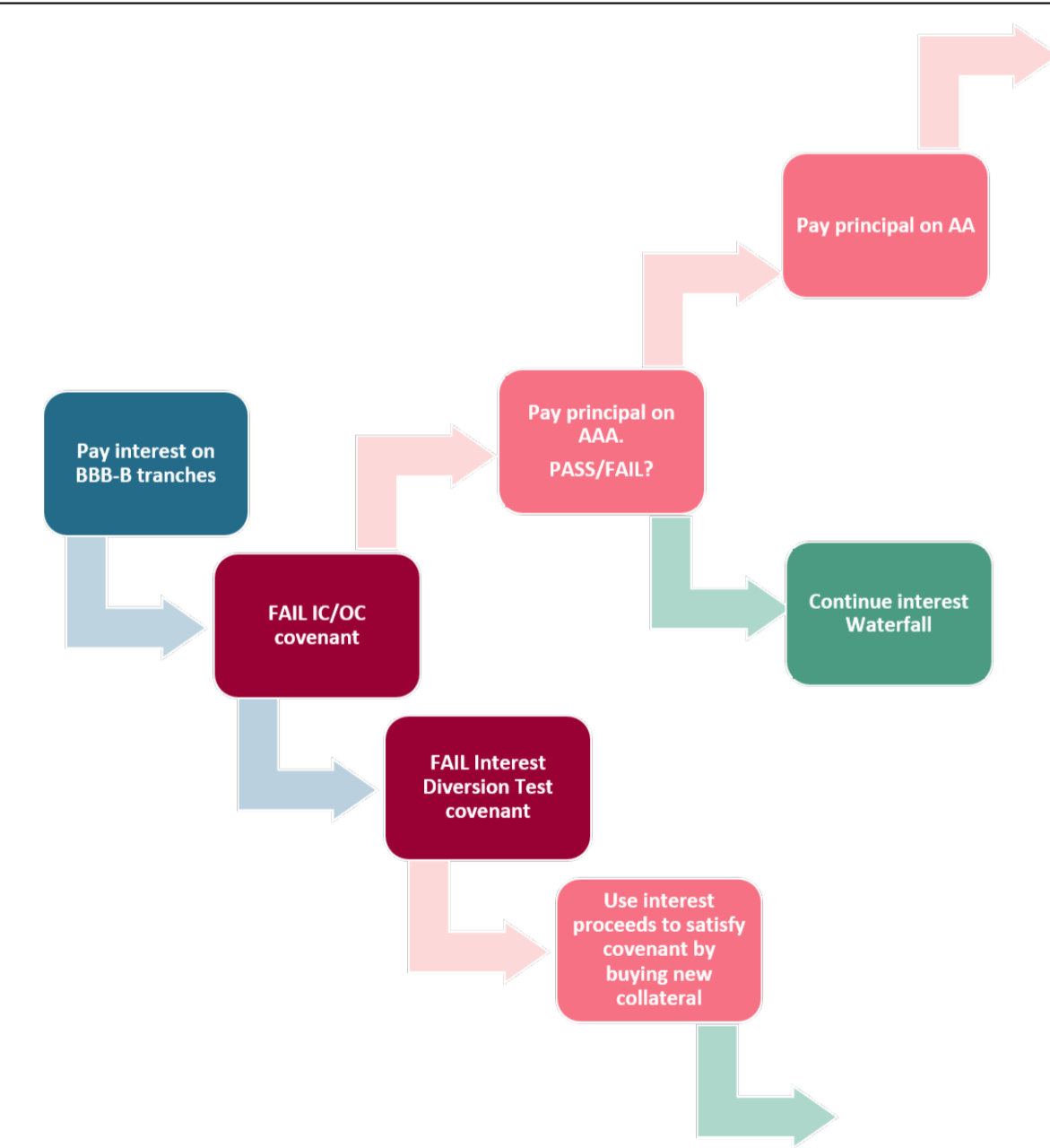
Growth of Leveraged Loan and CLO Markets

Leveraged loan and CLO markets have experienced rapid growth

- Substitution of banks by CLOs
 - Diversifies credit risk exposures
 - Increases complexity and opacity of interconnections



ABCs of CLOs



- Collateralized Loan Obligation (CLO) operates as an SPV – issues tranching notes and uses the proceeds to buy leveraged loans
- A CLO manager's financial interests are aligned with equity tranche, hence, the existence of covenants
- Covenants allocate control rights between the CLO manager and CLO investors, with triggers for cash flow diversion

Research Objective

Do contracts have externalities on asset prices which transmit to firms? What is the mechanism through which firm distress can propagate to other firms?

