Supplemental Appendix

Covenant-Driven Fire Sales

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Appendix A Contractual Arbitrage

A.1 Numerical Example

This section demonstrates how the piecewise design of covenant accounting rules influences CLO liquidation incentives. The example isolates the CCC/Caa1 bucket rule to highlight the discontinuity created by the 7.5% limit. It abstracts from other overlapping haircut definitions—such as discount obligations or defaulted loans—that may also apply in practice. The purpose is to illustrate the directional incentive created by the CCC threshold rather than to replicate the full complexity of typical indentures. The general framework may be extended to richer contractual environments.

Let the initial book value of assets be 100 and liabilities be 100. Let $\tau = 7.5\%$ denote the stipulated portfolio share of CCC/Caa1 loans. Assume each loan has equal face value.

Before distress:

$$ID = 1. \tag{A.1}$$

Now suppose distress occurs such that:

- Share of higher-priced CCC loans, g, is 7.5%
- Share of lower-priced CCC loans, b, is 7.5%
- Market price of higher-priced CCC loans, γ, is 95¢/\$
- Market price of lower-priced CCC loans, β, is 20¢/\$

Total CCC exposure is now 15%, exceeding the 7.5% threshold. Under the CCC bucket rule, the excess 7.5% is marked to market starting with the lowest-priced holdings. The ID ratio becomes:

$$ID = \frac{(1-(0.15-0.075))100 + (0.15-0.075)\times 0.20 \times 100}{100} \tag{A.2}$$

$$= \boxed{0.9400}. \tag{A.3}$$

If the CLO instead sells the higher-priced CCC loans (the 95¢/\$ loans), remaining CCC exposure falls to 7.5%, eliminating excess exposure under the CCC bucket rule. The ID ratio becomes:

$$ID = \frac{(1-0.075)100 + 0.075 \times 0.95 \times 100}{100} \tag{A.4}$$

$$= \boxed{0.99625}. \tag{A.5}$$

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This example abstracts from the possibility that a 20¢/\$ loan may also qualify as a discount or defaulted obligation in typical indentures, in which case it could remain marked at purchase price or projected recovery even after CCC exposure falls below 7.5%. Incorporating such overlapping haircut definitions would reduce the numerical improvement in the ID ratio but would not eliminate the underlying incentive: when accounting rules apply discontinuously across buckets, managers can improve covenant ratios by selectively liquidating higher-valued distressed loans.

Appendix Section A.2 generalizes this logic. The key insight is that when marking rules apply in a piecewise fashion, CLO managers maximize covenant improvement by selling risky loans in descending order of market value. Similar reasoning applies to defaulted loans and discount obligations whenever realized market value exceeds the accounting value used in par coverage calculations.

A.2 General Case

Let τ denote the stipulated portfolio share of CCC/Caa1 loans, A total CLO assets, and L total CLO liabilities. Suppose A consists of N discrete assets, each with initial book value normalized to 1. The initial OC/ID ratio is

$$OC/ID \;=\; \frac{N}{L}.$$

Suppose n of these assets become risky (e.g., downgraded to CCC/Caa1), so the CLO breaches its CCC/Caa1 limit:

$$\frac{n}{N} > \tau.$$

Let $\{\beta_1, \beta_2, \ldots, \beta_n\}$ denote the market values of the n risky assets, ordered so that

$$\beta_1 \leq \beta_2 \leq \cdots \leq \beta_n.$$

To restore compliance the manager must sell t risky assets with $0 \leq t \leq n$. Define t directly as the number of risky assets to be sold.

The non-risky assets (there are $N - n$ of them) each retain value 1. The total post-sale asset value depends on which risky assets are sold.

Case A: sell the t lowest-valued risky assets. If the manager sells $\{\beta_1, \ldots, \beta_t\}$ then the remaining risky assets are $\{\beta_{t+1}, \ldots, \beta_n\}$ and the post-sale asset value is

$$\text{Assets}_{\text{A}} = (N - n) \;+\; \sum_{i=t+1}^{n} \beta_i,$$

hence

$$OC/ID_{\text{A}} \;=\; \frac{(N - n) + \sum_{i=t+1}^{n} \beta_i}{L}.$$

Case B: sell the t highest-valued risky assets. If the manager sells $\{\beta_{n-t+1}, \ldots, \beta_n\}$ then the remaining risky assets are $\{\beta_1, \ldots, \beta_{n-t}\}$ and the post-sale asset value is

$$\text{Assets}_{\text{B}} = (N - n) + \sum_{i=1}^{n-t} \beta_i,$$

hence

$$OC/ID_{\text{B}} = \frac{(N - n) + \sum_{i=1}^{n-t} \beta_i}{L}.$$

Because the sequence is ordered, the sum of the largest $(n - t)$ risky values is at least as large as the sum of the smallest $(n - t)$ risky values:

$$\sum_{i=t+1}^{n} \beta_i \geq \sum_{i=1}^{n-t} \beta_i.$$

Therefore

$$OC/ID_{\text{A}} \geq OC/ID_{\text{B}}.$$

Thus, selling the lowest-valued risky assets (Case A) yields a weakly higher post-sale OC/ID than selling the highest-valued risky assets (Case B). In other words, the manager maximizes the remaining-assets value, and so the covenant ratio, by selling the smallest (β) risky loans.

Appendix B Selection and Matching of CLO Portfolios

This section assesses the magnitude of selection concerns, underlying the empirical strategy.

First, I find that portfolios are largely overlapping across CLOs. While the total value of outstanding CLOs increased from 2007 through 2019 – from $308 billion to $606 billion (International Monetary Fund (2020)) – the number of issuers across CLOs experienced a rather meager increase from 4,229 to 4,659 over the same time horizon. The median issuer's loans were held in 78 CLOs in the aftermath of the Great Financial Crisis of 2008 (Kundu (2023)). CLO exposures are highly correlated; 90% of CLOs are exposed to the top 50 US borrowers, and 80% are exposed to the top five borrowers (Financial Stability Board (2019)).

Second, I find no evidence that the capital covenant threshold varies with O&G exposure before the shock. In Appendix Table B.1, I investigate the relationship between O&G exposure and the ID threshold, using a within manager estimator to control for managerial style, risk appetite, and other factors. I also include CLO controls, such as age, size, and defaulted-share, as well as arranger, trustee, and time fixed effects. The results show no stable or statistically significant point estimates, suggesting no relation between O&G exposure and the covenant threshold. Moreover, since the CLO covenant threshold cannot be renegotiated, it is unlikely to be influenced by a CLO's subsequent investment decisions and trading behavior.

Third, before the shock, the distribution of investments across non-O&G industries is similar for CLOs with high and low O&G exposure, as shown in Appendix Figure B.1. This finding supports the interpretation that subsequent differential effects reflect O&G-induced fire sale pressure rather than pre-existing portfolio differences.[41]

[41]The industry Herfindahl-Hirschman Index (HHI) is 0.0574 for CLOs with high O&G exposure and 0.0598 for

Fourth, I compare the geographic concentration of investments for CLOs with high and low O&G exposure before the shock in Appendix Figure B.2. Using the *State* identifier in DealScan, I find that the geographic concentration is very similar between the two sets of CLO portfolios, indicating minimal differences in investment location.[42]

Fifth, I compare observable firm characteristics between CLOs with high and low O&G exposure before the shock in Appendix Table B.2. The characteristics of firms held by CLOs with high O&G exposure are similar to those held by CLOs with low O&G exposure across several dimensions, including size, age, capital expenditure, investment-capital ratio, leverage, long-ter debt growth, cash flow, sales growth, acqusitions, R&D growth. No material differences in firm characteristics are found across CLOs with differing O&G exposure.

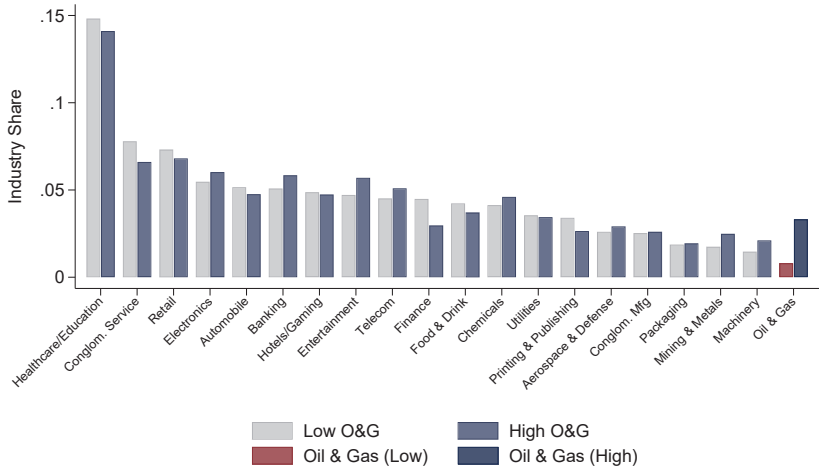
Sixth, I investigate whether firm sensitivity to oil price influences CLO selection in Appendix Table B.3. I use a within manager-arranger-trustee estimator to absorb all variation related to management style, risk appetite, specialization, taste, reputation and sophistication. In addition, I include several CLO and issuer controls, as well as time fixed effects. I do not find robust or statistically significant evidence that the covariance between oil price and firm profitability can predict CLO selection. Further, the R^2 associated with the simple OLS regression in column 1 is virtually nil. Hence, I rule out concerns of portfolio hedging with respect to O&G exposure.

In summary, these results suggest the following. CLOs hold largely overlapping portfolios. Firm, sectoral and geographic characteristics of CLO portfolios with different O&G exposures are largely similar. There is no strong relationship between CLO O&G exposure and the covenant threshold, before the shock, nor is there evidence that CLOs hedge against O&G exposure with the remaining allocation of the portfolio. As the O&G price plunge was not a foreseeable event, the O&G shares may be viewed as a random assignment. In other words, a CLO portfolio may be considered a combination of two distinct portfolios: a portfolio of O&G loans, and, the "market" portfolio – a portfolio of non-O&G loans. Variation in O&G exposure depends on how managers weigh the trade-off between enhancing arbitrage and default risk (Ashton (2020)). This is consistent with Figure 4 which indicates that O&G loans exhibited higher ratings than non-O&G loans yet yielded higher returns than non-O&G loans in each rating category.

