Does Loan Securitization Expose Borrowers to Non-Bank Investor Shocks?

Abhishek Bhardwaj, Shan Ge, Saptarshi Mukherjee*

Abstract

65% of syndicated loans are securitized and ultimately funded by CLO investors, theoretically insulating borrowers from both bank and idiosyncratic investor shocks. However, our evidence suggests that concentrated capital and sticky relationships expose firms to idiosyncratic shocks to insurers, the largest CLO investor group. We find that: 1) Insurers experiencing favorable cash flows invest more in CLOs, especially with familiar managers. 2) CLO managers exposed to these cash flows launch more deals. 3) Using an instrumental-variable approach, affected firms take out more loans at lower spreads, increase employment, and expand operations. These findings indicate significant frictions in loan securitization markets.

Keywords: Collateralized Loan Obligation (CLO), Securitization, Insurance Companies, Corporate Borrowing, Loans, Leveraged Loans, Lending Relationship, Investment Relationship, Non-Bank

JEL Codes: G22, G23, G32

*Abhishek Bhardwaj is at Tulane University. Email: abhardwaj@tulane.edu. Shan Ge is at New York University. Email: sg3634@stern.nyu.edu. Saptarshi Mukherjee is at Northeastern University. Email: sa.mukherjee@northeastern.edu. We are grateful for the comments by Umit Gurun (discussant), Michel Habib (discussant), Franz Hinzen (discussant), Thomas Philippon, Alexi Savov, and the seminar participants at Tulane University, New York University, Dartmouth College, Drexel University, the University of Miami, Midwest Finance Association 2024 Annual Meeting, the 7th World Symposium on Investment Research, and Esade Spring Workshop. Daniel Liu and Xinlin Yuan provided excellent research assistance. The authors acknowledge funding by the NBER/OFR Market Frictions and Financial Risks Grant. Shan Ge acknowledges financial support by the Center for Global Economy and Business at NYU. Abhishek Bhardwaj acknowledges financial support by Tulane University's Council on Research.

1 Introduction

The CLO market has expanded significantly, with outstanding amounts increasing from $100 billion in 2005 to $650 billion in 2020. As of 2022, 65% of syndicated term loans are securitized and funded by a diverse group of CLO investors, including insurance companies, pension funds, hedge funds, and private debt funds.[1] Traditional bank financing exposes borrowing firms to the idiosyncratic shocks of banks through sticky lending relationships. One might hypothesize that by securitizing loans and distributing them among a broad array of investors, the CLO market can shield firms from idiosyncratic shocks affecting CLO investors, in addition to those affecting banks. Given the size of the CLO market, it is crucial to understand the effects of credit supply shocks in this market, which have important implications for financial stability.

We study the effect of idiosyncratic shocks to investors' capital supply on CLO creation, as well as the financing and real outcomes of borrowing firms. The first challenge is the lack of data on CLO investors. To address this challenge, we use tranche-level holding and transaction data from Life and Property & Casualty insurance companies, the largest investor class for U.S.-based CLOs (DeMarco et al. (2020)). In our data, insurers purchased 35% of all tranches and 47% of mezzanine tranches issued by their relationship CLO managers (i.e., those that insurers invested with in the past) in 2020.

The second challenge is identification. Specifically, we need exogenous variation in investors' capital supply to the CLO market. We address this challenge by using insurers' cash flows as shocks for their capital supply to CLOs. We find that when insurers experience higher cash flows, they increase their investment in CLOs, particularly in deals launched by their relationship CLO managers. Based on this finding, we use insurers' operating cash flows as capital supply shocks to their relationship CLO managers. Different CLO managers are affected differently due to their varying levels of past relationships with each insurer. We argue that these shocks are plausibly exogenous to CLO managers and borrowing firms. These shocks are also idiosyncratic in the sense that they do

[1] See https://www.lsta.org/news-resources/another-looming-threat-to-clos-rule-15c2-11/.

not affect all CLO investors; we control for the average capital supply of CLO investors through time fixed effects in our analyses.

By using insurers' cash flows as shocks to their capital supply to the CLO market, we identify the causal effect of these investors' shocks on new CLO formation, as well as the financing and real outcomes of borrowing firms. Our results suggest that following positive shocks to insurers' capital supply to the CLO market, their relationship CLO managers are more likely to launch new deals. Borrowing firms, whose previous loans are purchased by these CLO managers, experience a decline in loan spreads and are more likely to take out new loans. In addition, these borrowing firms also increase their employment and establishment counts.

Our identification strategy relies on the idea that insurers' operating cash flows are related to CLO managers' deal activities and borrowing firms' financing/real outcomes only through insurers' capital supply. Insurers' operating cash flows depend on factors such as product demand, pricing, and realized losses due to mortality/weather events. By controlling for time fixed effects in all our regressions, we eliminate the average time trend in CLO market conditions and firms' demand for loans. We also control for CLO manager and firm fixed effects in our regressions, removing the effects of manager- or firm-level fixed characteristics. With these fixed effects, it is unlikely that insurers' cash flows are related to CLO managers' activities and firms' financing behavior through channels other than insurers' capital supply to CLOs.

We combine four sets of data. First, we use CLO-i Creditflux data for details on CLOs' assets and liabilities. Second, we use LPC Dealscan data for loan issuance and contract details. Third, we manually match the borrowing firms in the Dealscan-CLO-i matched data, 85% of which are private, to Dun & Bradstreet (D&B) data. D&B provides information on firms' employment and number of establishments. The fourth dataset, based on insurers' statutory filings, covers the universe of insurers' investment in CLOs at the tranche level, as well as insurers' financial information. Our sample, spanning from 2002 to 2020, includes 913 insurers that have ever invested in CLOs, 2,098 CLO deals, 221 CLO managers, and 9,480 firms.

Our analyses take five steps. First, we find that when insurers experience favorable cash flows, they increase their investment in CLOs. One potential reason behind this result is that when insurers have more funds to invest, they may increase their investments in multiple asset categories, including CLOs. Another possible reason relates to insurers' reaching-for-yield incentives (Becker and Ivashina 2015). Cordell et al. (2021) argue that CLOs offer higher yields relative to comparable corporate bonds. This is also the case in insurers' portfolios, as suggested by Fringuellotti and Santos (2021). Ge and Weisbach (2021) find that when P&C insurers are in worse financial health (e.g., due to exogenous weather shocks to their underwriting performance), they shift towards safer investment assets that offer higher yields. Becker and Ivashina (2015) also find consistent results: during the Great Financial Crisis, when insurers were in worse financial conditions, they reduced their reaching for yield. Thus, our finding that insurers increase their investment in CLOs following favorable operating performance is consistent with the idea that insurers are more risk-tolerant and seek higher yields in their portfolios when their financial conditions improve.

Second, we document a sticky relationship between insurers and CLO managers: if an insurer invested in a manager's deals in the past, the insurer is more likely to invest in the manager's new deals. The insurer-CLO manager relationship is stickier if the CLO manager has a smaller CLO portfolio or has a shorter track record, where relationships should matter more, due to worse information asymmetry. Moreover, when insurers' operating cash flows increase, their preference to invest in CLOs managed by their relationship CLO managers increases more.

Third, we find that if a CLO manager is more exposed to insurers' favorable operating cash flows, the CLO manager is more likely to launch a new CLO deal. We calculate each CLO manager's exposure to insurers' operating cash flows as a weighted average of insurers' cash flows, where the weights are the share of the manager's CLO liabilities held by each insurer prior to the cash flows.

Fourth, we document another sticky relationship, i.e., the one between CLO managers and borrowing firms. Specifically, we find that if a CLO manager purchased a certain

firm's loans in the past, the manager is more likely to purchase loans from this firm when she launches a new CLO deal. This result can be explained by CLO managers' information advantage of the firms whose loans they previously acquired.

Finally, we examine how investors' capital supply affects borrowing firms' financing and real outcomes through new CLO deals. A naive way to answer this question is to regress firm outcomes on the number of new CLO deals, assuming deal issuance is driven by investor demand. The problem with this approach is that the formation of new CLO deals could be driven by firms' financing demand: when firms' demand for loans increases, CLO managers may respond by launching more deals. Therefore, any observed relationship between the amount of new CLO deals and firms' outcomes does not reflect the causal effect of investors' demand for CLOs.

To get around the endogeneity concern described above, we use an instrumental variable approach. The endogenous variable is the weighted average number of new CLOs launched by each firm's relationship managers, where the weight is the lagged share of the firm's loans held by each CLO manager. Relying on our findings summarized above, we construct the instrument as firms' exposure to insurers' cash flows through CLO managers. Specifically, the instrument is each firm's weighted average of its relationship CLO managers' exposure to insurers' cash flows. CLO managers' exposure is as described in the third step above. The weight is again the lagged share of the firm's loans held by each CLO manager, as in the endogenous variable construction. For a firm's financing and real outcomes in quarter t, the instrument is constructed using the firm-CLO manager relation and CLO manager-insurer relation, both observed in quarter $t-5$, as well as insurers' cash flows from $t-4$ to $t-1$. To alleviate concerns regarding endogenous matching among firms, CLO managers, and insurers, we also conduct robustness tests where both of the relationships are from quarter $t-9$. Our results remain similar.

The first-stage result suggests that a firm's exposure to insurers' cash flows predicts CLO launches by its relationship managers. The second-stage result suggests that, when relationship managers launch new CLOs due to increased investor capital supply, spreads on new loans decline. In addition, firms, especially private ones that are presumably more

financially constrained, are more likely to take out new loans. We find that firms do not increasingly take out revolvers, which serves as a falsification test, because revolvers are not eligible for CLOs.

Moreover, using the same two-stage least-squares (2SLS) design, we find that firms increase the number of employees and establishments in response to insurers' capital supply increases. These results suggest that firms' financing, as well as real outcomes are exposed to non-bank investors' capital supply shocks through the CLO market.

We contribute new insights to the literature on securitization, in particular to the literature on CLO. Our results have three important implications. First, by having their loans securitized and distributed across a wide set of investors, borrowers can theoretically become more insulated from shocks to banks, as Loutskina and Strahan (2009) find in the case of mortgage securization. However, we find that firms can become susceptible to idiosyncratic shocks to non-bank investors in the CLO market due to concentrated capital and sticky relationships. Second, our results suggest that increased investor capital supply to the CLO market can affect firms' real outcomes rather than merely allowing banks to offload more loans or firms to substitute away from other forms of financing. Third, academics and industry participants attribute the growth of the market to tighter bank regulations (Acharya et al. (2013), Neuhann and Saidi (2016), Kim et al. (2018), and Irani et al. (2021)), as well as borrower demand for securitizable loans due to their covenant-light nature (Prilmeier and Stulz (2020)[2]). Our results suggest that investors' capital supply is likely an important driving force behind the growth of the CLO market, rather than simply catering to the demand of banks and borrowing firms.

Our paper is particularly related to two papers that are consistent with the idea that CLO or CDO (Collateralized Debt Obligation) investors' capital supply affects loans. Ivashina and Sun (2011) find that when loans remain in syndication for a shorter time before being sold, they on average have lower spreads. They also instrument the time before sale with aggregate fund flows into CDOs. Fleckenstein et al. (2020) find that non-

[2]Also see, https://www.ft.com/content/7a9cc064-9ab4-11e1-94d7-00144feabdc0 and https://www.forbes.com/sites/realspin/2014/09/26/leveraged-loans-should-be-lauded-not-maligned/?sh=3f8d471f1ed1.

bank loans, often bought by CLOs, are more cyclical than bank loans. They theorize that the cyclicality in non-bank loans could be driven by CLO investors' funding fluctuations, which is difficult to observe.