- Unlike banks, CLOs are arms-length intermediaries – a source of market financing
- CLO covenants are a mechanism for the amplification of shocks – idiosyncratic risk ⇒ systemic risk
- Fire sales in closed-end funds – thought to be immune to fire sales because of stable funding
- Contrary to traditional fire sales, CLOs sell *riskier* loans to alleviate constraints

Empirical Strategy

Bartik-style exposure difference in differences design

$$Y_{f,t} = \beta_0 + \beta_1(\text{Firm O\&G Exposure})_f + \beta_2(\text{Oil Shock})_t + \beta_3(\text{Firm O\&G Exposure}_f \times \text{Oil Shock})_t + \alpha_f + \alpha_{m,y} + \epsilon_{f,t} \quad (1)$$

$$\text{Firm O\&G Exposure}_f = \underbrace{\sum_{c \in C} \left(\frac{\sum_{k \in K} \mathcal{L}_{f,k,c}}{\sum_{k \in K} \mathcal{L}_{f,k,c}} \right)}_{\text{Firm exposure to CLO}} \times \underbrace{\left(\frac{\sum_{f \in F} \sum_{k \in K} L_{O\&G,f,k,c}}{\sum_{i \in I} \sum_{f \in F} \sum_{k \in K} L_{i,f,k,c}} \right)}_{\text{CLO exposure to O\&G}} \quad (2)$$

where $L_{i,k,f,c}$ denotes the loan amount for loan k ($k \in K$), issued by firm f ($f \in F$), in industry i ($i \in I$), held by CLO c ($c \in C$). Oil Shock $_t$ is 1 if the Oil and Gas (O&G) price plunge has occurred, and 0 otherwise. t indexes the time, and m, y denote the month and year, respectively. The sample period is from 2013 to 2015.

Assumptions:

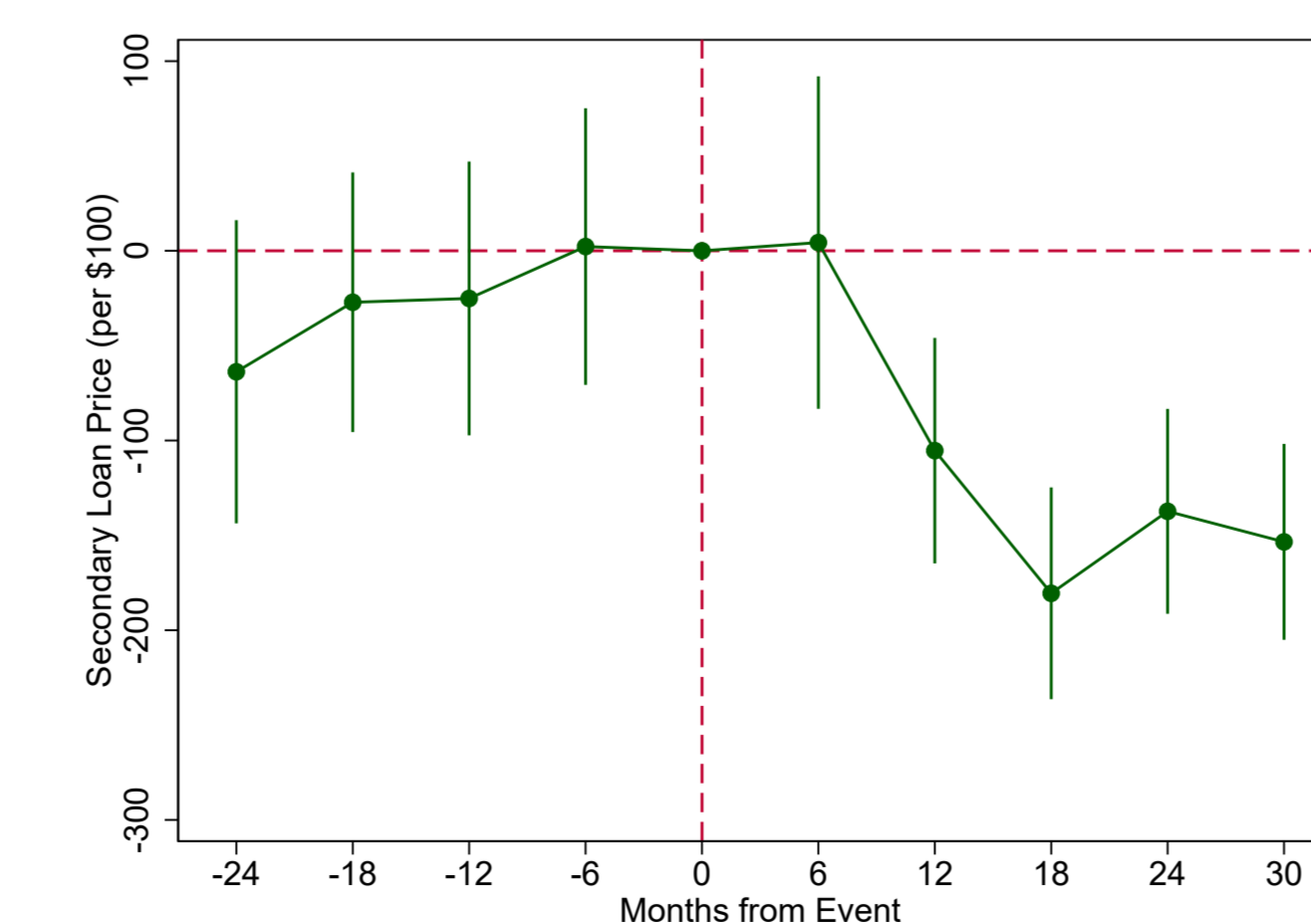
- O&G is a valid instrument for portfolio risk – strong relation with covenant constraints
- O&G shock is exogenous – causes lie outside of leveraged loan sector
- Selection concerns are limited – portfolios are overlapping; covenant threshold does not vary with CLO O&G share; industry, geography and firm distributions are similar across CLO O&G shares; CLO selection is not predictable based on covariance(firm profit, oil price)