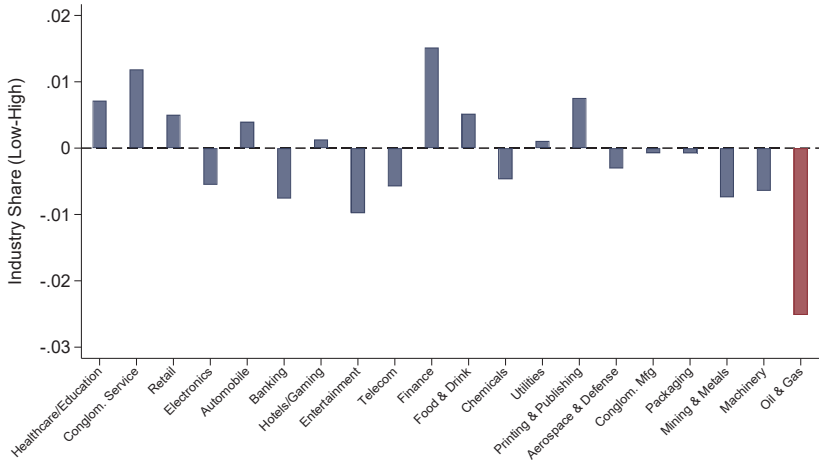
CLOs with low O&G exposure for non-O&G industries. The Euclidean distance between the two vectors of the industry share of firms held in CLOs with high and low CLO O&G exposure is 0.0416. The Kolmogorov-Smirnov test for equality of distribution functions fails to reject the null hypothesis, with a p-value of 0.9993.

[42]The state Herfindahl-Hirschman Index (HHI) is 0.0392 for CLOs with high O&G exposure and 0.0408 for CLOs with low O&G exposure for non-O&G industries. The Euclidean distance between the two vectors of the state share of firms held in CLOs with high and low CLO O&G exposure is 0.0120. The Kolmogorov-Smirnov test for equality of distribution functions fails to reject the null hypothesis, with a p-value of 0.8950.

Figure B.1: Industry Composition by CLO O&G Exposure (Pre-Period)



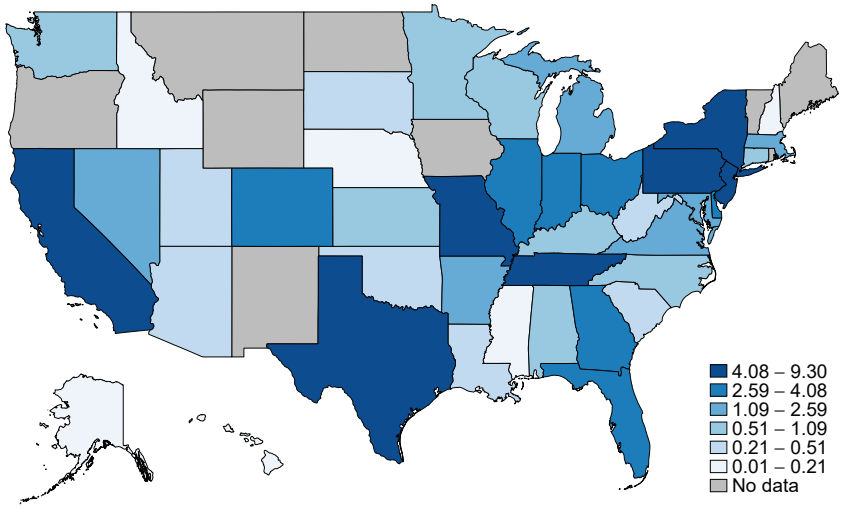
(a) Industry Distribution: Low vs High O&G Exposure



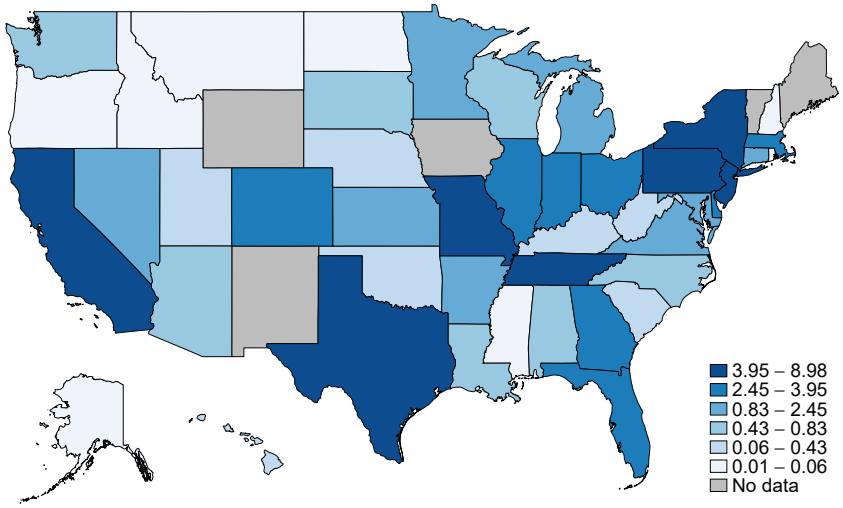
(b) Difference in Industry Shares (Low - High)

Notes: The figure compares industry portfolio composition between low- and high-O&G-exposure CLOs in the pre-shock period. High-O&G-exposure CLOs are defined as those with O&G portfolio shares above the median; low-O&G-exposure CLOs are below the median. Appendix Figure B.1a displays industry shares for the top 20 industries by total holdings. Light gray bars show low-O&G CLOs; dark blue bars show high-O&G CLOs. O&G is highlighted in red/dark blue to emphasize the primary difference between groups. Appendix Figure B.1b plots the difference in industry shares (Low - High) for each industry, with the horizontal line at zero indicating no difference. Despite the mechanical difference in O&G holdings (by construction), the two groups hold nearly identical portfolios across all other industries. Formal distributional tests indicate similarity: the Herfindahl-Hirschman Index is 0.0598 for low-O&G CLOs vs. 0.0574 for high-O&G CLOs (difference = 0.0024); the Euclidean distance between distributions is 0.0416; and a Kolmogorov-Smirnov test cannot reject distributional equality ($p = 0.9993$).

Figure B.2: Geographic Composition by CLO O&G Exposure



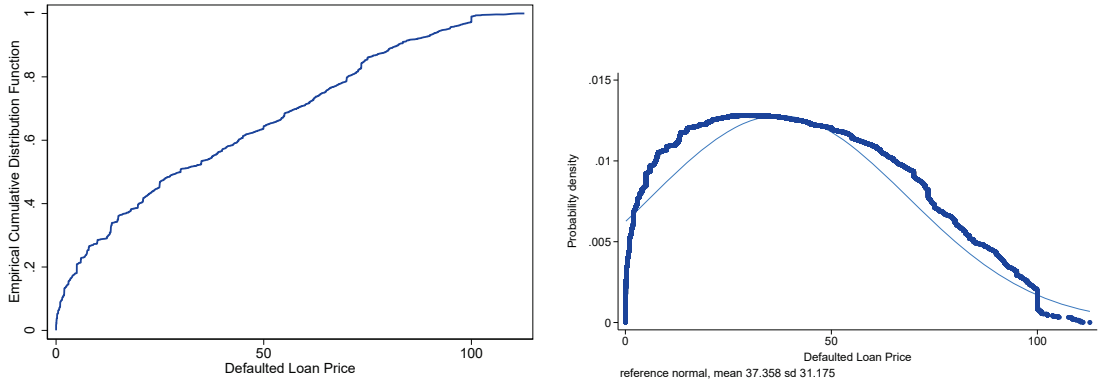
(a) Low O&G Exposure



(b) High O&G Exposure

Notes: This figure compares the geographic concentration of non-O&G firms for CLOs with high O&G exposure to CLOs with low O&G exposure in January, 2013. CLOs with above-median O&G exposure have high O&G exposure while CLOs with below-median O&G exposure have low O&G exposure. The plots present the share of firms headquartered in each state. For CLOs with low O&G exposure, the Herfindahl-Hirschman Index (HHI) is 0.0408, while it is 0.0392 for CLOs with high O&G exposure. The Euclidean distance between the two vectors of state share of firms held in CLOs with high and low CLO O&G exposure is 0.0120. The Kolmogorov-Smirnov test for equality of distribution functions fails to reject the null hypothesis, with a p-value of 0.8950.

Figure B.3: Distributions of Defaulted Loan Prices

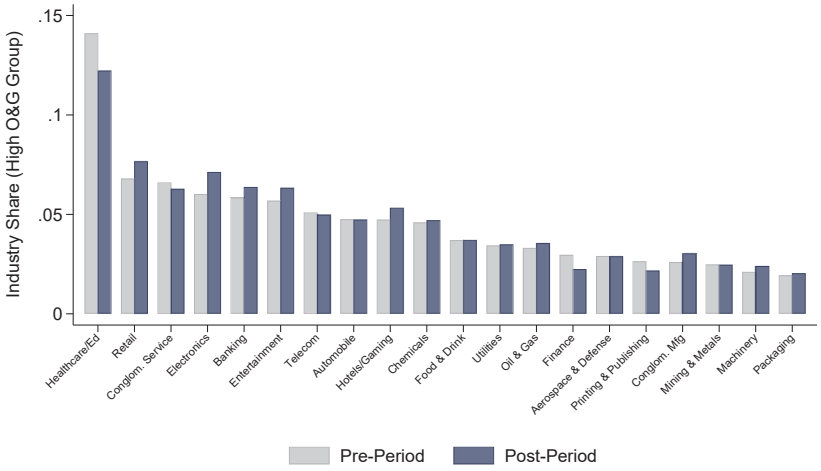


(a) CDF of Defaulted Loan Prices

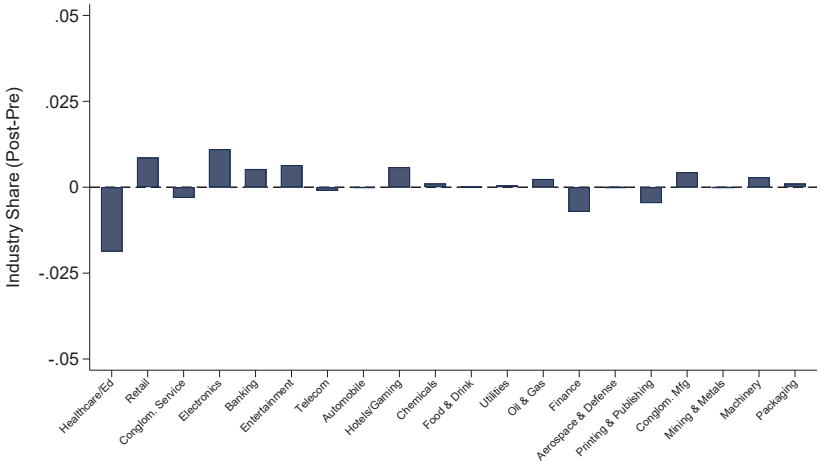
(b) PDF of Defaulted Loan Prices

Notes: The figure presents the cumulative distribution function (CDF) and probability density function (PDF) of defaulted loan prices. Appendix Figure B.3a presents the CDF of defaulted loan prices. Appendix Figure B.3b presents the PDF of defaulted loan prices.