We make several distinct contributions relative to Ivashina and Sun (2011) and Fleckenstein et al. (2020). First, by manually matching with the D&B data to collect employment and establishment information for private firms, we identify the effects of non-bank investors' capital supply on firms' real activities. Second, Ivashina and Sun (2011) study the effect of the *aggregate* fluctuation in funding supplies to the CDO market. Fleckenstein et al. (2020) theorize that the *aggregate* funding shocks lead to the cyclicality in non-bank loans. Instead, we highlight that even funding shocks that are *idiosyncratic* to a group of investors matter for the financing and real outcomes of firms affected through sticky relationships. This result highlights severe frictions in this market and has important financial stability implications. Third, our unique setting and data allow us to improve the identification of the *causal* effect of non-bank investors' funding on borrowers. We use microdata on the largest group of investors to directly identify shocks to investors' demand for CLOs. Moreover, we connect the link between investors and CLOs, as well as between CLOs and borrowing firms, and demonstrate that these relationships are sticky. This allows us to create cross-sectional variation in exposure to investor capital supply and to trace the effect of investor demand shocks to specific managers and borrowing firms.

Our paper is also related to a concurrent paper by Fringuellotti and Santos (2021). They focus on why insurers purchase CLOs and argue that insurers do so in search of high yields. We focus on the effect of insurers' capital supply on borrowing firms' financing and real outcomes, relying on insurers' operating performance as an instrument for causal identification.

Other papers in the CLO literature include the following. Nadauld and Weisbach (2012) argue that securitization lowers loan spreads. Benmelech et al. (2012), Wang and Xia (2014), and Bord and Santos (2015) study the effect of securitization on the credit quality of corporate loans. Shivdasani and Wang (2011) argue that growth in CDOs

fueled the LBO boom of 2004 to 2007 by focusing on the role played by banks' active structured credit underwriting. We differ by examining shocks to investors' demand for CLO securities. Loumioti and Vasvari (2019a) and Loumioti and Vasvari (2019b) study the impact of balance sheet constraints imposed on the funds on their portfolio choice and portfolio rebalancing. Cordell et al. (2021) study the performance of CLOs. Kundu (2021) and Bhardwaj et al. (2021), and Bhardwaj and Mukherjee (2022) examine how shocks to CLOs' asset side (loan holdings) affect borrowing firms. Finally, Hinzen (2023) discusses the role of market power in non-bank lending.

We also contribute to the broader literature on securitization beyond CLOs/CDOs, mostly focused on mortgage securitization. In particular, Merrill et al. (2014) find that insurers' demand for RMBS can change the price of these securities. Nadauld and Sherlund (2013) argue that mortgage securitization driven by investment banks led to the expansion of subprime credit. Chakraborty et al. (2020) document that Federal Reserve's purchase of MBS increased banks' mortgage lending. Buchak et al. (2024) build and estimate a model, which indicate that secondary market disruptions have significant large impacts on banks' mortgage lending. These results mirror ours, while we use granular investor data to trace the causal effect of their capital supply on borrowing firms through the CLO market.

Our paper also adds to the literature on how banks' credit supply affects firms' financing and real outcomes including Khwaja and Mian (2008), Duchin et al. (2010), Ivashina and Scharfstein (2010), Cornett et al. (2011), Schnabl (2012), Almeida et al. (2012), Becker and Ivashina (2014), Chodorow-Reich (2014), Acharya and Mora (2015) and so on.[3] Most of the papers study large syndicated loans from Dealscan, 65% of which are now being securitized. Thus, we add important insight to the bank lending literature. We demonstrate that, as a result of banks distributing loans to the CLO market with a wide range of investors, idiosyncratic shocks to large non-bank investors in the CLO market can also affect borrowing firms. The shocks are propagated through CLO

[3]Other papers include Leary and Roberts (2005), Peek and Rosengren (2000), Paravisini et al. (2015), Acharya et al. (2019), Acharya et al. (2018), Leary (2009), and so on.

managers' sticky relationships with both investors and borrowing firms.

Our paper is also broadly related to others that find shocks to non-bank investors in private debt affect firm financing, e.g., Gopal and Schnabl (2020), Erel and Liebersohn (2022), Howell et al. (2021), Davydiuk et al. (2024), and Davydiuk et al. (2020).[4] While they study finance companies, FinTech lenders, and business development companies, we examine the fast-growing and large loan securitization market using detailed data on investors, including data on their financial conditions.

Moreover, our paper contributes to our understanding of the investment behavior of insurers, as well as their effect on financial markets and firms. Insurers are an important group of institutional investors, with $12.8 trillion of assets as of 2024 Q1 (Fed Z1 data). It is important to understand their investment behavior and how they affect the rest of the economy. While most papers in the literature focus on insurers' investment in public corporate bonds, we highlight their role as large investors in the CLO market. Their demand for CLOs, affected by their operating performance, can affect new CLO creation as well as borrowing firms' financing and real activities. Our paper expands the popular view of insurers as "asset insulators", as illustrated by Chodorow-Reich et al. (2021) and Coppola (2021). They argue that insurers insulate the corporate bonds they *hold* in their portfolios from market downturns. We find that insurers' capital supply through their *purchase* of financial assets can be subject to their own idiosyncratic shocks, despite their infrequent sales. Shocks to their asset purchases can be transmitted to the rest of the economy.[5]

[4]Other papers on non-bank corporate lending include Chernenko et al. (2022) and Lim et al. (2014). Buchak et al. (2018b), Buchak et al. (2018a), and Jiang et al. (2020) study the role of non-banks on mortgages.

[5]Other papers examining insurers' investment include Ellul et al. (2011), Becker and Ivashina (2015), Ellul et al. (2015), Ellul et al. (2011), Greenwood and Vissing-Jorgensen (2018), Ozdagli and Wang (2019), Sen and Sharma (2020), Becker et al. (2022) and so on.

2 Data

2.1 CLO Deals and Managers

Detailed data on global CLOs comes from Acuris Creditflux, a leading information aggregator that maintains a comprehensive database of CDOs, CLOs, and credit hedge funds. The data, sourced directly from over 45,000 trustee reports and CLO prospectuses, provide detailed information on around 3,153 CLO deals managed by 226 fund managers over the the sample period of 2002 through 2020. The Creditflux CLO database has been extensively used in the literature,[6] and provides comprehensive coverage of holdings and trading of corporate leveraged loans in the secondary market, especially after 2009 when it becomes nearly complete. Creditflux data provides detailed information on the investments of CLO funds in more than 14,000 firms belonging to 35 broad Moody's industries at a monthly frequency.

A summary description of the CLO balance sheet at the fund's inception is provided in Table 1. A typical CLO in our sample has total assets under management (AUM) of $507 million. 63% of CLO liabilities are classified as senior tranches (defined as AAA rated at inception) and 25% are classified as mezzanine tranches (defined as those rated between AA and B). The weighted average coupon rate (expressed as spread over Libor) on CLO tranches is 1.73%. On the asset side, a typical CLO holds loans of approximately 192 firms, with an outstanding maturity of about 5 years. The loans have an average spread of 3.85% over Libor and a rating score of 11, which corresponds to a B rating. The equity holders of the CLO earn the difference between spreads received from portfolio loans and those paid to the debt investors.[7] There are 226 fund managers in our sample. As shown in Table 1, over the sample period considered in this paper, the average AUM of managers is $2.50 billion and has been in the CLO business for about 8 years.

[6] See Ivashina and Sun (2011), Benmelech et al. (2012), Loumioti and Vasvari (2019a), Loumioti and Vasvari (2019b), among others.

[7] The largest fraction of loans held in the CLO portfolio are rated BB/B, and earn a spread of about 4-5%, while the largest debt tranche of a CLO is rated AAA, and the fund pays a spread of about 0.75 - 1% over Libor.

Our empirical strategy relies on relationships of CLO managers to insurers. CLO managers connected to insurers are likely to be different from other CLO managers. Including manager fixed effects in our empirical analyses controls for the difference. To provide some background on what types of CLO managers insurers invest in, Table A1 tabulates the summary statistics of CLO managers with and without relationship insurers separately and compare the differences. At the mean, CLO managers that are connected with insurers have slightly larger deal sizes, a slightly larger senior and mezzenaine tranche share, as well as a larger number of portfolio firms. They also have a higher tranche-size weighted average tranche coupon rate, but a lower average loan spread. Such CLO managers also have longer experiences.

2.2 Loan Syndication Data

We compile a sample of leveraged loans from the period between 2002 and 2020 using the Refinity LPC DealScan database (DealScan). It contains information about a large number of syndicated loans. Our sample of leveraged loans comprises a subset of such syndicated loans. We include loans that are identified as (i) a term-loan facility, and (ii) has an all-in-drawn spread of greater than 125 basis points. This restriction criterion leads to a total sample of 82,499 leveraged loans originated by 21,702 unique firms in the sample.

Next, we match the firms in the DealScan sample with those held by the CLO funds using a fuzzy matching on names, yielding a matched sample of 9,480 unique borrowers. These are relatively large companies, and in terms of volume, they account for 90% of the CLO holdings in the sample. These firms have a 2.3% chance of issuing a new leveraged loan facility in any given quarter. The average size, spread, and maturity of the loans are $916 million, 315 bps, and 5.6 years.

2.3 Insurance Company Data

We obtain data on life insurance companies' financials and investments through S&P Global based on insurers' statutory filings. All US-domiciled operating insurance companies need to report these filings, giving us data on the universe of insurers in the U.S. Insurers' financial variables are available from 1996. We obtain data on their investment from 2002 to 2020.

Insurers report detailed investment holding and transaction data at the CUSIP level in Schedule D of their statutory filings. To map CUSIP to the CLO tranches, we proceed in two steps. First, we filter all CUSIPs whose description includes the string "CLO", "CDO", "collateralized loan obligations", or "collateralized debt obligations". Then, we use the Creditflux data to create a list of CLO tranche securities (with information on deal name, manager name, and tranche name) and hand-match each of them to CUSIPs using the information on issuers' names and issues' description in the NAIC data. Insurers' holdings comprise 7,154 CLO tranches of 1,851 CLOs issued by 188 managers and amounted to $84 billion in 2020.

2.4 Firm Outcomes Data

Employment and establishment-level data for our study come from the Global Linkage file in the D&B Historical Global Archive database. D&B gathers data from firms as well as other sources and distributes it for purposes such as marketing and credit scoring.[8] D&B sources data from various sources including state secretaries, Yellow Pages, court documents, and credit inquiries, in addition to direct telephone outreach to businesses. These files contain detailed information on the location and number of employees working at the establishment level. They also consist of international business records that contain ownership relationships linking them in a family tree structure. The database contains a *global-ultimate-duns-number* for every establishment, which we use as the firm identifier.

[8]While businesses aren't legally required to contribute or provide accurate information, D&B is driven by profitability motives to ensure data accuracy. Moreover, the credibility of individual businesses in terms of credit and other partnerships might hinge on the precision of the data they submit.