Main Findings

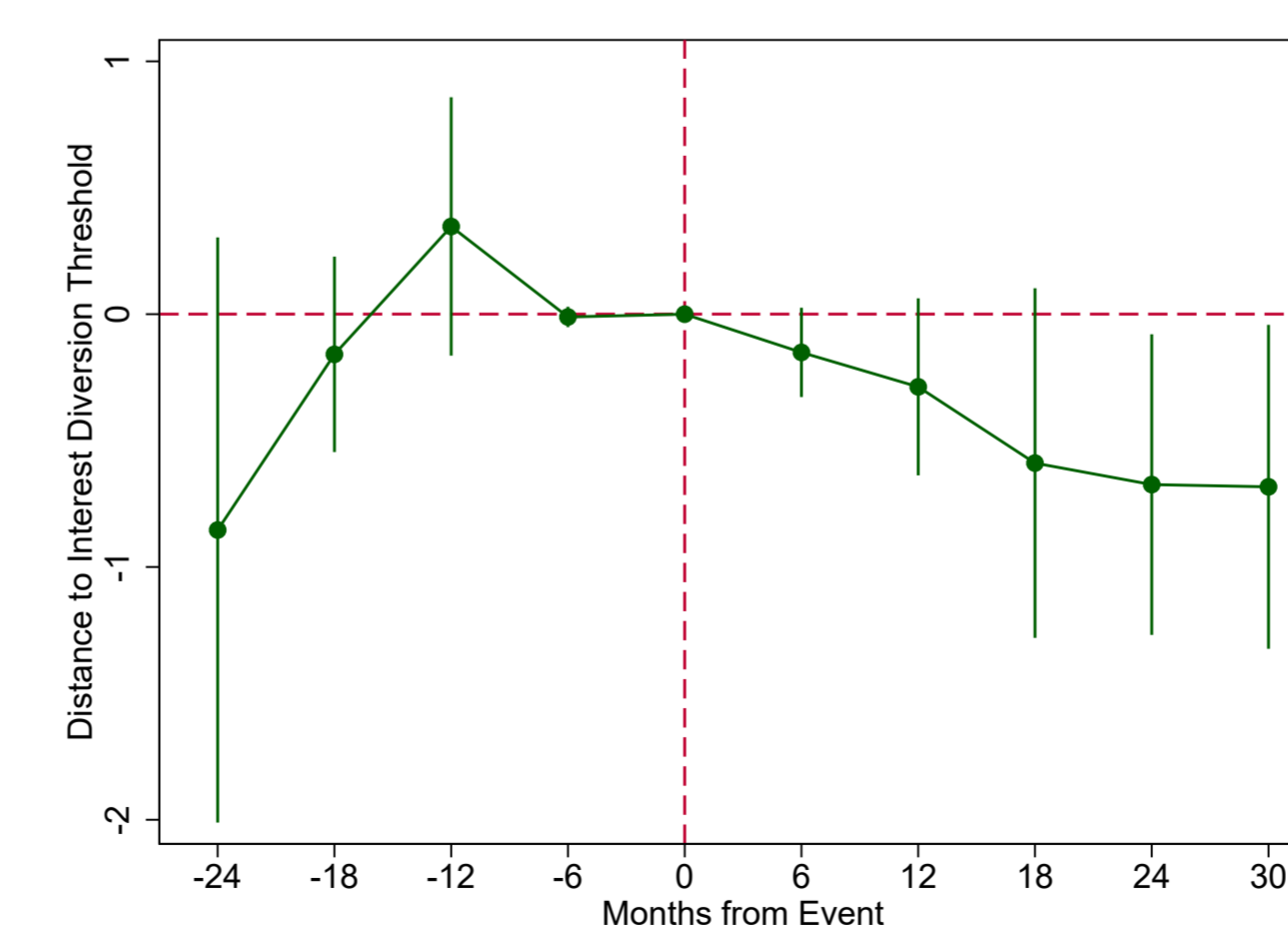
Firms with greater exposure to O&G before the shock experience...