Figure B.4: Portfolio Rebalancing by High-O&G-Exposure CLOs



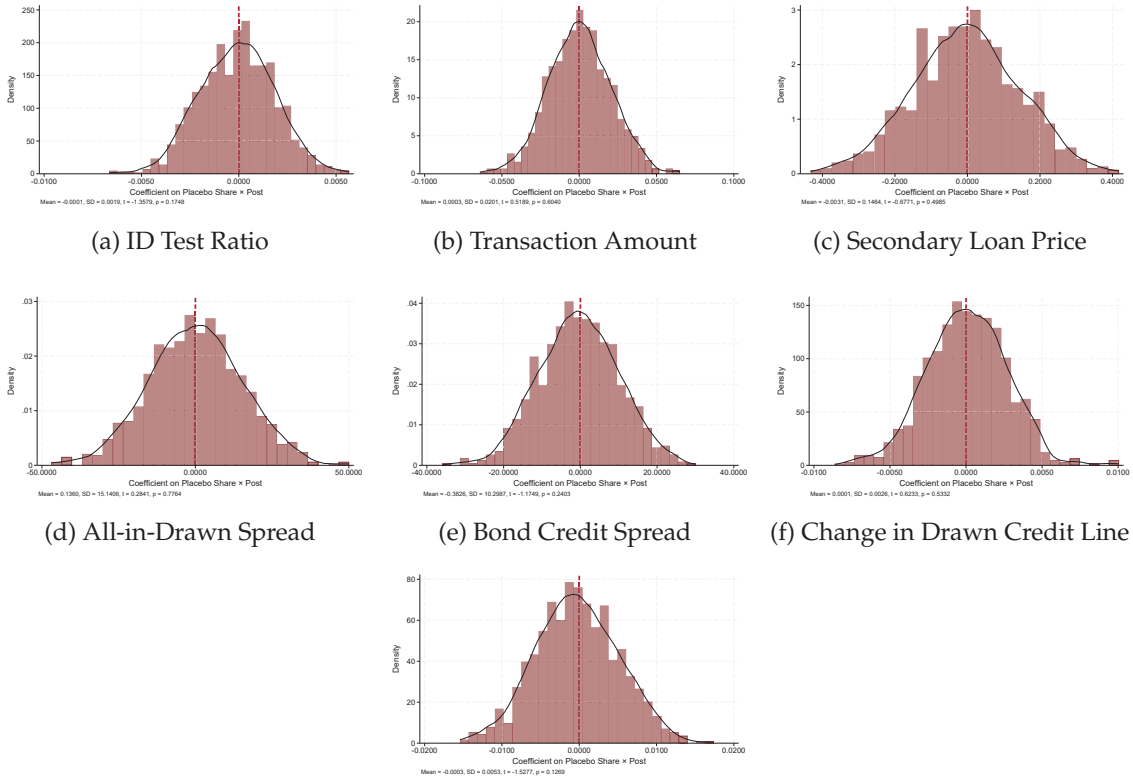
(a) Industry Distribution: Pre vs Post



(b) Change in Industry Shares (Post - Pre)

Notes: The figure examines how high-O&G-exposure CLOs (above median O&G share) rebalance their portfolios following the June 2014 oil price collapse. Appendix Figure B.4a compares industry shares in May 2014 (pre-period, light gray) with December 2014 (post-period, dark blue) for the top 20 industries. Appendix Figure B.4b shows the change in each industry's portfolio share (Post - Pre). Distributional tests indicate limited overall rebalancing: the Herfindahl-Hirschman Index changes from 0.0574 (pre) to 0.0566 (post), a difference of 0.0006; the Euclidean distance between pre- and post-shock distributions is 0.0292; and a Kolmogorov-Smirnov test cannot reject distributional equality (p = 0.9598).

Figure B.5: Placebo Tests: Random O&G Exposure



(a) ID Test Ratio

(b) Transaction Amount

(c) Secondary Loan Price

(d) All-in-Drawn Spread

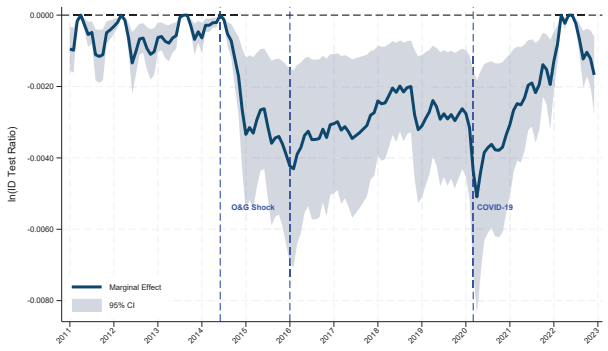
(e) Bond Credit Spread

(f) Change in Drawn Credit Line

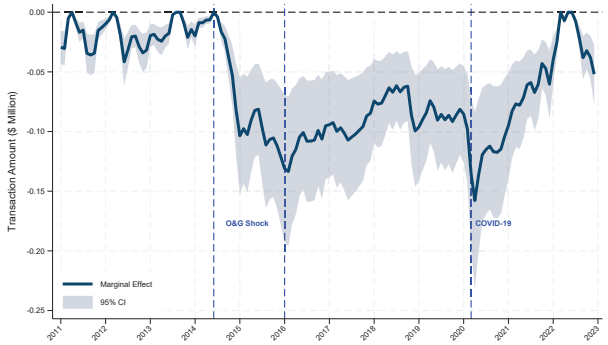
(g) Investment Rate

Notes: This figure presents histograms from 1,000 Monte Carlo simulations of placebo regressions. Firm O&G exposure is randomly assigned (drawn from a uniform distribution taking values 0 or 1) while keeping the actual June 2014 shock date fixed. Each panel shows the distribution of the coefficient on Placebo Share $\times$ Post from the most conservative specifications of the main analysis. Panel (a) uses CLO-level covenant distance (ln(ID Test Ratio)) as the outcome variable. Panel (b) uses transaction face amount. Panel (c) uses secondary loan prices. Panel (d) uses all-in-drawn spreads for refinancing term loans. Panel (e) uses bond credit spreads. Panel (f) uses changes in drawn lines of credit. Panel (g) uses the investment-capital ratio. The red dashed vertical line marks zero. The mean placebo coefficients and t-statistics are: (a) Mean = -0.0001, t = -1.3579; (b) Mean = 0.0003, t = 0.5189; (c) Mean = -0.0031, t = -0.6771; (d) Mean = 0.1360, t = 0.2841; (e) Mean = -0.3826, t = -1.1749; (f) Mean = 0.0001, t = 0.6233; (g) Mean = -0.0003, t = -1.5277. In all cases, the null hypothesis that the mean coefficient equals zero cannot be rejected ($p > 0.10$), confirming that randomly assigned O&G exposure generates no systematic effects on any outcome variable.

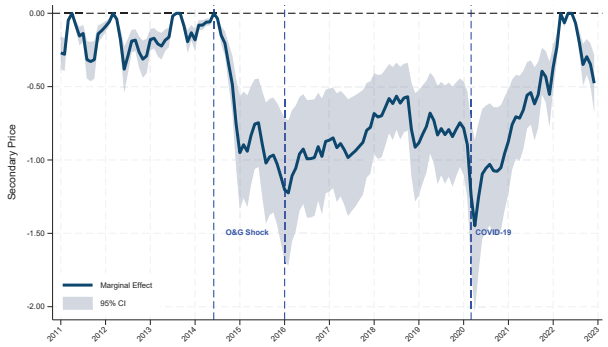
Figure B.6: Marginal Effects of O&G Exposure Over Time



(a) ID Test Ratio



(b) Transaction Amount



(c) Secondary Loan Price

Notes: This figure plots the time-varying marginal effect of a one percentage point increase in firm O&G exposure on three outcomes. Each panel shows $\frac{\partial Y}{\partial \text{O\&G Share}} = \beta_1 + \beta_2 \times \text{Oil Decline}_t$, where coefficients come from the regression specification: $Y_{i,t} = \beta_0 + \beta_1 \text{O\&G Share}_f + \beta_2 \text{Oil Decline}_t + \beta_3(\text{O\&G Share}_f \times \text{Oil Decline}_t) + \alpha_i + \alpha_t + \epsilon_{i,t}$ where Oil Decline_t measures the dollar decline in WTI crude oil price from the June 2014 baseline: Oil Decline_t = Max(0, \$105.79 - WTI Price$_t$). By December 2014, oil had declined \$46.50/barrel. The marginal effect is scaled to represent a 1 percentage point increase in O&G exposure by dividing regression coefficients by 100. Appendix Figures B.6a, B.6b, B.6c show effects on CLO covenant distance, measured as ln(ID test result / threshold), transaction amounts (face value in \$ millions), and secondary loan prices (per \$100 par), respectively. Negative values indicate sales. Shaded areas represent 95% confidence intervals. Vertical dashed lines mark the O&G shock period and COVID-19 shock. The specification for Appendix Figure B.6b includes deal and month-year fixed effects with standard errors clustered by CLO and month-year. Appendix Figures B.6c and B.6 include issuer-loan type, month-year, and currency fixed effects with standard errors clustered by CLO×issuer and transaction date.