We match the D&B data with the Dealscan data using firm names, locations, and industry identifiers. Table 1 presents the summary statistics of key variables used in our analysis. The median firm in our matched sample employs 322 employees and has 5 establishments.

3 Insurers' Cash Flows

Insurers' operating cash flows, based on statutory filings, are the sum of premiums, net investment income, and miscellaneous income, minus benefits and losses, transfers to separate accounts, commissions, dividends to policyholders, and taxes. We add back dividends to policyholders as this is an endogenous decision. We also subtract investment income related to insurers' investments in CLOs, although CLOs make up a small portion (2.6% in 2020) of insurers' cash and invested assets. This addresses the concern that insurers' past high cash flows can be correlated with the favorable performance of their relationship CLO managers, which may drive our results. We then scale this cash flow measure by insurers' lagged assets and use these cash flows as our instrument.

One may still be concerned that insurers' non-CLO investment cash flows can be endogenously related to the outcomes we study. We address this concern in two ways. First, one concern is that insurers may tilt their portfolios towards certain industries or states in both their CLO and non-CLO investments. Say, firms in certain industries or states have performed well in the recent past, which leads to higher lagged insurer investment cash flows. The subset of these firms in the CLO market may also experience higher financing needs, causing an endogenous relation between insurers' cash flows and firm outcomes.

To address this concern, throughout our firm-level analyses, we control for state-by-time and industry-by-time fixed effects to remove the effect of state and industry trends. In addition, we also present robustness tests excluding all of insurers' investment cash flows. All of our main results hold at the insurer, CLO manager, and firm levels, despite the first stage becoming weaker. These results suggest it is unlikely that unobservable common factors in insurers' non-CLO investments cause both insurers' lagged cash flows

and the related CLO borrowing firms' financing needs to be high.

4 Effect of Insurers' Cash Flows on their CLO Investments

We hypothesize that when life insurers' operating cash flows are high, they are likely to increase their investment in CLOs. The first reason is that when operating cash flows are high, insurers have more cash flows to invest in financial assets since their payout to shareholders is limited by regulation (see, Ge (2022)). The second reason is related to Ge and Weisbach (2021), who show that when property and casualty insurers experience favorable operating performance, they shift their investment portfolios towards riskier bonds likely due to their increased appetite to reach for yield. Becker and Ivashina (2015) also find consistent results: during the Great Financial Crisis, when insurers were in worse financial conditions, their tendency to reach for yield decreased. Cordell et al. (2021) argue that CLOs cater to investors' reaching-for-yield demand given their high yields relative to corporate bonds with the same rating. In this section, we first examine whether cash flow shocks increase insurers' investment in CLOs.

In Table 2, we estimate the following regression:

$$\text{Y}_{i,t} = \beta \times \text{Insurer Operating CF}_{i,t-4 \text{ to } t-1} + \alpha_i + \alpha_t + \varepsilon_{i,t}$$

$Y_{i,t}$ denotes insurer i's investment in CLO in year-quarter t. We use three measures of CLO investment: (i) $1(CLO\ Purchase)_{i,t}$ is an indicator for a CLO purchase transaction, (ii) $\#\ CLO\ Purchase_{i,t}$ is the number of CLOs purchased, and (iii) $Log(1 + CLO\ Purchase)_{i,t}$ is the dollar value of CLO tranches purchased, expressed in natural logarithm. $Insurer\ Operating\ CF_{i,t-4 \text{ to } t-1}$ is insurer i's total cash flows from year-quarter $t-4$ to $t-1$ scaled by assets at $t-5$. We use four quarters of insurer cash flows so that any seasonality or volatility in each insurer's quarterly cash flows can be smoothed

out. This also allows some delay between insurers' cash flows and their capital supply to the CLO market. We include insurer and year-quarter fixed effects. Standard errors are clustered at the insurer level.

The estimated coefficients on *Insurer Operating CF* are positive and statistically significant in all three columns, suggesting that insurers increase their investment in CLOs following favorable operating cash flows. The estimate in Column (3) suggests that a one-standard-deviation increase in insurers' cash flows is associated with an 8.72-percent (=0.08×1.09) increase in the amount of CLO liabilities purchased by insurers. Here we restrict to insurers who had any holdings of CLOs as of year-quarter $t-5$, because the empirical strategy for the rest of the paper relies on these insurers. In Table A2, we repeat the analyses with the universe of US insurers. Overall, these results indicate that insurers' increase their investment in CLOs following favorable operating performance.

In Table A3, we replace the outcome variable with insurers' quarterly purchases of industrial bonds (excluding CLOs) in Column (1) and US government bonds in Column (2), both in natural logs. The estimated coefficients on insurers' cash flows are positive and statistically significant. This suggests that when insurers have more cash flows to invest, they increase their investment across the board. This result also offers support for our identification strategy. Because insurers also increase their government bond purchases following favorable cash flows, it is unlikely that some ommitted variables are correlated with both CLO activities and insurer cash flows.

Do insurers increase their CLO investment with their cash flows even more when interest rates are low? Table A5 repeats Table 2, adding an interaction term between insurers' cash flows and the Fed Funds Rate. The estimated coefficient on the interaction is negative in each column and is statistically significant in Column (3). This result is consistent with the idea that insurers' reaching-for-yield responses to their cash flows are stronger in a low-interest rate environment. This could also be consistent with the fact that the CLO market was larger in later years of our sample period when interest rates were low. During these periods, when insurers experienced higher cash flows, they were more likely to invest in CLOs because CLOs are more readily available, compared to

earlier years when CLOs were less available.

5 Insurer-CLO Manager Relationship and Insurers' CLO Purchase

Our results in Table 2 suggest that insurers increase their investment in CLOs following an increase in their operating performance. However, insurers may not invest randomly across all newly issued CLOs. We hypothesize that they may rely on their past relationships with CLO managers and disproportionately invest in deals issued by these managers. One reason is that a CLO manager is more likely to market to its past investors since it has easy access to them. Another possible reason is information asymmetry. Consistent with this argument, Barbosa and Ozdagli (2021) find that insurers buy more bonds from issuers whose bonds they already hold. Information is likely to be more opaque in the CLO market. Thus, insurers' familiarity with certain CLO managers is presumably more important, because insurers may produce private information about the managers. In this section, we first construct a measure of the manager-insurer relationship and then show that higher insurers' cash flows lead them to increase investments in new CLOs launched by their relationship managers.

We use insurers' holdings data to calculate each insurer i's investment in CLOs issued by manager m in year-quarter t, *Insurer's CLO Holding*$_{i,m,t}$. In other words, we define that an insurer has a relationship with a manager if it holds any of the outstanding tranches issued by the manager.

We use this relationship measure to test our hypothesis that, when insurers experience higher operating cash flows, they increase their investment disproportionately in deals launched by their relationship managers. Table 3 presents the results of the following

specification:

$$\begin{aligned}1(\text{Insurer Investment})_{i,c(m,t)} = \beta \times \text{CLO Manager-Insurer Relation}_{i,m,t-5} \\ + \lambda \times \text{Insurer Operating CF}_{i,t-4 \text{ to } t-1} \\ + \gamma \times \text{CLO Manager-Insurer Relation}_{i,m,t-5} \times \text{Insurer Operating CF}_{i,t-4 \text{ to } t-1} \\ + \alpha_i + \alpha_c + \alpha_t + \varepsilon_{i,c(m,t)}.\end{aligned}$$

Observations are at the insurer-CLO deal level. We match each CLO deal to every possible investor, where the set of potential investors consists of insurers with nonzero CLO holdings during the previous year. The variable $1(Insurer\ Investment)_{i,c(m,t)}$ is an indicator of whether insurer i invested in CLO c launched by manager m in year-quarter t (multiplied by 100). We consider investments within one year of each CLO's formation.[9] As defined above, the indicator, $CLO\ Manager\text{-}Insurer\ Relation_{i,m,t-5}$, is one if insurer i holds a CLO of manager m in year-quarter $t-5$. $Insurer\ Operating\ CF_{i,t-4 \text{ to } t-1}$ is insurer i's total cash flows from year-quarter $t-4$ to $t-1$ scaled by assets.

We use year-quarter fixed effects (α_t) to absorb aggregate trends and CLO fixed effects (α_c) to address the possibility that some CLOs may be attractive to many insurance companies. We also control for insurer fixed effects (α_i) because of factors like insurers' share in the CLO market, which can be simultaneously correlated with our relationship measure (through past investments) and the probability of new CLO investment. Standard errors are clustered at the CLO level.

In Column (1) of Table 3, we only include CLO Manager-Insurer Relation as the independent variable, along with the fixed effects described above. The estimated coefficient on CLO Manager-Insurer Relation is positive and statistically significant. The magnitude suggests that an insurer that financed a manager in the past is 1.3 ($=\frac{1.59+1.21}{1.21}$) times more likely to invest in new CLO deals issued by the manager relative to the unconditional

[9] We consider initial investments because insurers make most of their investments during this period and rarely trade CLO tranches in the illiquid secondary market (Hendershott et al. (2020)). Additionally, CLO managers' decision to launch new funds would be most likely driven by their ability to sell the newly issued tranches.

average. Following the literature on traditional bank lending relationships (Bharath et al. (2011)) we interpret this as evidence of a sticky relationship between insurers and CLO managers.

In Column (2), we add the interaction between *CLO Manager-Insurer Relation* and *Insurer Operating CF* from the previous year-quarter. The estimated coefficient on the interaction term is positive and statistically significant, suggesting that after insurers experience higher cash flows, they increase their investment in deals launched by their relationship managers by more. The estimate suggests that a one-standard-deviation increase in an insurer's cash flow to assets ratio further increases its probability of investing in a relationship CLO by 0.60 (=$(5.53 + 1.15) \times 0.09$) percentage points and a non-relationship CLO by (=1.15×0.09) by 0.10 percentage point. As a benchmark, the average investment probability is 1.21%.

As we hypothesize earlier in this subsection, the insurer-CLO manager relationship can be sticky if CLO managers have limited marketing reach or if insurers produce valuable private information on CLO managers. Relationships will matter more for CLO managers with smaller deals in the past or a shorter track record, since these managers likely have a more limited marketing reach and their management strategies/skills are more opaque. To test these predictions, in Column (3), we also interact $CLO\ Manager\text{-}Insurer\ Relation_{i,m,t-1}$ with $Large\ Manager_{m,t-1}$ and $Old\ Manager_{m,t-1}$, which are indicators for whether manager m's CLO assets and age are higher than the sample median during year-quarter $t-1$.

In Column (3), the negative estimated coefficient on the interaction terms with *Large Manager* and *Old Manager* suggests that preexisting relationships are less important for older and larger managers. For instance, while small and new managers are 3.3 (= 4.00/1.21) times more likely to receive funding from a relationship insurer, our estimates suggest that larger (older managers are only 1.1 (=$frac4.00 - 2.621.21$) times and (2.3 (=$frac4.00 - 1.241.21$) times more likely to receive funding from a relationship insurer, respectively. This is consistent with the notion that as managers grow and develop a wide marketing reach and a longer track record over time, they are less dependent on their

preexisting set of investors and can build new ties with investors more easily. It is also possible that managers who grow to be larger and stay longer in business are of higher quality, making private information about them less valuable.