- Fire sales in the secondary loan market
- Lower debt prices
 - Secondary loan prices ↓
 - Primary loan spreads (new issuance) ↑
 - Bond credit spreads ↑
- Less liquidity
 - Bond bid-ask spread ↑
 - Δ unused line of credit ↓
 - Δ drawn line of credit ↑
- Negative real effects
 - Long-term debt growth ↓, cash flow ↓, investment ↓, R&D growth ↓, employment growth ↓, sales growth ↓, acquisitions ↓
 - More pronounced for firms without access to the bond market, smaller firms, younger firms, firms in the tradable sector and firms which had last refinanced before the shock.
- Decline in stock returns

Parallel Trends



Secondary Loan Price



Distance to Interest Diversion Covenant Threshold

How do Fire Sales Occur?

Contractual Arbitrage

Capital Covenant Constraints

$$= \frac{\text{Par value of collateral} + \text{Defaulted collateral value} + \text{Purchase price of discounted collateral} - \text{"CCC" excess adjustment}}{\text{Principal balance of tranche and all senior tranches}} \quad (3)$$

Loan is marked to par unless it is risky, i.e.,

- Defaulted: $\min(\text{Market Value}, \text{Recovery Value})$
- Discounted: purchase price until loan trades above a threshold (e.g., 90 cents/\$) for > 30 days
- Excess CCC/Caa1: lowest market values of CCC/Caa1 loans

CLOs can mechanically improve the covenant constraints by selling risky loans with the greatest differences between market values and accounted values

Supporting empirical evidence:

- Likelihood of selling a loan below par ↑
- Incidence of default and CCC loans ↓
- Interest rate of loans ↓
- Risky loans experience almost 5-7x as large effects

Do Changes in Firm Fundamentals Drive the Results? No

Falsification test

Revolving lines of credit and term loans A are typically retained by banks and not securitised. If the results occur through changes to firm fundamentals, similar effects are expected for these facilities. I find no effects.

All-In-Drawn Spread	(1)	(2)	(3)	(4)	(5)	(6)
O&G Share × Post	-40.3666	161.3654	135.2760	250.2754	197.1342	-142.2520
	(248.2369)	(262.9362)	(268.0703)	(259.5060)	(194.2592)	(223.3746)
Post	-17.6838*	-27.0345**	-15.4694	-18.6264	-14.3602	
	(9.6592)	(11.1942)	(18.8218)	(16.9834)	(17.5971)	
Maturity					-1.9344**	-1.5368**
					(0.7311)	(0.6951)
Issuer FE	✓	✓	✓	✓	✓	✓
Secured FE		✓	✓	✓	✓	✓
Purpose FE					✓	✓
Distribution Method FE					✓	✓
Seniority FE					✓	✓
Loan Type FE				✓	✓	✓
Country of Syndication FE					✓	✓
Year FE			✓	✓	✓	✓
Month-Year FE					✓	✓
N	610	440	440	438	432	432
R ²	0.8716	0.8518	0.8528	0.8769	0.8912	0.9141

Standard errors are two-way clustered by issuer and month-year in parentheses
* p < 0.1, ** p < 0.05, *** p < 0.01

Conclusion

Covenants intrinsic to optimal contracts provide a mechanism for idiosyncratic shocks to amplify as a source of systemic risk

O&G price plunge ⇒ O&G companies suffer ⇒ Drop in the value of CLOs holding O&G ⇒ Greater likelihood of covenant violations ⇒ Fire sales of risky loans ⇒ Price impact to secondary spreads ⇒ Pass through to primary spreads and corp. bond spreads ⇒ Increase in effective cost of capital to issuing firms ⇒ Financial and real adjustments