Table B.1: Interest Diversion Threshold and O&G Exposure

ln(ID Threshold)	(1)	(2)	(3)	(4)
O&G Share	-0.3075	-0.2474	-0.3873	-0.1486
	(0.3469)	(0.4429)	(0.4175)	(0.2594)
CLO Controls		✓	✓	✓
Manager FE	✓	✓	✓	✓
Arranger FE				✓
Trustee FE				✓
Year FE		✓		
Month-Year FE			✓	✓
N	66	66	66	66
R^2	0.5904	0.6251	0.8227	0.9698

Notes: The table presents the relation between CLO O&G exposure and the natural log of the Interest Diversion (ID) covenant threshold before the shock occurs. The regression specification is: $Y_{c,t} = \beta_0 + \beta_1(\text{CLO O\&G Exposure})_c + \gamma_0' X_c + \alpha_t + \alpha_a + \alpha_m + \alpha_e + \epsilon_{c,t}$ where $Y_{c,t}$ is the Interest Diversion covenant threshold of CLO c, measured as the most recently reported value at time t prior to the shock, a denotes the CLO arranger, m denotes the CLO manager, e denotes the CLO trustee, and X_c denotes the vector of controls, consisting of current CLO age (Columns 1-4), CLO size (Columns 2-4), CCC-share and defaulted-share (Columns 3-4). CLO O&G Exposure$_c$ (labeled "O&G Share" in the table) is the O&G share of CLO c measured when the CLO is first reported in the sample. There is one observation per CLO. Standard errors are robust.

Table B.2: CLO Comparison based on Observable Firm Characteristics

Low O&G Exposure	N	Q1	Median	Q3	Mean	Std. Dev.
Size	2,390	7.2432	8.3261	9.2797	8.2723	1.3328
Age (Years)	1,645	1.4000	5.3810	10.4000	5.8202	4.8005
ln(CapEx)	2,377	2.8019	3.8516	5.0407	3.9011	1.7660
Investment-Capital Ratio	2,373	-0.0021	0.0065	0.0213	0.0137	0.0347
Leverage	2,385	0.3492	0.5085	0.7150	0.5619	0.2970
Long-term Debt Growth	2,268	-0.0066	0.0079	0.0348	0.0121	0.0467
Cash Flow	2,307	0.0161	0.0193	0.0269	0.0211	0.0123
Sales Growth	2,363	0.0041	0.0157	0.0316	0.0251	0.0607
Acquisitions	2,286	0.0000	0.0047	0.0160	0.0133	0.0216
R&D Growth	676	-0.0324	0.0087	0.0184	-0.0244	0.0828
High O&G Exposure	N	Q1	Median	Q3	Mean	Std. Dev.
Size	7,164	7.0834	8.2781	9.2797	8.1796	1.3565
Age (Years)	4,981	1.2727	5.2727	10.2727	5.4101	4.8313
ln(CapEx)	7,080	2.6516	3.7977	4.8768	3.8298	1.7709
Investment-Capital Ratio	7,063	-0.0016	0.0088	0.0256	0.0161	0.0365
Leverage	7,142	0.3492	0.5045	0.6982	0.5515	0.3154
Long-term Debt Growth	6,798	-0.0060	0.0102	0.0379	0.0173	0.0581
Cash Flow	6,876	0.0159	0.0193	0.0269	0.0209	0.0129
Sales Growth	7,074	0.0035	0.0172	0.0371	0.0265	0.0596
Acquisitions	6,809	0.0001	0.0067	0.0223	0.0163	0.0278
R&D Growth	2,083	-0.0324	-0.0005	0.0184	-0.0166	0.0651

Notes: This table compares characteristics of firms with high CLO O&G exposure to firms with low CLO O&G exposure, before the shock. CLOs with above-median O&G exposure have *high* O&G exposure while CLOs with below-median O&G exposure have *low* O&G exposure. The characteristics of interest are: size, age, capital expenditure, investment-capital ratio, leverage, long-term debt growth, cash flow, sales growth, acquisitions, and R&D growth. The number of observations, first quartile, median, third quartile, mean, and standard deviation associated with each variable are in Columns 2-7, respectively.

Table B.3: CLO Selection by Covariance of Oil Price and Firm Profitability

	$\mathbb{1}_{\text{High CLO O\&G Share}}$			
	(1)	(2)	(3)	(4)
Covariance(Oil Price, Firm Profitability)	-0.7544	-0.8338	-3.9743	-0.1699
	(3.3693)	(1.1698)	(3.7136)	(0.6699)
Constant	0.7642***			
	(0.0249)			
CLO Controls			✓	✓
Issuer Controls				✓
Manager-Arranger-Trustee FE				✓
Rating-Industry FE			✓	✓
Manager FE		✓		
Year FE		✓	✓	
Month-Year FE				✓
N	5,029	5,029	5,029	5,029
R^2	0.0000	0.3302	0.2170	0.9075

Notes: The table presents the relation between the covariance of firm profitability and oil price, and, an indicator of whether the CLO portfolio that holds firm f has a high share of O&G before the shock occurs. CLOs with above-median O&G exposure have *High* O&G exposure. The regression specification is:: $\mathbb{1}_{(f \in c \text{ with high O\&G exposure})c,f} = \alpha + \beta(\text{Covariance(Oil Price, Profitability)})_f + \gamma_0 X_c + \gamma_1 Z_f + \alpha_t + \epsilon_{c,f}$ where $\mathbb{1}_{(f \in c \text{ with high O\&G exposure})c,f}$ indicates whether firm f is held in a CLO c with high O&G exposure, f denotes the portfolio firm ($f \in c$), t denotes the time, X_c is a vector of CLO controls and Z is a vector of issuer controls. CLO controls include size, age, CCC-share and defaulted-share (Columns 3, 5). Issuer controls include size, capital expenditure, leverage, cash flow, and sales growth (Columns 4-5). Standard errors are two-way clustered by CLO and issuer.

Table B.4: CLO Covenant Pressure and O&G Exposure: 2009-2019

$\ln(\frac{\text{Test Result}}{\text{Covenant Threshold}})$	**Panel A:** Distance to ID Threshold					
	(1)	(2)	(3)	(4)	(5)	(6)
O&G Share × Post	-0.7849***	-0.4338***	-0.3693***	-0.3561***	-0.3805***	-0.3667***
	(0.1754)	(0.1327)	(0.0995)	(0.1016)	(0.1065)	(0.1078)
O&G Share	0.4324	0.2799*	0.2203	0.2776**		
	(0.2774)	(0.1679)	(0.1423)	(0.1230)		
Post	0.0462***	0.0112*			0.0111**	
	(0.0087)	(0.0057)			(0.0049)	
CLO Controls		✓	✓	✓		
CLO FE					✓	✓
Manager FE	✓	✓	✓	✓		
Year FE		✓			✓	
Month-Year FE			✓	✓		✓
N	4,903	4,903	4,903	4,903	4,903	4,903
R^2	0.3306	0.4406	0.4558	0.4664	0.6255	0.6352
$\mathbb{1}_{Fail}$	**Panel B:** ID Covenant Violation					
	(1)	(2)	(3)	(4)	(5)	(6)
O&G Share × Post	3.1316***	1.7670***	1.1969***	1.1288***	1.2854***	1.2950***
	(0.7533)	(0.4959)	(0.3941)	(0.4100)	(0.4130)	(0.4060)
O&G Share	-4.7432***	-2.1267***	-1.4302*	-1.6277*		
	(1.4042)	(0.7656)	(0.8435)	(0.8840)		
Post	-0.1579***	-0.0504***			-0.0332***	
	(0.0343)	(0.0143)			(0.0125)	
CLO Controls		✓	✓	✓		
CLO FE					✓	✓
Manager FE	✓	✓	✓	✓		
Year FE		✓			✓	
Month-Year FE			✓	✓		✓
N	4,903	4,903	4,903	4,903	4,903	4,903
R^2	0.2345	0.3638	0.4123	0.4187	0.5017	0.5379

Notes: The table examines the relation between CLO O&G exposure and covenant pressure over the period 2009-2019. Panel A uses the log distance to the Interest Diversion covenant threshold as the dependent variable, measured as $\ln(\text{Test Result}/\text{Covenant Threshold})$. Panel B uses an indicator for covenant violation (distance < 1.0) as the dependent variable. The regression specification is $Y_{c,t} = \beta_0 + \beta_1(\text{CLO O\&G Exposure})_c + \beta_2(\text{Post})_t + \beta_3(\text{CLO O\&G Exposure}_c \times \text{Post}_t) + \gamma_0' X_c + \alpha_c + \alpha_t + \epsilon_{c,t}$ where $Y_{c,t}$ is the covenant distance (Panel A) or violation indicator (Panel B) for CLO c at time t. CLO O&G Exposure is measured as of May 2014 (pre-shock), calculated as the value-weighted share of CLO holdings allocated to O&G borrowers. Post equals one after June 2014. CLO Controls include CLO age (Columns 2-6), CLO size measured as log principal balance (Columns 3-6), share of CCC-rated loans, and share of defaulted loans (Columns 4 and 6). Columns 1-4 include manager fixed effects; Columns 5-6 include CLO fixed effects. Standard errors are two-way clustered by CLO and month-year.

Table B.5: CLO-Level Trading Effects

	Transaction Amount ($ mn)					
	(1)	(2)	(3)	(4)	(5)	(6)
O&G Share × Post	-21.6305***	-21.5070***	-20.6993***	-18.6094***	-19.0013***	-32.5076***
	(3.9353)	(3.9990)	(3.8396)	(4.2161)	(4.3387)	(7.2586)
O&G Share	13.6202***	13.5009***	13.7480***	15.3415***		
	(3.3401)	(3.4149)	(3.1630)	(4.0040)		
Post	0.1100	0.2832*			0.1569	
	(0.1332)	(0.1528)			(0.1652)	
Manager FE			✓			
Rating-Industry FE				✓		
CLO-Issuer FE						✓
Year FE		✓			✓	
Month-Year FE			✓	✓		✓
N	52,211	52,211	52,211	52,211	52,211	52,211
R^2	0.0121	0.0136	0.0442	0.0414	0.0623	0.4269

Notes: The table presents the relation between firm O&G exposure and net transaction amount for non-O&G firms. The regression specification is: $Y_{c,f,t} = \beta_0 + \beta_1(\text{Firm O\&G Exposure})_f + \beta_2(\text{Post})_t + \beta_3(\text{Firm O\&G Exposure}_f \times \text{Post}_t) + \gamma_0 Z_f + \alpha_{c,f} + \alpha_t + \epsilon_{c,f,t}$. $Y_{c,f,t}$ is the net transaction amount of firm f by CLO c at time t (f), and Z is a vector of firm controls including rating and industry. Firm O&G Exposure$_f$ (labeled "O&G Share" in the table) measures the value-weighted average O&G share across all CLOs holding firm f's debt before the shock occurs, while Post is an indicator variable that takes a value of 1 if the O&G price plunge has occurred, and 0 otherwise. Standard errors are two-way clustered by issuer and month-year.