One potential reason for sticky relationships between insurers and CLO managers is that certain insurers might dominate in a particular CLO market segment. Thus, CLO managers in that market segment may be restricted to those insurers as potential investors, leading to repeated interactions. In Column (4), we investigate whether this drives our result. To do so, we include the following fixed effects: insurer by year-quarter, insurer by CLO size quartile, and insurer by CLO weighted-average coupon quartile. With these fixed effects, we essentially control for each insurer's average investment probability in a year-quarter, as well as in a CLO size and coupon quartile. The estimated coefficient on *CLO Manager-Insurer Relation* remains similar to Column (3), indicating that sticky relationships are unlikely an artifact of insurer specialization.

For the idnetification of our empirical strategy, our key result in this section is that relationship managers obtain more of insurers' funding when insurers' cash flows increase.

6 Relationship CLO Managers Respond to Insurers' Capital Supply By Launching New CLOs

Our results in Table 3, discussed above, suggest that insurers' favorable operating performance increases their demand for CLOs, especially new deals by their relationship managers. In this section, we examine the effect of insurers' capital supply on CLO managers. Specifically, we analyze whether insurers' relationship CLO managers launch more deals in response to these demand shocks. We use the sticky manager-insurer relationships to calculate each manager's exposure to insurers' cash flows. Since each manager is related to a different set of insurers, we can exploit the cross-sectional variation in managers' exposure in our analysis.

Formally, we construct manager m's exposure to insurers' performance in quarter $t-1$

as:

$$\text{CLO Manager Exposure}_{m,t-1} = \sum_i \left(\frac{\text{Insurer's CLO Holding}_{i,m,t-5}}{\text{Outstanding CLO Liabilities}_{m,t-5}} \times \text{Insurer Operating CF}_{i,t-4 \text{ to } t-1} \right).$$

$\frac{\text{Insurer's CLO Holding}_{i,m,t-5}}{\text{Outstanding CLO Liabilities}_{m,t-5}}$ is insurer i's share in manager m's outstanding liabilities in quarter $t-5$. $Insurer\ Operating\ CF_{i,t-4 \text{ to } t-1}$ is insurer i's cash flows between quarter $t-4$ and quarter $t-1$ scaled by assets in quarter $t-5$. In other words, a manager's exposure is the average value of insurers' cash flows to assets weighted by a continuous measure of its relationship with each insurer.

We test whether exposure to insurers' cash flows in $t-1$ increases the probability of CLO issuance in t. To do so, we regress CLO issuance activity for each manager in quarter t on manager exposure in quarter $t-1$. Table 4 shows the results of the following specification:

$$Y_{m,t} = \beta \times \text{CLO Manager Exposure}_{m,t-1} + \alpha_m + \alpha_t + \varepsilon_{m,t}.$$

$Y_{m,t}$ denotes outcomes of manager m in year-quarter t, which is an indicator for CLO issuance in Column (1), the number of CLOs launched in Column (2), and the log of CLO issuance volume plus one in Column (3). We employ manager fixed effects (α_m) and year-quarter fixed effects (α_t) since the decision to launch new deals is potentially correlated with unobserved manager characteristics and aggregate economic trends. We cluster the standard errors at the manager level.

Column (1) shows that a one-standard-deviation increase in the exposure to insurers' cash flows increases the probability of CLO issuance in a quarter by 1.96 percentage points (3.71×0.53), which is 12% of the unconditional probability of CLO issuance in a given quarter (16.44%). Columns (2) and (3) show that higher manager exposure is also associated with a higher number and dollar value of new CLOs. These results highlight that insurers' capital supply, driven by their operating performance, has a significant impact on relationship managers' decisions to launch a new CLO.

Our interpretation of the results in Table 4 relies on the idea that insurers are significant investors in CLO deals. In our data, 1,627 out of 3,153 (51%) CLOs have insurer investors. For these CLOs, Figure A2 plots the distribution of the percentage of CLO liabilities purchased by insurers, both at the CLO deal and manager levels. On average, an insurer invests in approximately 14% of newly issued liabilities in each CLO deal and 16% of all liabilities issued by a CLO manager. 26% of CLO deals have an insurer purchasing more than 20% of all liabilities. These numbers highlight that insurers are an important class of investors for CLOs and can plausibly have a significant impact on CLO manager's decisions.

We can compare the magnitudes of the effect of insurers' cash flows on their investment in CLOs (Table 2) and on CLO managers' activities (Table 4). Table 2 suggests that when an insurer's cash flows increase by two standard deviations, their CLO purchase amount increase by 18% or \$34M (multiplying 18% by the amount of the average total investment of \$186M). Each insurer invests in a total of 1.7 (mean) managers in a given quarter. Thus, each manager obtains on average \$34M/1.7=\$20M extra capital supply. Based on Table 4, two standard deviations increase in relationship-weighted insurer cash flows correspond to a 25% or \$19M increase in the launch volume for managers related to those insurers. The two magnitudes separately inferred from the two tables—\$20M and \$19M—are very close to each other.

7 Sticky Relationships between CLO Managers and Borrowing Firms

Our results so far suggest that 1) when insurers experience higher cash flows, they increase their investment in their relationship CLOs; 2) CLO managers more exposed to insurer cash flows through past relationships are more likely to launch new deals. Ultimately, we are interested in the effect of increased insurer capital supply to the CLO market on borrowing firms. In this section, we identify which firms are more likely to

be affected by increased insurer investment in CLOs by analyzing sticky relationships between CLO managers and borrowing firms.

When CLO managers decide to launch a new CLO, they purchase on average over 200 loans worth $500 million in a short span of six months.[10] It is likely that their demand for loans increases the capital supply to firms that use leveraged loans for financing. If so, which firms benefit from the capital flow to CLOs depends on how managers choose their portfolio firms when launching a new fund. We hypothesize that managers exhibit persistence in their portfolio choices of firms: a manager is more likely to choose loans of firms in which the manager has invested in the past. As a result, firms having a preexisting relationship with a CLO manager may benefit more when the manager launches new deals in response to an increased capital supply.

There can be several reasons why managers purchase the loans of their past portfolio firms for their new deals. First, acquiring and producing information about loan quality may be costly, so managers may be inclined towards purchasing the loans of firms for which they have already examined through their previous purchases. If costly information acquisition or production drives the continuation of relationships, then the effect is likely to be stronger for more opaque firms. Second, CLO managers often purchase their loans after consulting their underwriter bank. The underwriter bank may themselves have a relationship with borrowing firms, thus, creating a link between CLO managers and a certain set of firms. The bank may induce the CLO manager to invest in these firms (by transferring soft information or by any other means) if it benefits the bank in securing higher loan underwriting fees. These two reasons for the continuation of relationships may operate simultaneously.

To examine how relationships affect the initial portfolio formation in new CLO deals, we focus on the loans chosen by a manager during the ramp-up period. We ignore the

[10]Once managers decide to launch a new CLO, they finalizes a portfolio of loans that will go into the fund over the course of three to six months. This period is called the *ramp-up* period of the CLO. The "Effective date" of a fund signifies the end of this formation period, at which point the fund becomes active. From that point, the manager actively trades in the secondary loan market, the fund runs monthly compliance tests to ensure good standing on contractual covenants, and periodic payouts to debt and equity holders commence.

loans they buy later, because their trading behavior in later periods are less likely to be driven by insurers' capital supply, but more likely to be driven by news about borrowing firms.For CLO c launched by manager m in year-quarter t, we define a consideration set of firms whose loans can be chosen by the manager. The consideration set consists of all firms with leveraged loans outstanding between $t-20$ and t.[11] Essentially, we allow the possibility that a manager purchases either an outstanding loan or a new loan taken out in quarter t by such a firm. This method ensures that only firms with an active presence in the leveraged loan market enter our consideration set. To evaluate the extent to which existing relationships between firms and fund managers impact their probability of being selected in the new fund, we estimate the following specification and present results in Table 5:

$$1(\text{Loan Included in CLO})_{f,c(m,t)} = \beta \times \text{Firm-CLO Manager Relation}_{f,m,t-1} + \alpha_c + \alpha_{f,t} + \varepsilon_{f,c(m,t)}$$

Observations are at the CLO-firm level. Each observation is a CLO c matched to one of the firms in its consideration set. $1(\textit{Loan Included in CLO})_{f,c(m,t)}$ is an indicator which assumes a value of one if loans issued by firm f are included in a new CLO c launched by the manager m in year-quarter t, and zero otherwise. $\textit{Firm-CLO Manager Relation}_{f,m,t-1}$ is an indicator that equals one if loans from firm f were also held by existing CLOs of manager m during year-quarter $t-1$.

We include CLO, firm, and year-quarter fixed effects in Column (1). We include CLO and firm-by-year-quarter fixed effects in Columns (2) and (3). These fixed effects ensure that the relationship effect is not driven by the large presence of certain CLO deals or borrowing firms, nor by a time period with few managers and borrowing firms. We double cluster the standard errors by CLO and launch year-quarter.

The estimated coefficients on *Firm-CLO Manager Relation* are positive and statisti-

[11] While forming the initial portfolio, the manager can choose among the leveraged loans already trading in the secondary market, or acquire them directly through active participation in the leveraged loan syndication process. Bharath et al. (2011) adopt a similar look-back strategy to quantify bank-firm relationships. Our results are also robust to using the entire set of firms in the CLO database as the consideration set.

cally significant. The estimate in Column (1) indicates that CLO managers are 7.73 times (25.57/3.31) more likely to purchase loans of firms they previously invested in relative to loans of an average firm in their consideration set. Thus, there appears significant persistence in CLO managers' portfolio choices across their subsequent deals. The estimate in Column (2), where we control for firm-year-quarter fixed effects, is very similar. A concurrent paper by Hinzen (2023) also documents the sticky relationship between CLO managers and borrowing firms.

The interaction term, *Firm-CLO Manager Relation*$\times$*CLO-Manager Exposure*, has a positive and statistically significant estimated coefficient. This suggests that when managers experience high insurer cash flows through their past relationship with insurers, they disproportionally buy loans taken by firms that were in their past portfolios. This additional effect is small. However, for our identification purpose, we can obtain variation of the insurers' effect on firms through firms' relationship with managers as long as the manager-borrower relationship does not disappear when manager exposure is high. In other words, we only need the coefficient on the interaction term not to be negative and offset the effect of *Firm-CLO Manager Relation*.

We conjecture earlier in this section that information acquisition costs and the mediating banks' influence may result in the stickiness of firm-manager relationships in the CLO business. To shed light on the mechanism, we add the interaction between *Firm-CLO Manager Relation*$_{f,m,t-1}$ and *Firm-Underwriter-CLO Manager-Relation*$_{f,m,t-1}$. The latter of the two is an indicator that equals one if a bank that is a lead arranger of any of firm f's outstanding loans outstanding at time $t-1$ is also an underwriter of any of manager m's CLOs outstanding at time $t-1$, i.e., when a bank has simultaneous relationships with firm f and manager m in $t-1$.

The coefficient on the interaction term is positive and statistically significant. The estimate implies that the relationship effect for firms linked to CLO managers through a common bank is 15% stronger than the average firm. This result is consistent with the idea that banks can alleviate search frictions between firms and CLO managers, thereby helping their relationship borrowers obtain CLO financing (Bhardwaj and Mukherjee

(2022)). These results suggest that both information acquisition costs and the mediating banks' influence may result in the stickiness of firm-CLO manager relationships.

8 Effects of Investor Capital Supply to CLOs on Firms

8.1 Effects on Firm Borrowing

Our results above suggest that when investors' capital supply to CLOs increases, CLO managers respond by launching new deals. In this section, we analyze how investors' capital supply to CLOs affects firms' decisions on taking out new loans. In a naive approach, one would analyze the relationship between new CLOs being launched and firms' financing outcomes, assuming that CLOs are launched due to increased investor capital supply. We start our analysis with this naive approach before turning to our instrumental variable approach.

Results in Table 5 indicate that CLO formation increases the demand for leveraged loans issued by portfolio firms in managers' past deals. Thus, we hypothesize that when a firm's relationship managers launch new deals, the firm is more likely to take out new loans. We test this hypothesis by studying firms' borrowing activities in response to a new deal launched by one of their relationship managers. We use the LPC Dealscan data from 2002 to 2020 to identify new leverage loans. Column (1) of Table 6 shows the estimation results of the following OLS specification:

$$1(\text{Loan Issuance})_{f(j,s),t} = \beta \times \text{Relation Manager \# CLO}_{f,t-1} + \alpha_f + \alpha_{j,t} + \alpha_{s,t} + \varepsilon_{f,t}$$

$1(Loan\ Issuance)_{f(j,s),t}$ is an indicator that equals one if firm f in industry j and state s issues a new leveraged loan during year-quarter t. $Relation\ Manager\ \#\ CLO_{f,t-1}$ is the relationship-weighted average number of funds launched by firm f's related CLO managers during the year-quarter $t-1$. We control for firm, industry-year-quarter, and state-year-quarter fixed effects. We cluster the standard errors at the firm level.

We find that when the weighted average number of funds launched by relationship managers increases by one standard deviation (0.30), the firm's probability of issuing a new leveraged loan increases by 0.26 (0.86×0.30) percentage points. The unconditional probability is 3.5%, indicating a 7% jump in loan issuance. Figure 1, Panel (a) is a scatter plot of the outcome variable against the independent variable, both demeaned by taking out firm, state-year-quarter, and industry-year-quarter fixed effects. The scatter plot also shows a positive correlation between the two.

Instrumental Variable Analysis An important concern in estimating the causal impact of CLO funding and new CLO launches on firms' borrowing decisions is that CLOs are not created randomly. In our setting, the primary identification concern is that new CLO formation is driven by firms' demand for credit. When firms' demand for loans increases, they are more likely to take out new loans and CLO managers may respond by launching more deals as banks try to distribute these loans to the CLO market. This can lead to a positive correlation between new CLO deal formation and firms' loan issuances.

To address the concern with the OLS regression, we use an instrumental variable approach, which relies on our previous two findings: (1) insurers' operating cash flows affect the CLO formation of exposed CLO managers (2) the relationship between CLO managers and their portfolio borrowing firms is sticky. We construct an instrument for $Relation\ Manager\ \#\ CLO_{f,t-1}$ using firm-level exposure to insurers' cash flows using the two relationships as weights as follows:

$$\text{Firm Exposure to Insurer CF}_{f,t-2} = \sum_m \left(\frac{\text{Manager's Firm Holding}_{f,m,t-6}}{\text{Outstanding Firm Loan}_{f,t-6}} \times \text{CLO Manager Exposure}_{m,t-2} \right)$$
$$= \sum_m \left[\frac{\text{Manager's Firm Holding}_{f,m,t-6}}{\text{Outstanding Firm Loan}_{f,t-6}} \times \sum_i \left(\frac{\text{Insurer's CLO Holding}_{i,m,t-6}}{\text{Outstanding CLO Liabilities}_{m,t-6}} \times \text{Insurer Operating CF}_{i,t-5 \text{ to } t-2} \right) \right]$$

$\frac{\text{Manager's Firm Holding}_{f,m,t-6}}{\text{Outstanding Firm Loan}_{f,t-6}}$ is the share of firm f's outstanding loans held by manager m during year-quarter $t-6$. In this equation, $Outstanding\ Firm\ Loan_{f,t-6}$ is the total value of firm f's outstanding loans in the CLO-i data during the year-quarter $t-6$. $CLO\ Manager\ Exposure_{m,t-2}$ is manager m's exposure to related insurers' cash flows, as

defined in Section 6 and spelled out in the second line of the equation. $CLO\ Manager\ Exposure_{m,t-2}$ depends on managers' relationship with insurers in quarter $t-6$ and insurers' cash flows between $t-5$ and $t-2$. A firm has a higher exposure to insurer cash flows if it has more relationships with managers that are exposed to insurer cash flows.

We use $Firm\ Exposure\ to\ Insurer\ CF_{f,t-2}$ as an instrument for CLO launches by firm f's relationship managers in quarter $t-1$. The exclusion restriction we assume is that, after absorbing time-invariant firm-level factors using firm fixed effects, industry and local geographic fluctuations using industry-year-quarter and state-year-quarter fixed effects, insurers' operating performance affects firms' borrowing decisions in the leveraged loan market only by increasing new CLO formations.

Since life insurance companies' cash flows depend mainly on policy premiums, payouts, and investment income, they are unlikely to correlate with the economic prospects and financing outcomes of non-financial firms through other channels. This is especially the case since we exclude income related to insurers' CLO investments, as well as control for firm, industry-by-year-quarter, and state-by-year-quarter fixed effects.

For the endogenous variable in year-quarter $t-1$, the instrument is constructed using the firm-CLO manager relation and CLO manager-insurer relation, both observed in quarter $t-6$, as well as insurers' cash flows from $t-5$ to $t-2$. To alleviate concerns regarding endogenous matching among firms, CLO managers, and insurers, we also conduct robustness tests where the two relationships are from quarter $t-13$. We discuss these results in Section 8.3.

Column (2) of Table 6 presents the first-stage result. It suggests that a one-standard-deviation increase in the firms' exposure increases the average number of CLO fund issuance by relationship managers by 0.14, a large magnitude compared to the mean of 0.09. Figure 1, Panel (b) is a scatter plot of the endogenous variable against the instrument, both twice demeaned according to our fixed effects. The scatter plot shows a positive correlation between the two.

Column (3) of Table 6 shows the results of the second-stage instrumental variable

specification. The estimated coefficient on the instrumented *Relation Manager # CLO* suggests that firms' probability of taking out a leveraged loan is 0.34 percentage points higher when the number of funds launched in the previous quarter increases by one standard deviation (0.3). This magnitude is 10% of the unconditional probability of taking out a leveraged loan. Figure 1, Panel (c) is a scatter plot of the outcome variable against the predicted endogenous variable, both demeaned according to our fixed effects in Table 6. The scatter plot also shows a positive correlation between the two.

Our interpretation of the results so far in this section relies on the idea that CLO managers can play a significant role in the borrowing firms' financing. In other words, CLO managers need to buy significant shares of firms' loans. Figure A1 plots the histogram of the share of firms' outstanding securitized loans held by each CLO manager. CLO managers often hold a significant share of a firm's leveraged loans with the mean being 7.36%. The largest manager for a firm holds around 57% of its loans.

We next examine whether our results hold for public or private firms in Table 7. In Column (1), we use the sample of public firms, while in Column (2), we use private firms. The results indicate that the effect on loan financing is only present for private firms, but not for public firms. This is consistent with the idea that private firms are more financially constrained, because of e.g., worse information asymmetry. Therefore, private firms are more likely to face credit rationing by banks. When banks can more easily sell the loans, they may become more likely to offer loans to firms. Thus, private firms can be more sensitive to such changes in loan supply.

In Column (3) of Table 7, we examine the probability of firms taking out a revolver loan as a falsification test. CLOs generally do not purchase revolver loans. If investors' capital supply drives firms to take out more debt through the CLO market, we should not observe any effects on firms' probability of taking revolver loans. Column (3) repeats the second-stage instrumental variable regression in Table 6, replacing the dependent variable with an indicator for whether a firm takes out a revolver loan in a quarter. The estimated coefficient on the instrumented *Relation Manager # CLO* is negative and statistically indistinguishable from zero. This result suggests that investors' capital inflow through

the CLO market has little effect on firms' probability of taking revolver loans, consistent with our hypothesis.

Effects on Loan Characteristics, Spreads, and Purpose We next investigate the effect of investor capital supply to CLOs through relation managers on the characteristics and spreads of the new leveraged loans taken out by borrowing firms. We use data at the loan level and look at how loan characteristics and spreads vary with the instrumented number of new CLOs by relationship managers. As before, we instrument CLO launches using firm exposure to insurer cash flows and present the results of the instrumental variable specification in Table 8. We find that the influx of institutional capital lowers loan maturity and spreads. For a one-standard-deviation increase in the instrumented weighted number of CLOs by relationship managers (0.37), new loan maturities decline by 0.24 years or around three months, 5% of the average maturity of 5.3 years. We do not observe significant changes to loan size or the number of covenants. In addition, we find that loan spreads decline with the instrumented *Relation Manager # CLO*. In Column (5), where we control for loan characteristics including maturity, a one-standard-deviation increase in the weighted number of CLOs by relationship managers leads to a reduction in loan spreads by 10.7 basis points, which is 3% of the mean.

Table A4 examines the purpose of new loans as an outcome variable. In Panel (A), we use the linear instrumental variable framework as in the previous tables. The outcome variable is an indicator of whether a new loan is designated for (1) "General Purpose" and other investment purposes; (2) either refinancing or dividend payouts; (3) leveraged buyouts; (4) other purposes. In Panel (B), we use a multinomial logit regression. Due to the lack of a standard estimation procedure for instrumenting endogenous variables in a multinomial logit model, we use the instrument directly as the main independent variable in the regression rather than a 2SLS approach. Due to econometric problems associated with including a large number of fixed effects in nonlinear models, we only include year-quarter fixed effects. Panel (B) reports the marginal effects estimated at the mean of the independent variables. The results in both panels suggest that when

investor demand for leveraged loans increases, new loans are more likely to be for general purposes/investment, and less likely to be for leveraged buyouts.

8.2 Effects on Firm Employment and Establishment Counts

Does the increased financing have any real effects? If the increased credit supply through the CLO market simply substitutes other forms of lending (e.g., banks' on-balance-sheet lending), we may not see any real effects. To study this question, we follow the same 2SLS structure of our previous analysis. Table 7 suggests that investors' capital supply mainly affects the financing activities of private firms. Since standard datasets on firm outcomes such as Compustat do not cover private firms, we use the number of employees and the number of establishments in the D&B data to identify the effect of capital supply on firms' real outcomes, namely the number of employees and establishments.

Table 9 repeats the second-stage instrumental variable regression in Table 6, replacing the dependent variable with firms' employment and number of establishments, both in natural logarithm. The coefficients on the instrumented *Relation Manager # CLO* are positive and statistically significant in all the columns. In Column (1), the result indicates that firms increase employment and establishment count by 7.3% and 7.0% when the number of CLO funds launched in the previous quarter increases exogenously by one standard deviation.

The results in this section suggest that when investors' capital supply to the CLO market increases, new debt becomes cheaper, firms obtain more loans, increase their employment, and expand their operations. These results indicate that an increased capital supply to the CLO market does not simply allow banks to offload more loans from their balance sheet, but rather supply more capital to borrowing firms.