Table B.6: Issuer-Level Trading Effects

	Transaction Amount ($ mn)				
	(1)	(2)	(3)	(4)	(5)
O&G Share × Post	-95.8462***	-95.4423***	-86.2444***	-67.1475*	-71.4915**
	(26.2995)	(25.9980)	(27.9809)	(35.1166)	(35.0057)
O&G Share	58.8115**	58.8819**	50.8740**		
	(23.2905)	(22.8091)	(24.5047)		
Post	1.9572*	1.4534		0.5601	
	(1.0063)	(1.0454)		(1.2796)	
Issuer FE				✓	✓
Rating-Industry FE			✓		
Year FE		✓		✓	
Month-Year FE			✓		✓
N	11,036	11,036	11,036	11,036	11,036
R^2	0.0009	0.0011	0.0362	0.0774	0.0849

Notes: The table presents the relation between firm O&G exposure and net transaction amount for non-O&G firms. The regression specification is: $Y_{f,t} = \beta_0 + \beta_1(\text{Firm O\&G Exposure})_f + \beta_2(\text{Post})_t + \beta_3(\text{Firm O\&G Exposure}_f \times \text{Post}_t) + \gamma_0 Z_f + \alpha_f + \alpha_t + \epsilon_{f,t}$. $Y_{f,t}$ is the net transaction amount of firm f across all CLOs c at time t (f), and Z is a vector of firm controls including rating and industry. Firm O&G Exposure$_f$ (labeled "O&G Share" in the table) measures the value-weighted average O&G share across all CLOs holding firm f's debt before the shock occurs, while Post is an indicator variable that takes a value of 1 if the O&G price plunge has occurred, and 0 otherwise. Standard errors are two-way clustered by issuer and month-year.

Table B.7: Issuer-Level Effects by Transaction Type

	Transaction Amount ($ mn)					
	Purchases			Sales		
	(1)	(2)	(3)	(4)	(5)	(6)
O&G Share × Post	9.5680	41.3923	26.1959	117.6805***	136.3471***	122.1907***
	(53.9782)	(65.7839)	(63.4950)	(34.4770)	(42.4549)	(40.0693)
O&G Share	-143.2491***			-193.2717***		
	(48.3649)			(37.9378)		
Post		-3.9390			-5.1911***	
		(2.6491)			(1.8116)	
Rating-Industry FE	✓			✓		
Issuer FE		✓	✓		✓	✓
Year FE		✓			✓	
Month-Year FE	✓		✓	✓		✓
N	8,526	8,526	8,526	8,068	8,068	8,068
R^2	0.0676	0.1335	0.1493	0.0962	0.1800	0.2036

Notes: The table presents the relation between firm O&G exposure and total purchases in millions of dollars (columns 1-3) and sales in millions of dollars (columns 4-6) for non-O&G firms. The regression specification is: $Y_{f,t} = \beta_0 + \beta_1(\text{Firm O\&G Exposure}_f \times \text{Post}_t) + \beta_2(\text{Post})_t + \gamma_0 Z_f + \alpha_f + \alpha_t + \epsilon_{f,t}$ where $Y_{c,f,t}$ is the total transaction amount of firm f across all CLOs c at time t (f), and Z is a vector of firm controls including rating and industry. Firm O&G Exposure$_f$ (labeled "O&G Share" in the table) measures the value-weighted average O&G share across all CLOs holding firm f's debt before the shock occurs, while Post is an indicator variable that takes a value of 1 if the O&G price plunge has occurred, and 0 otherwise. Standard errors are two-way clustered by issuer and month-year.

Table B.8: Primary Institutional Loan Maturity and O&G Exposure

Maturity (Months)	(1)	(2)	(3)	(4)	(5)
O&G Share × Post	-418.8758**	-410.7880**	-406.1509**	-376.8414*	-455.7650**
	(166.3351)	(169.7268)	(172.7002)	(200.4208)	(178.8450)
Post	13.3268**	13.8982*	12.6951*	12.0573	
	(5.2230)	(7.1315)	(6.9838)	(7.6664)	
Issuer FE	✓	✓			
Loan Type FE	✓	✓			
Issuer-Loan Type FE			✓	✓	✓
Secured FE		✓	✓	✓	✓
Purpose FE				✓	✓
Distribution Method FE				✓	✓
Seniority FE			✓	✓	✓
Country of Syndication FE				✓	✓
Year FE		✓	✓	✓	
Month-Year FE					✓
Currency FE	✓	✓	✓	✓	✓
N	513	513	513	513	513
R^2	0.5961	0.5974	0.6184	0.6665	0.7133

Notes: The table presents the relation between firm O&G exposure and primary loan maturity for non-O&G firms. The regression specification is: $Y_{i,t} = \beta_0 + \beta_1(\text{Firm O\&G Exposure}_f \times \text{Post}_t) + \beta_2(\text{Post})_t + \gamma_0 X_i + \alpha_t + \alpha_{f,l} + \epsilon_{i,t}$ where $Y_{i,t}$ is the maturity in months of loan i at time t, of loan type l, issued by firm f ($i \in f$), and X_i is the vector of non-time varying controls associated with loan i including secured status, purpose, distribution method, seniority, currency and country of syndication. Firm O&G Exposure$_f$ (labeled "O&G Share" in the table) measures the value-weighted average O&G share across all CLOs holding firm f's debt before the shock occurs, while Post is an indicator variable that takes a value of 1 if the O&G price plunge has occurred, and 0 otherwise. Standard errors are two-way clustered by issuer and month-year.

Table B.9: Primary Institutional Loan Amount and O&G Exposure

ln(Loan Amount)	(1)	(2)	(3)	(4)	(5)
O&G Share × Post	-8.6964	-8.6127	-8.2966	-6.8979	-6.5803
	(7.2299)	(7.1540)	(7.1399)	(6.1675)	(6.6498)
Post	0.0654	0.2187	0.1587	0.1995	
	(0.2567)	(0.3323)	(0.3436)	(0.3006)	
Maturity				0.0178***	0.0186***
				(0.0032)	(0.0031)
Issuer FE	✓	✓			
Loan Type FE	✓	✓			
Issuer-Loan Type FE			✓	✓	✓
Secured FE		✓	✓	✓	✓
Purpose FE				✓	✓
Distribution Method FE				✓	✓
Seniority FE			✓	✓	✓
Country of Syndication FE				✓	✓
Year FE		✓	✓	✓	
Month-Year FE					✓
Currency FE	✓	✓	✓	✓	✓
N	582	582	582	582	582
R^2	0.6228	0.6243	0.6653	0.7341	0.7514

Notes: The table presents the relation between firm O&G exposure and primary loan amount for non-O&G firms. The regression specification is: $Y_{i,t} = \beta_0 + \beta_1(\text{Firm O\&G Exposure}_f \times \text{Post}_t) + \beta_2(\text{Post})_t + \beta_3\text{Maturity}_{i,t} + \gamma_0 X_i + \alpha_t + \alpha_{f,l} + \epsilon_{i,t}$ where $Y_{i,t}$ is the loan amount ($ln(\text{loan amount})$) of loan i at time t, of loan type l, issued by firm f ($i \in f$), and X_i is the vector of non-time varying controls associated with loan i including secured status, purpose, distribution method, seniority, currency and country of syndication. Firm O&G Exposure$_f$ (labeled "O&G Share" in the table) measures the value-weighted average O&G share across all CLOs holding firm f's debt before the shock occurs, while Post is an indicator variable that takes a value of 1 if the O&G price plunge has occurred, and 0 otherwise. Standard errors are two-way clustered by issuer and month-year.

Table B.10: Bond Credit Spread and O&G Exposure

Bond Credit Spread	(1)	(2)	(3)	(4)	(5)
O&G Share × Post	3160.2455*	3167.5359*	3278.2290*	2432.5527*	2407.3678*
	(1619.9895)	(1616.0869)	(1661.9927)	(1288.0783)	(1284.2039)
Post	-30.1414	-31.9794	-33.5413	-11.4341	
	(33.1831)	(39.0225)	(38.7291)	(27.8727)	
Time to Maturity				4.5149***	4.5907***
				(1.0078)	(0.9985)
Issuer FE	✓	✓			
Bond Type FE	✓	✓			
Issuer-Bond Type FE			✓	✓	✓
Security Level FE			✓	✓	✓
Rating FE				✓	✓
IG FE				✓	✓
Defaulted FE				✓	✓
Year FE		✓	✓	✓	
Month-Year FE					✓
N	9,876	9,876	9,876	9,876	9,876
R^2	0.5211	0.5297	0.5663	0.6911	0.6979

Notes: The table presents the relation between firm O&G exposure and bond credit spread for non-O&G firms. Bond credit spread is measured relative to a treasury with corresponding maturity. The regression specification is: $Y_{i,t} = \beta_0 + \beta_1(\text{Firm O\&G Exposure}_f \times \text{Post}_t)_f + \beta_2(\text{Post})_t + \beta_3\text{Time to Maturity} + \gamma_0 X_{i,t} + \alpha_{f,b} + \alpha_t + \epsilon_{i,t}$ where $Y_{i,t}$ is the bond credit spread (%) of bond i at time t, of bond type b, issued by firm f ($i \in f$), and $X_{i,t}$ is the vector of controls associated with bond i including security level, rating, investment-grade indicator, and defaulted status. Firm O&G Exposure$_f$ (labeled "O&G Share" in the table) measures the value-weighted average O&G share across all CLOs holding firm f's debt before the shock occurs, while Post is an indicator variable that takes a value of 1 if the O&G price plunge has occurred, and 0 otherwise. Standard errors are two-way clustered by issuer and month-year.