8.3 Robustness

8.3.1 Using Longer-Lagged Relationships

Results in Section 6 indicate that CLO managers launch more new deals after they experience an increase in their relationship insurers' cash flows. One may be concerned that this is the result of endogenous matching. For example, CLO managers who want to launch new deals establish relationships with insurers who will experience favorable cash flows. Alternatively, say, some insurers know that they will experience high cash flows and, thus, will want to invest more in CLOs. In anticipation of their future investment, they establish relationships with CLO managers who will launch more deals.

To alleviate the concern, Table A7 repeats Table 4 by replacing the relationship measure used with the one further lagged. Specifically, we regress CLO manager outcomes in year-quarter t on the term below, where relationship is measured in year-quarter $t-12$:

$$\sum_i \left(\frac{\text{Insurer's CLO Holding}_{i,m,t-12}}{\text{Outstanding CLO Liabilities}_{m,t-12}} \times \text{Insurer Operating CF}_{i,t-4 \text{ to } t-1} \right).$$

The results stay similar to those in Table 4.

One may be similarly concerned about our 2SLS analyses on firms' outcomes. For firms' outcomes in year-quarter t, the instrument uses CLO manager-firm relationship and CLO manager-insurer relationships both measured in $t-6$, which are prior to insurer cash flows measured from $t-5$ to $t-2$. Even with such lagged relationships, one may still be concerned that they are endogenous to the borrowing firms' demand for capital: if a firm anticipates increased borrowing needs in t, it may establish a relationship with certain CLO managers in $t-6$. These CLO managers are matched with insurers in $t-6$, who will experience favorable cash flows from $t-5$ to $t-2$.

To alleviate the concern above, we use longer lags between the measurement of the relationships and insurers' cash flows in robustness tests. In Table A6, we repeat our main 2SLS results on firm outcomes. We use an alternative instrument where both CLO manager-firm and CLO manager-insurer relationships are measured as of $t-13$, eight

quarters prior to insurer cash flows from $t-5$ to $t-2$.

The first-stage result in Table A6 suggests that this alternative instrument still predicts more CLO deals by firms' relationship managers. The second-stage results indicate that firms respond to an increase in CLO capital supply predicted by this alternative instrument. They are more likely to take out new loans and increase their employment and establishment counts. These results are consistent with our main analyses. To the extent that it is hard to predict insurers' cash flows eight quarters prior, this alternative instrument alleviates the endogeneity concern described above.

8.3.2 Using Insurers' Cash Flows Excluding Investment Income

As we mentioned earlier, our insurer cash flow measure excludes any cash flows related to insurers' investment in CLOs. However, one may still be concerned that some common factors can drive an insurer's investment income, as well as the capital demand of borrowing firms that are connected to the insurer through their relationship CLO managers.

To address this concern, we repeat our main analyses using insurers' cash flows excluding all of their investment-related cash flows. Table A8 suggests that insurers increase their investment in CLOs when their operating performance excluding insurers' investment cash flows improves. This result is consistent with Table 2. Table A9 indicates that when CLO managers' exposure to relationship insurers' non-investment cash flows increases, they are more likely to launch a new CLO. This result stays similar to Table 4.

Table A10 repeats our main 2SLS analyses with the instrument constructed using insurers' non-investment cash flows. The results indicate that firms are more likely to take out new loans, as well as increase their employment and establishment counts in response to an increase in the instrumented CLO capital supply, consistent with our main results.

9 Conclusion

The market for securitizing loans has grown drastically over the last two decades. One may suspect that by securitizing and distributing loans to a wide range of investors, the CLO market can insulate firms from not only idiosyncratic shocks to banks but also idiosyncratic shocks to investors in the CLO market. We examine whether borrowing firms are exposed to the idiosyncratic shocks to non-bank investors' capital supply through the CLO market.

Using detailed data from an important group of investors, i.e. insurance companies, we establish three main findings. First, insurers' cash flows are positively related to their capital supply to the CLO market. Second, CLO managers launch new deals in response to increased investor capital supply. Third, new deals induced by insurers' capital supply cause affected firms to take more loans, as well as increase their employment and expand their operation.

Our results have two important implications. First, by having their loans securitized and distributed across a wide set of investors, firms may become more insulated from shocks to banks. However, they become susceptible to shocks to non-bank investors in the CLO market. Second, increased investor capital supply to the CLO market can affect firm financing rather than merely allowing banks to offload more loans and ultimately have effects on firms' real activities. To understand the financial stability implications of the current credit market, it is important to understand the role played by nonbank investors providing the ultimate financing for bank loans.

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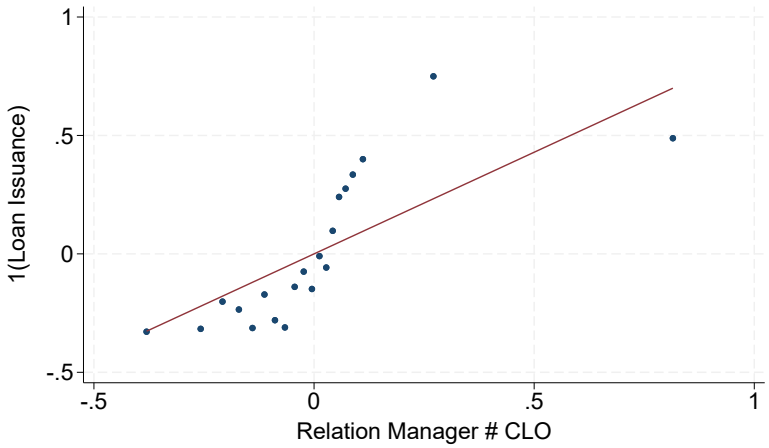
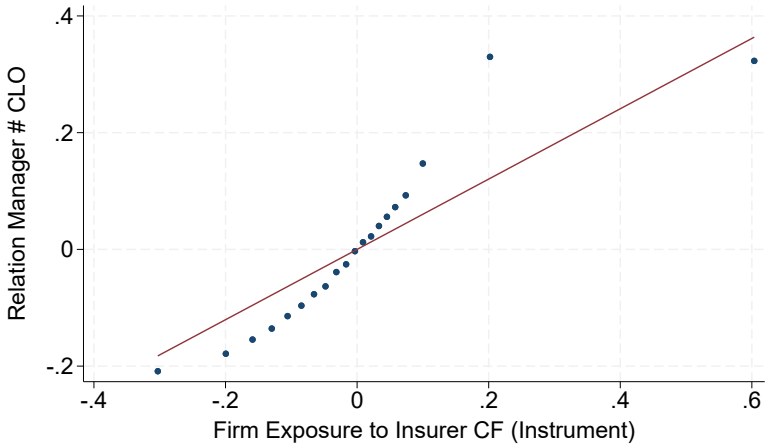
Figures and Tables

Figure 1. The Effect of Investor Demand on New Loans: Scatter Plots

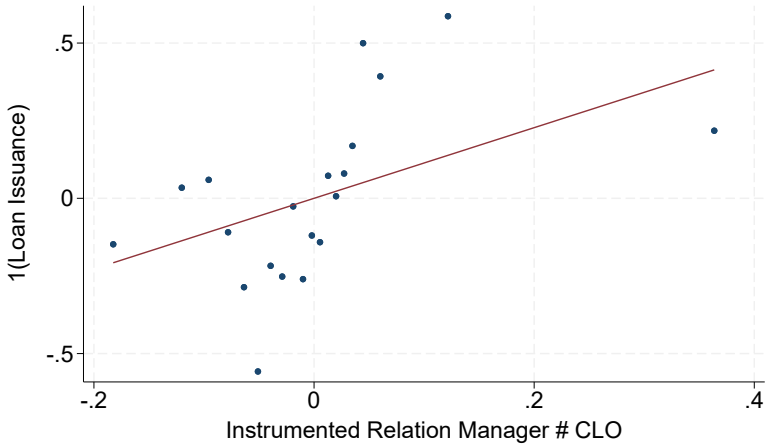
(a) 1(Loan Issuance) vs Relation Manger # CLO



(b) Relation Manger # CLO vs Firm Exposure to Insurer CF (Instrument)



(c) 1(Loan Issuance) vs Instrumented Relation Manger # CLO



Note: Figure 1 presents several scatter plots. Panel (a) is a scatter plot of the outcome variable (1(Loan Issuance)) against the endogenous independent variable (Relation Manger # CLO). Panel (b) is a scatter plot of the endogenous variable against the instrument (Firm Exposure to Insurer CF). Panel (c) is a scatter plot of the outcome variable against the predicted endogenous variable. Are the (predicted) variables in the three panels are demeaned by taking out firm, state-year-quarter and industry-year-quarter fixed effects.

Table 1. Summary Statistics

	(1) Mean	(2) SD	(3) 5%tile	(4) Median	(5) 95%tile
Insurance Companies					
Insurer Operating CF (scaled by Assets)	0.04	0.08	-0.07	0.04	0.17
1(CLO Purchase) (per Quarter)	0.30	0.46	0.00	0.00	1.00
# CLO Purchase (per Quarter)	0.78	1.39	0.00	0.00	4.00
Log(1+CLO Purchase) (per Quarter)	0.99	1.90	0.00	0.00	5.31
CLO Deals					
Deal Size ($ Millions)	507.04	197.75	303.09	468.87	814.88
Senior Tranche (% of Liabilities)	63.33	9.43	52.56	63.12	77.73
Mezzanine Tranche (% of Liabilities)	25.10	7.45	11.77	27.14	32.39
Tranche Coupon (%, Wtd. Average)	1.73	0.67	0.55	1.82	2.60
No. of Portfolio Firms	192.72	91.86	62.70	187.53	333.89
Loan Spread (%, Wtd. Average)	3.85	0.77	3.04	3.68	5.31
Loan Rating Score (Wtd. Average)	11.42	0.61	10.35	11.48	12.13
Loan Maturity (Months, Wtd. Average)	56.46	9.14	40.81	59.05	64.14
Insurer Holdings (%, Wtd. Average)	14.06	12.62	0.44	11.81	37.83
CLO Managers					
1(CLO Launched) (per Quarter)	16.44	37.07	0.00	0.00	100.00
# CLO Launched (per Quarter) (×100)	18.33	45.19	0.00	0.00	100.00
Log(1 + Launched Volume) (×100)	93.42	221.69	0.00	0.00	624.18
CLO Manager Exposure to Insurers	0.23	0.53	0.00	0.00	1.28
Manager Size ($ Billions)	2.50	3.80	0.07	0.95	9.82
Manager Age (in Quarters)	34.64	19.44	4.00	34.00	67.00
Firm Borrowing and Real Outcomes					
1(Loan Issuance) (per Quarter)	3.50	18.38	0.00	0.00	0.00
Relation Manager # CLO (per Quarter)	0.17	0.37	0.00	0.00	1.00
Log(Deal Amount)	5.99	1.25	4.00	5.99	8.04
All In Spread Drawn (in bps)	379.97	176.70	175.00	350.00	750.00
Maturity (in Years)	5.30	1.72	2.00	5.00	8.00
# Covenants	1.30	2.90	0.00	0.00	9.00
Firm Exposure to Insurer CF	0.08	0.24	0.00	0.00	0.58
Employment (per Year)	2,114	5,540	5	322	10,508
# Establishments (per Year)	36	108	1	5	174

Notes: Table 1 shows the summary statistics of key variables used in the empirical analysis.

Table 2. Effect of Insurers' Operating Performance on their CLO Investments

	(1) 1(CLO Purchase)	(2) # CLO Purchase	(3) Log(1+CLO Purchase)
Insurer Operating CF	0.20***	0.64***	1.09***
	(0.06)	(0.23)	(0.31)
$\overline{y}$	.38	1	1.26
SD(x)	.08	.08	.08
Insurer FE	Y	Y	Y
Year-Quarter FE	Y	Y	Y
Obs	16,502	16,502	16,502
Adj. R-squared	0.39	0.47	0.51

Notes: Table 2 analyzes the relationship between insurers' CLO investments and their operating performance. The sample contains all insurers in the sample that had nonzero CLO holdings in the previous year. The specification is:

$$\text{Y}_{i,t} = \beta \times \text{Insurer Operating CF}_{i,t-4 \text{ to } t-1} + \alpha_i + \alpha_t + \varepsilon_{i,t}$$

$Y_{i,t}$ denotes outcomes for insurer i in year-quarter t: (i) $1(CLO\ Purchase)_{i,t}$ is an indicator for a CLO purchase transaction, (ii) $\#CLO\ Purchase_{i,t}$ is the number of CLOs purchased, and (iii) $Log(1 + CLO\ Purchase)_{i,t}$ is the dollar value of CLO tranches purchased, in natural logarithm. $Insurer\ Operating\ CF_{i,t-4 \text{ to } t-1}$ is insurer i's total cash flows from year-quarter $t-4$ to $t-1$ scaled by assets. α_i and α_t denote insurer and year-quarter fixed effects, respectively. We cluster standard errors at the insurer level.

Table 3. Evidence of Sticky Relationship between Insurers and CLO Managers

	(1)	(2)	(3)	(4)
	1(Insurer Investment)×100			
CLO Manager-Insurer Relation	1.59***	1.32***	4.00***	4.11***
	(0.11)	(0.11)	(0.31)	(0.30)
CLO Manager-Insurer Relation × Insurer Operating CF		5.53***	5.34***	3.83***
		(0.86)	(0.85)	(0.89)
CLO Manager-Insurer Relation × Large Manager			-2.62***	-2.67***
			(0.36)	(0.35)
CLO Manager-Insurer Relation × Old Manager			-1.24***	-1.22***
			(0.31)	(0.31)
Insurer Operating CF		1.15***	1.17***	
		(0.15)	(0.15)	
$\overline{y}$	1.21	1.21	1.21	1.21
CLO FE	Y	Y	Y	Y
Insurer FE	Y	Y	Y	
Closing Year-Quarter FE	Y	Y	Y	
Insurer × Closing Year-Quarter FE				Y
Insurer × CLO Size Quartile FE				Y
Insurer × CLO Coupon Quartile FE				Y
Obs	1,211,775	1,211,775	1,211,775	1,211,295
Adj. R-squared	0.05	0.05	0.05	0.07

Notes: Table 3 analyzes how insurers' pre-existing relationships with CLO managers affect their decision to invest in new CLOs of those managers. The specification corresponding to Column (2) is:

$$\begin{aligned}\text{1(Insurer Investment)}_{i,c(m,t)} = {} & \beta \times \text{CLO Manager-Insurer Relation}_{i,m,t-5} + \lambda \times \text{Insurer Operating CF}_{i,t-4 \text{ to } t-1} \\ & + \gamma \times \text{CLO Manager-Insurer Relation}_{i,m,t-5} \times \text{Insurer Operating CF}_{i,t-4 \text{ to } t-1} \\ & + \alpha_i + \alpha_c + \alpha_t + \varepsilon_{i,c(m,t)}.\end{aligned}$$

$1(\textit{Insurer Investment})_{i,c(m,t)}$ is an indicator for whether insurer i invested in CLO c launched by manager m in year-quarter t (multiplied by 100). We focus on investments made within one year of deal formation. For each CLO, the data contains one observation for each potential investor, where the set of potential investors are insurers with nonzero CLO holdings during the previous year. $\textit{CLO Manager-Insurer Relation}_{i,m,t-5}$ indicator is one if insurer i held a CLO of manager m in year-quarter $t-5$. $\textit{Insurer Operating CF}_{i,t-4 \text{ to } t-1}$ is insurer i's total cash flows from year-quarter $t-4$ to $t-1$ scaled by assets. $\textit{Large Manager}_{m,t-1}$ and $\textit{Old Manager}_{m,t-1}$ are indicators for when manager m's CLO assets and age are higher than the sample median during year-quarter $t-1$. α_i, α_c, and α_t are insurer, CLO, and launch year-quarter fixed effects. Standard errors are clustered at the CLO level.

Table 4. CLO Manager Exposure to Investor Demand and New CLO Creation

	(1) 1(CLO Launched)×100	(2) # CLO Launched×100	(3) Log(1+Launched Volume)×100
CLO Manager Exposure	3.71***	3.95***	23.46***
	(1.06)	(1.36)	(6.43)
$\overline{y}$	16.44	18.33	93.42
SD(x)	.53	.53	.53
Manager FE	Y	Y	Y
Year-Quarter FE	Y	Y	Y
Obs	13,634	13,498	13,427
Adj. R-squared	0.30	0.29	0.27

Notes: Table 4 analyzes the relation between CLO managers' exposure to relationship insurers' cash flows and their decision to launch a new CLO. The specification is:

$$\text{Y}_{m,t} = \beta \times \text{CLO Manager Exposure}_{m,t-1} + \alpha_m + \alpha_t + \varepsilon_{m,t}$$

$Y_{m,t}$ denotes outcomes of manager m in year-quarter t - (i) $1(CLO\ Launched)_{m,t}$ is an indicator for CLO issuance (multiplied by 100), (ii) $\#\ CLO\ Launched_{m,t}$ is the number of CLOs launched (multiplied by 100), and (iii) $Log(1 + Launched\ Volume)_{m,t}$ is the CLO issuance volume (in logs, multiplied by 100). $CLO\ Manager\ Exposure_{m,t-1}$ is m's exposure to relationship insurers' cash flows in year-quarter $t-1$ as defined in Section 6. α_m and α_t are the manager and year-quarter fixed effects. Standard errors are clustered at the manager level.

Table 5. Sticky Relationship Between Borrowing Firms and CLO Managers

	(1)	(2)	(3)
	1(Loan Included in CLO)×100		
Firm-CLO Manager Relation	25.57***	27.43***	24.47***
	(0.49)	(0.49)	(0.61)
× CLO Manager Exposure			0.68*
			(0.41)
× Firm-Underwriter-CLO Manager Relation			3.70***
			(0.51)
× Private Firm			-0.21
			(0.24)
Firm-Underwriter-CLO Manager Relation			3.75***
			(0.16)
$\overline{y}$	3.31	3.19	3.19
CLO FE	Y	Y	Y
Firm FE	Y		
Year-Quarter FE	Y		
Firm × Year-Quarter FE		Y	Y
Obs	6,599,186	6,576,474	6,576,474
Adj. R-squared	0.29	0.37	0.38

Notes: Table 5 documents the degree of stickiness exhibited by a fund manager at the inception of a new CLO. The specification with respect to column (2) is:

$$1(\text{Loan Included in CLO})_{f,c(m,t)} = \beta_1 \times \text{Firm-CLO Manager Relation}_{f,m,t-1} + \alpha_c + \alpha_{f,t} + \varepsilon_{f,c(m,t)}$$

$1(\textit{Loan Included in CLO})_{f,c(m,t)}$ is an indicator which assumes a value of one if loans taken by firm f are included in a new CLO c launched by the manager m in year-quarter t, and zero otherwise (multiplied by 100). $\textit{Firm-CLO Manager Relation}_{f,m,t-1}$ is an indicator that equals one if loans from firm f were also held by existing CLOs of manager m during year-quarter $t-1$. $\textit{CLO Manager Exposure}_{m,t-1}$ is m's exposure to relationship insurers' cash flows in year-quarter $t-1$. $\textit{Firm} - \textit{Underwriter} - \textit{CLO Manager Relation}_{f,m,t-1}$ is an indicator for when a bank has simultaneous relationships with firm f and manager m during year-quarter $t-1$. This implies that a bank that is a lead arranger on (one or more) outstanding loans of f is also an underwriter of (one or more) outstanding CLOs of m at time $t-1$. $\textit{Private Firm}_{f,t-1}$ is an indicator which assumes a value of one for private firms, and zero for publicly listed firms. α_c, α_f, and α_t are CLO, firm, and launch year-quarter fixed effects, respectively. Standard errors are clustered at the CLO level.

Table 6. Effect of Investor CLO Demand on Loan Issuance

	OLS	2SLS: 1st Stage	2SLS: 2nd Stage
	(1)	(2)	(3)
	1(Loan Issuance) ×100	Relation Manager # CLO	1(Loan Issuance) ×100
Relation Manager # CLO	0.86***		1.14***
	(0.13)		(0.26)
Firm Exposure to Insurer CF (Instrument)		0.60***	
		(0.01)	
$\overline{y}$	3.5	.09	3.5
SD(x)	.3	.24	.3
Firm FE	Y	Y	Y
Industry-Year-Quarter FE	Y	Y	Y
State-Year-Quarter FE	Y	Y	Y
Kleibergen-Paap Wald rk F			6,078
Obs	535,952	535,952	535,952

Notes: Table 6 suggests that firms take out new loans when their relationship CLO managers launch a new CLO. The OLS specification is:

$$1(\text{Loan Issuance})_{f(j,s),t} = \beta \times \text{Relation Manager \# CLO}_{f,t-1} + \alpha_f + \alpha_{j,t} + \alpha_{s,t} + \varepsilon_{f,t}$$

The first-stage 2SLS specification is:

$$\text{Relation Manager \# CLO}_{f(j,s),t} = \beta \times \text{Firm Exposure to Insurer CF}_{f,t-1} + \alpha_f + \alpha_{j,t} + \alpha_{s,t} + \varepsilon_{f,t} \quad (1)$$

The second-stage 2SLS specification is:

$$1(\text{Loan Issuance})_{f(j,s),t} = \beta \times \text{Relation } \widehat{\text{Manager}} \text{ \# CLO}_{f,t-1} + \alpha_f + \alpha_{j,t} + \alpha_{s,t} + \varepsilon_{f,t} \quad (2)$$

$1(\textit{Loan Issuance})_{f(j,s),t}$ is an indicator for when firm f in industry j and state s takes a new leveraged loan during year-quarter t (multiplied by 100). $\textit{Relation Manager\# CLO}_{f,t}$ is the relationship-weighted-average number of CLO deals launched by f's relationship managers during year-quarter t. It is calculated as:

$$\text{Relation Manager \# CLO}_{f,t} = \sum_m \left(\frac{\text{Manager's Firm Holding}_{f,m,t-4}}{\text{Outstanding Firm Loan}_{f,t-4}} \times \text{\# CLO Launched}_{m,t} \right) \quad (3)$$

$\frac{\text{Manager's Firm Holding}_{f,m,t-4}}{\text{Outstanding Firm Loan}_{f,t-4}}$ is the share of firm f's outstanding loans held by manager m during year-quarter $t-4$. Relation $\widehat{\text{Manager}}$ # $\text{CLO}_{f,t-1}$ denotes the predicted value estimated in the first-stage regression corresponding to year-quarter $t-1$. $\textit{Firm Exposure to Insurer CF}_{f,t}$ is firm f's exposure to insurers' cash flows during year-quarter t. It is calculated as:

$$\text{Firm Exposure to Insurer CF}_{f,t} = \sum_m \left(\frac{\text{Manager's Firm Holding}_{f,m,t-4}}{\text{Outstanding Firm Loan}_{f,t-4}} \times \text{CLO Manager Exposure}_{m,t} \right) \quad (4)$$

$\textit{CLO Manager Exposure}_{m,t}$ is manager m's exposure to related insurers' cash flows in year-quarter t. α_f, $\alpha_{j,t}$, and $\alpha_{s,t}$ denote fixed effects at firm, industry-year-quarter, and state-year-quarter level, respectively. We cluster standard errors at the firm level.