Table B.11: Bond Liquidity and O&G Exposure

Bond Liquidity	(1)	(2)	(3)	(4)	(5)
O&G Share × Post	1.9006**	1.9044**	2.0690**	2.0969**	2.0997**
	(0.9023)	(0.8943)	(0.9378)	(0.8108)	(0.8117)
Post	-0.0489**	-0.0340	-0.0369	-0.0329	
	(0.0210)	(0.0226)	(0.0233)	(0.0224)	
Time to Maturity				0.0228***	0.0228***
				(0.0034)	(0.0034)
Issuer FE	✓	✓			
Bond Type FE	✓	✓			
Issuer-Bond Type FE			✓	✓	✓
Security Level FE			✓	✓	✓
Rating FE				✓	✓
IG FE				✓	✓
Defaulted FE				✓	✓
Year FE		✓	✓	✓	
Month-Year FE					✓
N	9,955	9,955	9,955	9,955	9,955
R^2	0.2739	0.2767	0.2919	0.3861	0.3926

Notes: The table presents the relation between firm O&G exposure and bond liquidity for non-O&G firms. The regression specification is: $Y_{i,t} = \beta_0 + \beta_1(\text{Firm O\&G Exposure}_f \times \text{Post}_t) + \beta_2(\text{Post})_t + \beta_3\text{Time to Maturity}_{i,t} + \gamma_0 X_{i,t} + \alpha_{f,b} + \alpha_t + \epsilon_{i,t}$ where $Y_{i,t}$ is the bond liquidity in % of bond i at time t, of bond type b, issued by firm f ($i \in f$), and $X_{i,t}$ is the vector of controls associated with bond i including bond type, security level, rating, investment-grade indicator, and defaulted status. Bond liquidity is defined as the average bid-ask spread. Firm O&G Exposure$_f$ (labeled "O&G Share" in the table) measures the value-weighted average O&G share across all CLOs holding firm f's debt before the shock occurs, while Post is an indicator variable that takes a value of 1 if the O&G price plunge has occurred, and 0 otherwise. Standard errors are two-way clustered by issuer and month-year.

Table B.12: CLO Defaulted Share and O&G Exposure

	Distressed Share			
	(1)	(2)	(3)	(4)
O&G Share × Post	-0.1943***	-0.2378**	-0.2320*	-0.2270*
	(0.0674)	(0.1168)	(0.1162)	(0.1147)
Post	0.00556	0.0299***	0.0172**	
	(0.0060)	(0.0062)	(0.0067)	
O&G Share	-0.3887*			
	(0.2088)			
CLO FE		✓	✓	✓
Year FE			✓	
Month-Year FE				✓
N	11,760	11,760	11,760	11,760
R^2	0.0146	0.6628	0.6642	0.6665

Notes: The table presents the relation between CLO O&G exposure and share of distressed loans. Distressed loans refer to loans that are reported as "defaulted" by the CLO, which can include payment defaults and covenant breaches. The regression specification is: $Y_{c,t} = \beta_0 + \beta_1(\text{CLO O\&G Exposure})_c + \beta_2(\text{Post})_t + \beta_3(\text{CLO O\&G Exposure}_c \times \text{Post}_t) + \alpha_c + \alpha_t + \epsilon_{c,t}$ where $Y_{c,t}$ is the share of distressed loans in CLO c at time t. CLO O&G Exposure$_c$ (labeled "O&G Share" in the table) is the O&G share of CLO c before the shock occurs, while Post is an indicator variable that takes a value of 1 if the O&G price plunge has occurred, and 0 otherwise. Standard errors are two-way clustered by CLO and month-year.

Table B.13: CLO-Level IV: Covenant Pressure and Portfolio Liquidations

	(1)	(2)	(3)	(4)
	First Stage	**Second Stage**		
	ID Test Ratio	ln(Holdings)		
ln(ID Test Ratio)		18.6295***	10.0175**	10.8057**
		(6.0662)	(3.7966)	(4.0796)
O&G Share × Post	-0.1701***			
	(0.0566)			
Deal FE	✓	✓	✓	✓
Month-Year FE		✓		
Issuer FE			✓	
Issuer × Month-Year FE	✓			✓
Observations	325,769	325,769	325,769	325,769
Kleibergen-Paap LM	6.6929			
Kleibergen-Paap Wald F	9.0348			

Notes: This table presents two-stage least squares (2SLS) estimates of the causal effect of CLO covenant pressure on portfolio liquidations of non-O&G firms. The sample consists of CLO holdings aggregated to the deal-issuer-month level during 2013-2015, excluding all O&G sector firms. Column 1 reports the first-stage regression: $\ln(\text{ID Test Ratio}_{c,t}) = \gamma_0 + \gamma_1(\text{CLO O\&G Share}_c \times \text{Post}_t) + \alpha_c + \alpha_{f,t} + u_{c,t}$ where c indexes CLO deals, f indexes issuers (firms), and t denotes month-year. The ID Test Ratio measures natural log of the distance to the Interest Diversion covenant threshold, calculated as ln(Test Result/Covenant Threshold), with lower values indicating tighter constraints. CLO O&G Share$_c$ is CLO c's pre-shock exposure to the O&G sector. Post equals 1 after June 2014. Columns 2-4 report second-stage IV regressions: $\ln(\text{Holdings}_{c,f,t}) = \beta_0 + \beta_1 \ln(\widehat{\text{ID Test Ratio}}_{c,t}) + \alpha_c + \alpha_{f,t} + \epsilon_{c,f,t}$. The coefficient β_1 measures the elasticity of portfolio liquidations with respect to covenant pressure. Standard errors are two-way clustered by CLO deal and month-year.

Table B.14: Covenant Distance Heterogeneity: Split-Sample Estimates

	Transaction Amount ($mn)		**Secondary Loan Price ($/$100)**		**Investment-Capital Ratio**	
	Loose Covenants	Tight Covenants	Loose Covenants	Tight Covenants	Loose Covenants	Tight Covenants
	(1)	(2)	(3)	(4)	(5)	(6)
O&G Share × Post	-13.5364***	-16.2629***	-0.6313	-65.5133**	-0.2042	-0.8751**
	(2.6778)	(4.3762)	(30.6993)	(32.6139)	(0.4395)	(0.3932)
Issuer-Loan Type FE	✓	✓	✓	✓		
Issuer FE					✓	✓
Month-Year FE	✓	✓	✓	✓		
Quarter-Year FE					✓	✓
Currency FE	✓	✓	✓	✓		
N	46,501	83,288	46,507	83,299	799	1,124
R^2	0.1132	0.0627	0.6604	0.2771	0.2393	0.1798

Notes: This table presents split-sample regression estimates corresponding to Figure 10. The sample is divided based on firm-level pre-shock covenant distance, measured as the weighted average covenant distance across all CLOs holding the firm's debt. Loose covenants (above-median) include firms whose CLO lenders had covenant distance above the median; tight covenants (below-median) include firms whose CLO lenders operated closer to covenant thresholds. The regression specification is:

$$Y_{i,t} = \beta_0 + \beta_1(\text{Firm O\&G Exposure}_f \times \text{Post}_t) + \gamma_0 Z_i + \alpha_{i,l} + \alpha_t + \epsilon_{i,t}$$

where $Y_{i,t}$ is the transaction amount in columns 1 and 2 and secondary loan price in columns 3 and 4 of loan i at time t issued by firm f. Z_i includes a currency control, and l denotes the loan-type.

$$Y_{f,t} = \beta_0 + \beta_1(\text{Firm O\&G Exposure}_f \times \text{Post}_t) + \alpha_f + \alpha_t + \epsilon_{i,t}$$

where $Y_{f,t}$ is the investment capital ratio in columns 5 and 6. Firm O&G Exposure measures the weighted average O&G share across all CLOs holding the firm's debt as of May 2014. Post equals one after June 2014. The coefficient of interest, O&G Share × Post, captures the differential effect of O&G exposure on firm outcomes following the oil price shock. Specifications include issuer-loan type fixed effects in columns 1-4, issuer fixed effects in columns 5-6, month-year fixed effects in columns 1-4, quarter-year fixed effects in columns 5-6, and currency fixed effects in columns 1-4. Standard errors (in parentheses) are two-way clustered by CLO × issuer and trade date in columns 1-4 and by issuer in columns 5-6.

Table B.15: Reduced Form: O&G Exposure and Changes in CLO Holdings

$\Delta \ln(\text{Holdings})$	(1)	(2)	(3)	(4)
O&G Share × Post	-3.2347*	-3.3654**	-3.5405**	-3.7038**
	(1.6377)	(1.6125)	(1.6466)	(1.6607)
Post	0.0427	0.0999		
	(0.0466)	(0.0784)		
Firm FE	✓	✓	✓	✓
Year FE		✓		
Month-Year FE			✓	
Industry × Month-Year FE				✓
Observations	12,008	12,008	12,008	12,008
R^2	0.0861	0.0885	0.2152	0.2856

Notes: This table presents reduced-form estimates of the effect of firm O&G exposure on changes in CLO holdings. The specification is:

$$\Delta \ln(\text{Holdings}_{f,t}) = \beta_0 + \beta_1(\text{O\&G Exposure}_f \times \text{Post}_t) + \beta_2 \text{Post}_t + \alpha_f + \alpha_{i,t} + \epsilon_{f,t}$$

where i denotes the industry, $\text{O\&G Exposure}_f$ is the value-weighted average share of O&G loans across all CLOs holding firm f's debt, measured in May 2014 (pre-shock). Post takes a value of 1 after the O&G price plunge has occurred, and 0 otherwise. Standard errors are two-way clustered by issuer and month-year.

Table B.16: Heterogeneous Effects by Firm CLO Dependence

$\Delta \ln(\text{Holdings})$	(1)	(2)	(3)	(4)
CLO Dependence × O&G Share × Post	-2.6880*	-2.6740*	-2.6801*	-2.5585**
	(1.4538)	(1.3213)	(1.3344)	(1.1844)
CLO Dependence × Post	0.0813**	0.0811**	0.0819**	0.0793**
	(0.0357)	(0.0310)	(0.0317)	(0.0302)
O&G Share × Post	-0.5024	-0.5251	-0.6238	-0.7371
	(0.6714)	(1.4330)	(1.4283)	(1.4046)
Post	-0.0022	0.0237		
	(0.0167)	(0.0635)		
Issuer FE	✓	✓	✓	✓
Year FE		✓		
Month-Year FE			✓	
Industry × Month-Year FE				✓
Observations	20,463	20,463	20,463	20,463
R^2	0.0431	0.0436	0.1006	0.1597

Notes: This table examines how the effect of O&G exposure on CLO fire sales varies with firm dependence on CLO financing. The specification is:

$$\begin{aligned}\Delta \ln(\text{Holdings}_{f,t}) =& \beta_0 + \beta_1(\text{CLO Dep}_f \times \text{O\&G Exp}_f \times \text{Post}_t) \\ &+ \beta_2(\text{CLO Dep}_f \times \text{Post}_t) + \beta_3(\text{O\&G Exp}_f \times \text{Post}_t) \\ &+ \beta_4 \text{Post}_t + \alpha_f + \alpha_{i,t} + \epsilon_{f,t}\end{aligned}$$

CLO Dependence is measured as the share of a firm's total institutional term loans held in CLO portfolios (pre-shock), standardized to mean zero and unit standard deviation. Higher values indicate firms more reliant on CLO financing. O&G Exposure is the value-weighted average share of O&G loans across all CLOs holding firm f's debt, measured in May 2014 (pre-shock). i denotes the industry. Standard errors are two-way clustered by issuer and month-year.

Table B.17: Exploiting the 7.5% CCC Threshold: Alternative Exposure Measures

	Panel A: Sale Amount ($mn)			
	(1)	(2)	(3)	(4)
	High-CCC Only	CCC Distance	CCC Excess	CCC Share
CCC Measure × Post	93.8707***	7.9527***	21.7684***	1.9002***
	(27.7656)	(1.9254)	(6.0686)	(0.5723)
Issuer-Loan Type FE	✓	✓	✓	✓
Month-Year FE	✓	✓	✓	✓
N	56,095	56,095	56,095	56,095
R^2	0.2681	0.2685	0.2681	0.2683
	Panel B: Secondary Loan Price (per $100 par)			
	(1)	(2)	(3)	(4)
	High-CCC Only	CCC Distance	CCC Excess	CCC Share
CCC Measure × Post	-1233.0546***	-36.9388*	-255.6393**	-16.8469**
	(415.1968)	(21.1330)	(117.1604)	(6.6878)
Issuer-Loan Type FE	✓	✓	✓	✓
Month-Year FE	✓	✓	✓	✓
N	56,102	56,102	56,102	56,102
R^2	0.6065	0.6059	0.6063	0.6062

Notes: This table tests the 7.5% CCC covenant threshold using alternative firm-level exposure measures. The dependent variable in Panel A is the sale amount (in millions of dollars). The dependent variable in Panel B is the secondary loan price (per $100 of par). The sample includes sales transactions from non-O&G firms within 5 percentage points of the 7.5% threshold during 2013-2015. To ensure common support, I restrict to firms borrowing from CLOs with O&G exposure between the 25th and 75th percentiles. The results remain robust when these restrictions are relaxed. Post is an indicator equal to 1 after June 2014. All CCC exposure measures are calculated pre-shock (before June 2014) as value-weighted averages across CLOs holding each firm's debt. Column 1: O&G Exposure calculated *only* from CLOs with CCC share $\geq$ 7.5% (High-CCC Only = $\sum_c w_c \times$ O&G Share$_c \times \mathbb{1}$[CCC Share$_c \geq 0.075$]); Column 2: Firm's weighted average distance from the 7.5% threshold (CCC Distance = $\sum_c w_c \times$ (CCC Share$_c - 0.075$)); Column (3): Firm's weighted average *excess* CCC holdings above 7.5% (CCC Excess = $\sum_c w_c \times \max(0, \text{CCC Share}_c - 0.075)$); Column (4): Share of firm debt held by CLOs with CCC share $\geq$ 7.5% (CCC Share = $\sum_c w_c \times \mathbb{1}$[CCC Share$_c \geq 0.075$]). All specifications include issuer-loan type and month-year fixed effects and are restricted to sales transactions. Standard errors are two-way clustered by CLO×issuer and trade date.

Table B.18: Falsification Test: Primary Non-Institutional Loan Spread and O&G Exposure

	All-in-Drawn Spread				
	(1)	(2)	(3)	(4)	(5)
O&G Share × Post	371.1692	304.2327	310.1660	226.3725	-140.3541
	(248.9200)	(252.3536)	(251.4295)	(206.5975)	(225.6863)
Post	-38.0206***	-14.4615	-15.1705	-10.9200	
	(10.6312)	(15.0827)	(15.1755)	(14.7855)	
Maturity				-1.5374***	-0.9770***
				(0.4526)	(0.3503)
Issuer FE	✓	✓			
Loan Type FE	✓	✓			
Issuer-Loan Type FE			✓	✓	✓
Secured FE		✓	✓	✓	✓
Purpose FE				✓	✓
Distribution Method FE				✓	✓
Seniority FE			✓	✓	✓
Country of Syndication FE				✓	✓
Year FE		✓	✓	✓	
Month-Year FE					✓
Currency FE	✓	✓	✓	✓	✓
N	347	347	347	347	347
R^2	0.8941	0.9000	0.9006	0.9141	0.9409

Notes: The table presents the relation between firm O&G exposure and primary non-institutional loan spread for non-O&G firms. The regression specification is: $Y_{i,t} = \beta_0 + \beta_1(\text{Post})_t + \beta_2(\text{Firm O\&G Exposure}_f \times \text{Post}_t) + \beta_3\text{Maturity}_{i,t} + \gamma_0 X_i + \alpha_t + \alpha_f + \epsilon_{i,t}$ where $Y_{i,t}$ is the all-in-drawn spread of loan i at time t issued by firm f ($i \in f$), and X_i is the vector of non-time varying controls associated with loan i including secured status, purpose, distribution method, seniority, loan type, currency, and country of syndication. Firm O&G Exposure$_f$ (labeled "O&G Share" in the table) measures the value-weighted average O&G share across all CLOs holding firm f's debt before the shock occurs, while Post is an indicator variable that takes a value of 1 if the O&G price plunge has occurred, and 0 otherwise. Standard errors are two-way clustered by issuer and month-year.

Table B.19: Falsification Test: Primary Revolving Credit Undrawn Spread and O&G Exposure

	All-in-Undrawn Spread				
	(1)	(2)	(3)	(4)	(5)
O&G Share × Post	21.6797	-1.5194	-1.5194	-6.7756	89.2444
	(42.6808)	(43.0084)	(42.8894)	(43.4886)	(90.0033)
Post	-4.5477***	1.0591	1.0591	1.0947	
	(1.6102)	(2.3330)	(2.3265)	(2.3630)	
Maturity				-0.1223	-0.1434
				(0.0848)	(0.1415)
Issuer FE	✓	✓			
Loan Type FE	✓	✓			
Issuer-Loan Type FE			✓	✓	✓
Secured FE		✓	✓	✓	✓
Purpose FE				✓	✓
Distribution Method FE				✓	✓
Seniority FE			✓	✓	✓
Country of Syndication FE				✓	✓
Year FE		✓	✓	✓	
Month-Year FE					✓
Currency FE	✓	✓	✓	✓	✓
N	190	190	190	190	190
R^2	0.8729	0.8846	0.8846	0.8865	0.9278

Notes: This table presents the relation between firm O&G exposure and primary undrawn spread associated with revolving credit facilities for non-O&G firms. The regression specification is: $Y_{i,t} = \beta_0 + \beta_1(\text{Post})_t + \beta_2(\text{Firm O\&G Exposure}_f \times \text{Post}_t) + \beta_3\text{Maturity}_{i,t} + \gamma_0 X_i + \alpha_t + \alpha_f + \epsilon_{i,t}$ where $Y_{i,t}$ is the all-in-undrawn spread of facility i at time t issued by firm f ($i \in f$), and X_i is the vector of non-time varying controls associated with facility i including secured status, purpose, distribution method, seniority, loan type, currency, and country of syndication. Firm O&G Exposure$_f$ (labeled "O&G Share" in the table) measures the value-weighted average O&G share across all CLOs holding firm f's debt before the shock occurs, while Post is an indicator variable that takes a value of 1 if the O&G price plunge has occurred, and 0 otherwise. Standard errors are two-way clustered by issuer and month-year.

Table B.20: Correlation Matrix: Alternative O&G Exposure Measures

	(1) Volume Weights	(2) Log Weights	(3) Count Weights	(4) Binary Exposure	(5) Equal Weights
(1) Volume Weights	1.000				
(2) Log Weights	0.9899	1.000			
(3) Count Weights	0.9562	0.9671	1.000		
(4) Binary Exposure	0.9854	0.9970	0.9676	1.000	
(5) Equal Weights	0.9588	0.9698	0.9974	0.9703	1.000

Notes: This table presents pairwise correlations between alternative constructions of firm-level O&G exposure. All measures aggregate CLO-level O&G portfolio shares to the firm level using different weighting schemes. Sample includes all non-O&G firms held by CLOs with available data as of May 2014 (pre-shock). N = 6,638.

- **Volume Weights (Baseline):** $\omega_{f,c} = \text{Holdings}_{f,c} / \sum_c \text{Holdings}_{f,c}$ – the dollar share of firm f's total CLO debt held by CLO c
- **Log Weights:** $\omega_{f,c} = \ln(\text{Holdings}_{f,c}) / \sum_c \ln(\text{Holdings}_{f,c})$
- **Equal Weights:** $\omega_{f,c} = 1/N_f$ where N_f is the number of CLOs holding firm f's debt – equal weight across all lenders regardless of position size.
- **Count Weights:** Weight by the number of loans rather than dollar volume – $\omega_{f,c}$ is the share of firm f's loans (not dollars) held by CLO c.
- **Binary Exposure:** $\text{Exposure}_f = \sum_c \mathbb{1}\{\text{Holdings}_{f,c} > 0\} \times \text{O\&G Share}_c / N_f$ – ignores loan size completely, exploiting connection to O&G-stressed CLOs

Table B.21: Robustness: Alternative O&G Exposure Weighting Schemes

	(1) Volume Weights	(2) Log Weights	(3) Equal Weights	(4) Count Weights	(5) Binary Exposure
Panel A: Transaction Amount ($ Million)					
O&G Share × Post	-13.5289***	-20.3401***	-20.6267***	-20.1221***	-20.2100***
	(2.3324)	(3.1617)	(3.2265)	(3.3268)	(3.1993)
Issuer-Type FE	✓	✓	✓	✓	✓
Month-Year FE	✓	✓	✓	✓	✓
Currency FE	✓	✓	✓	✓	✓
N	136,808	136,808	136,808	136,808	136,808
R^2	0.0849	0.0852	0.0851	0.0851	0.0851
Panel B: Secondary Loan Price ($/$100)					
O&G Share × Post	-79.1517***	-126.7102***	-129.8827***	-132.0492***	-130.3186***
	(28.4219)	(41.7556)	(42.8615)	(45.0871)	(42.5488)
Issuer-Type FE	✓	✓	✓	✓	✓
Month-Year FE	✓	✓	✓	✓	✓
Currency FE	✓	✓	✓	✓	✓
N	136,827	136,827	136,827	136,827	136,827
R^2	0.4616	0.4617	0.4617	0.4617	0.4617

Notes: This table examines robustness to alternative constructions of firm O&G exposure. All specifications use the most saturated fixed effects structure from the main analysis: issuer-loan type, month-year, and currency fixed effects. Standard errors (in parentheses) are two-way clustered by CLO × issuer and trade date.

- **Volume Weights (Baseline):** Columns 1 and 6 use $\omega_{f,c} = \text{Holdings}_{f,c} / \sum_c \text{Holdings}_{f,c}$ – the dollar share of firm f's total CLO debt held by CLO c
- **Log Weights:** Columns 2 and 7 use $\omega_{f,c} = \ln(\text{Holdings}_{f,c}) / \sum_c \ln(\text{Holdings}_{f,c})$
- **Equal Weights:** Columns 3 and 8 use $\omega_{f,c} = 1/N_f$ where N_f is the number of CLOs holding firm f's debt – equal weight across all lenders regardless of position size.
- **Count Weights:** Columns 4 and 9 weight by the number of loans rather than dollar volume – $\omega_{f,c}$ is the share of firm f's loans (not dollars) held by CLO c.
- **Binary Exposure:** Columns 5 and 10 use $\text{Exposure}_f = \sum_c \mathbb{1}\{\text{Holdings}_{f,c} > 0\} \times \text{O\&G Share}_c / N_f$ – ignores loan size completely, exploiting connection to O&G-stressed CLOs

Panel A uses transaction face amounts in millions of dollars; negative coefficients indicate increased selling. Panel B uses secondary loan transaction prices per $100 of par.

Table B.22: Continuous Oil Price Specification

	(1) ID Test Ratio (ln)	(2) Transaction Amt ($ Million)	(3) Secondary Price ($/$100)
Panel A: Regression Coefficients			
O&G Share × Oil Decline	-0.0046***	-0.1768***	-1.6226***
	(0.0016)	(0.0424)	(0.3348)
Panel B: Marginal Effects at Peak Oil Decline ($68.61)			
$\partial Y / \partial$O&G Share	-0.3152***	-12.1295***	-111.3216***
	(0.1122)	(2.9082)	(22.9666)
CLO FE	✓		
Issuer-Type FE		✓	✓
Month-Year FE	✓	✓	✓
Currency FE		✓	✓
Observations	1,867	136,808	136,808
R^2	0.8298	0.0845	0.4617

Notes: This table reports estimates from continuous oil price specifications:

$$Y_{i,t} = \beta_0 + \beta_1 \,\text{O\&G Share}_f + \beta_2 \,\text{OilDecline}_t + \beta_3 \,(\text{O\&G Share}_f \times \text{OilDecline}_t) + \gamma' Z_f + \alpha_i + \alpha_t + \epsilon_{i,t},$$

where i denotes the issue-type, f denotes the firm, and t indexes time. Z is a vector of firm controls including currency fixed effects. OilDecline_t measures the dollar decline in WTI crude oil price from the June 2014 baseline. O&G Share ranges from 0 to 1, representing the weighted average O&G portfolio share across all CLOs holding firm f's debt, measured in May 2014 (pre-shock). Panel A reports the regression coefficients. Panel B reports the marginal effect of O&G Share evaluated at peak oil decline:

$$\frac{\partial Y}{\partial \text{O\&G Share}} \;=\; \beta_1 \;+\; \beta_3 \times \text{OilDecline}_{\text{peak}}.$$

At peak oil decline (December 2014: $\$68.61$), this evaluates to $\beta_1 + \beta_3 \times 68.61$. Because firm-level O&G exposures in the sample are small (IQR: 0.32%–2.84%), the 0–100% scaling in Panel B is a normalization rather than an in-sample scenario. To interpret economically meaningful magnitudes: at peak oil decline, a one percentage point increase in O&G exposure tightens covenant distance by 0.32% (Column 1), increases net selling by $0.12 million (Column 2), and reduces secondary prices by $1.11 per $100 par (Column 3). Column 1 uses ln(ID test ratio) as the dependent variable with CLO and month-year fixed effects. Columns 2–3 use issuer-type, month-year, and currency fixed effects. Standard errors in parentheses, clustered by deal and month-year (Column 1) and by CLO×Issuer and transaction date (Columns 2–3).

Table B.23: Distance to Interest Diversion Covenant and COVID-19 Exposure

	Distance to ID Threshold					
	(1)	(2)	(3)	(4)	(5)	(6)
COVID-19 Share × Post	-0.1698***	-0.1716***	-0.1723***	-0.1743***	-0.1837***	-0.1833***
	(0.0425)	(0.0421)	(0.0420)	(0.0391)	(0.0365)	(0.0367)
COVID-19 Share	-0.2023**	-0.1115	-0.0946	-0.0168		
	(0.0825)	(0.0794)	(0.0789)	(0.0522)		
Post	0.0038	0.0040			0.0056	
	(0.0049)	(0.0048)			(0.0040)	
CLO Controls		✓	✓	✓		
CLO FE					✓	✓
Manager FE	✓	✓	✓	✓		
Year FE		✓			✓	
Month-Year FE			✓	✓		✓
N	5,772	5,772	5,772	5,772	5,772	5,772
R^2	0.6611	0.6812	0.7096	0.7650	0.8322	0.8591

Notes: The table presents the relation between CLO COVID-19 exposure and distance to the Interest Diversion covenant. The regression specification is: $Y_{c,t} = \beta_0 + \beta_1(\text{CLO COVID-19 Exposure})_c + \beta_2(\text{Post})_t + \beta_3(\text{CLO COVID-19 Exposure}_c \times \text{Post}_t) + \gamma_0' X_c + \alpha_c + \alpha_t + \epsilon_{c,t}$ where $Y_{c,t}$ is the distance to the Interest Diversion constraint ($ln(\frac{\text{Current Performance}}{\text{Current Threshold}})$) of CLO c at time t, and X_c denotes the vector of controls, consisting of current CLO age in columns 2-4 and CLO size in columns 3-4, and CCC-share and defaulted-share (Column 4). COVID-19 Share$_c$ is the share of CLO c in industries most vulnerable to COVID-19: O&G, automotive exposure, retail, durable consumer goods, cargo transportation, energy and transportation, and consumer sectors. Post$_t$ is an indicator variable that takes a value of 1 after March 1, 2020 (onset of COVID-19 pandemic), and 0 otherwise. The analysis is restricted to 2020. The Standard errors are two-way clustered by CLO and month-year.

Table B.24: Secondary Loan Price and COVID-19 Exposure

Transaction Price (per $100 par)	(1) O&G	(2) Auto	(3) Retail	(4) Consumer Goods	(5) Cargo	(6) O&G and Auto	(7) Retail and Goods	(8) All (Col 1-5)
COVID-19 Share × Post	-145.6504***	-135.0664***	-91.2316***	-259.1544***	-394.5945***	-105.4744***	-126.2100***	-76.9684***
	(27.8020)	(34.4771)	(15.0409)	(45.9466)	(69.7795)	(18.8614)	(16.3700)	(11.2853)
Issuer-Loan Type FE	✓	✓	✓	✓	✓	✓	✓	✓
Month-Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Currency FE	✓	✓	✓	✓	✓	✓	✓	✓
N	356,481	354,651	354,005	363,840	359,489	347,161	353,852	332,550
R^2	0.6610	0.6631	0.6614	0.6680	0.6679	0.6558	0.6616	0.6454

Notes: The table examines whether COVID-19 sectoral shocks generate spillover effects on non-affected firms through CLO fire sales, analogous to the baseline O&G shock analysis. Each column measures a different dimension of firm exposure to COVID-19 vulnerable sectors through CLO holdings. The dependent variable is the secondary loan price (per $100 of par). The regression specification is:

$$\text{Price}_{f,l,t} = \beta_1(\text{Sector Exposure}_f \times \text{Post}_t) + \beta_2 \text{Sector Exposure}_f + \beta_3 \text{Post}_t + \alpha_{f,l} + \alpha_t + \alpha_c + \epsilon_{f,l,t}$$

where f indexes firms, l indexes loan type, t indexes time, and c indexes currency. *Sector Exposure* measures the value-weighted share of CLO holdings allocated to the specified vulnerable sector(s), calculated as of pre-COVID. *Post* equals one after March 1, 2020 (onset of COVID-19 pandemic). The sample includes only firms outside the vulnerable sectors listed in each column header, capturing spillover effects on otherwise unaffected borrowers. O&G exposure in column 1, automotive exposure in column 2, retail exposure in column 3, durable consumer goods exposure in column 4, cargo transportation in column 5, energy and transportation sector (O&G + automotive) in column 6, consumer sectors (retail consumer goods) in column 7, and all COVID-vulnerable sectors combined in column 8. The analysis restricts to transactions before May 7, 2020 (Federal Reserve corporate credit facility announcement) to avoid contamination from policy interventions. Standard errors are two-way clustered by CLO × issuer and trade date.

Appendix C Data Construction of Firm-Level Variables

In this section, I describe the definition of variables.

1. *Debt Growth (long-term)* is defined as the natural log difference in long-term debt ($\Delta \ln(\texttt{dlttq})$).
2. *Sales Growth* is defined as the natural log difference in sales ($\Delta \ln(\texttt{saleq})$).
3. *Cash Flow* is the ratio of operating income before depreciation minus interest expense minus taxes to lagged total assets: $(\texttt{oibdpq} - \texttt{xintq} - \texttt{txtq})/\texttt{atq}_{t-1}$.
4. *Investment-Capital Ratio* is defined as the ratio of the change in capital stock to the lagged capital stock. For each firm, the initial value of capital stock is equal to the level of gross plant, property and equipment (ppegt). This is k_{it+1} for firm i. The evolution of k_{it+1} is computed using changes in net plant, property and equipment (ppent). Missing observations of net plant, property, and equipment are estimated using linear interpolation of values right before and after the observation; values outside the observed range are not extrapolated. This definition is used in Ottonello and Winberry (2020).
5. *Acquisitions* is the ratio of acquisition expenditures to lagged total assets: $\texttt{aqcy}/\texttt{atq}_{t-1}$.
6. *R&D Growth* is defined as the natural log difference in R&D expenditures ($\Delta \ln(\texttt{xrdq})$).
7. *Employment Growth* is defined as the natural log difference in employment ($\Delta \ln(\texttt{emp})$).
8. *Capital Expenditures* is defined as the natural log of capital expenditures ($ln(\texttt{capxy})$
9. *Leverage* is defined as the ratio of total debt to total assets: $\texttt{(dltt+dlcq)/atq}$.