Table 7. Effect of Investor CLO Demand on Loan Issuance: Public/Private and Revolvers (2SLS Specification)

Sample	(1) Public	(2) Private	(3) All Firms (Falsification Test)
	1(Loan Issuance)×100		1(Revolver Issuance)×100
Relation Manager # CLO	-0.37	0.50*	-0.28
(Instrumented)	(0.90)	(0.29)	(0.23)
$\overline{y}$	5.25	3.12	3.71
SD(x)	.29	.3	.3
Firm FE	Y	Y	Y
Industry-Year-Quarter FE	Y	Y	Y
State-Year-Quarter FE	Y	Y	Y
Kleibergen-Paap Wald rk F	885	4,830	6,078
Obs	78,288	442,012	535,952

Notes: Table 7 analyzes how new CLOs launched by relationship managers affect leveraged loan issuance. The outcome variable is an indicator for when firm takes a new leveraged loan during a given year-quarter (multiplied by 100). Column (1) corresponds to public firms and Column (2) corresponds to private firms. Column (3) shows the impact on revolvers that are typically retained on the bank balance sheet and not sold to CLOs. The 2SLS specification is analogous to that in Table 6.

Table 8. Effect of Investor CLO Demand on Loan Characteristics (2SLS Specification)

	(1) Log(Loan Size)	(2) Maturity	(3) # Covenants	(4) Spread	(5) Spread
Relation Manager # CLO (Instrumented)	-0.11	-0.64***	0.05	-54.99***	-29.09*
	(0.10)	(0.20)	(0.29)	(16.42)	(17.68)
Log(Loan Size)					-26.10***
					(5.27)
Maturity					44.96***
					(2.17)
# Covenants					-1.10
					(1.54)
$\overline{y}$	5.99	5.31	1.29	380.19	380.19
SD(x)	.37	.37	.37	.37	.37
Firm FE	Y	Y	Y	Y	Y
Industry-Year-Quarter FE	Y	Y	Y	Y	Y
State-Year-Quarter FE	Y	Y	Y	Y	Y
Kleibergen-Paap Wald rk F	231	231	231	231	229
Obs	33,644	33,644	33,644	33,644	33,644

Notes: Table 8 studies how characteristics of borrowing firms' new loans change following new fund originations of relationship managers. Each observation corresponds to a leveraged loan in our sample and the 2SLS estimation follows the analysis in Table 6. The outcome variables are loan amount expressed in natural logarithm (Column (1)), loan maturity expressed in years (Column (2)), number of covenants in Column (3), and loan spread expressed in bps in Columns (4) and (5). We employ firm, industry-year-quarter, and state-year-quarter fixed effects and cluster standard errors at the firm level.

Table 9. Effect of Investor CLO Demand on Firms' Real Outcomes (2SLS Specification)

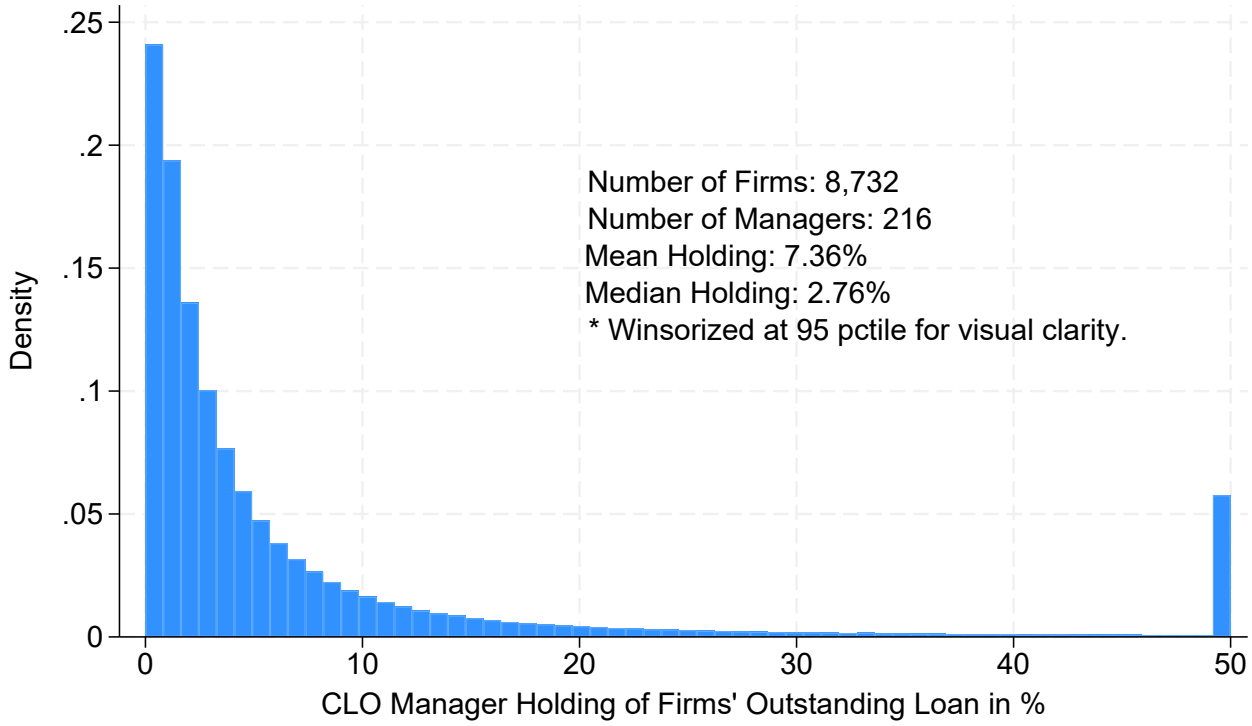
	Log(Employment)	Log(Establishments)
Relation Manager # CLO (Instrumented)	0.23*** (0.04)	0.22*** (0.03)
$\overline{y}$	5.81	2.02
SD(x)	.32	.32
Firm FE	Y	Y
Industry-Year FE	Y	Y
State-Year FE	Y	Y
Kleibergen-Paap Wald rk F	2,802	2,802
Obs	35,266	35,266

Notes: Table 9 analyzes how borrowing firms' employment and establishment count respond when their related CLO managers launch new CLO funds. The 2SLS specification is analogous to that in Table 6. The outcome variables are total employment and number of establishments (expressed in natural logarithms) at the firm-year level. For this analysis, we aggregate the data at the firm-year level since the outcome variables are only available at an annual frequency. We employ fixed effects at the firm, industry-year, and state-year level, respectively. We cluster standard errors at the firm level.

Online Appendices

A Additional Figures and Tables

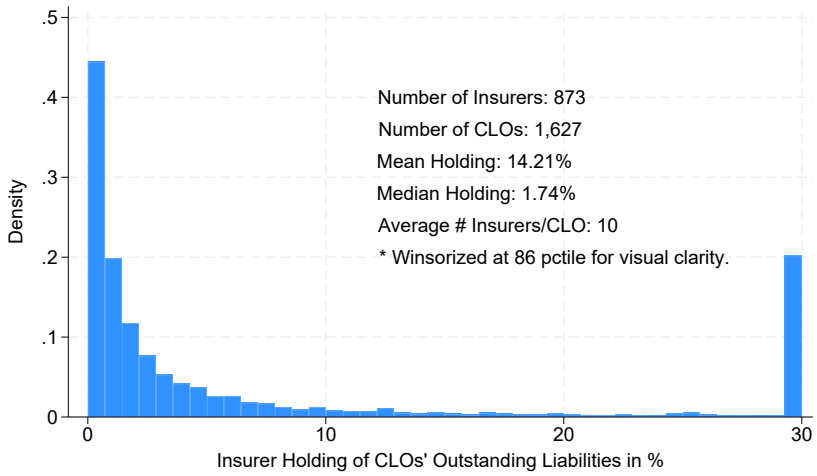
Figure A1. Histogram: Percent of firm loans held by each CLO manager



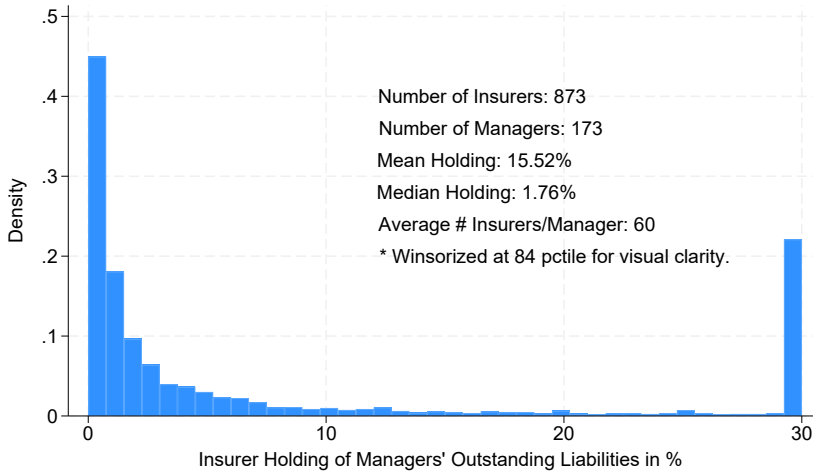
Note: Figure A1 plots the distribution of the percent of firms' outstanding securitized loans held by each CLO manager.

Figure A2. Histogram: Percent of CLO liabilities (deal-level and manager-level) held by insurers

(a) Deal level (Per Insurer)



(b) Manager level (Per Insurer)



Note: Figure A2 shows the fraction of CLO liabilities held by each insurer in our sample. Panel (a) shows deal-level holding for each insurer and Panel (b) manager-level holding for each insurer.

Table A1. Summary Statistics and Differences Between CLOs With and Without Relationship Insurers

	With Insurers		Without Insurers		T-Test
	N	Mean	N	Mean	Difference
CLO Deals					
Deal Size ($, Millions)	1,627	508.31	1,526	491.15	17.16*
Senior Tranche (% of Liabilities)	1,627	62.56	1,525	61.31	1.25**
Mezzanine Tranche (% of Liabilities)	1,627	25.49	1,525	23.82	1.67***
Tranche Coupon (%, Wtd. Avg.)	1,610	1.83	1,476	1.66	0.17***
No. of Portfolio Firms	1,523	216.60	1,364	162.60	54.00***
Loan Spread (%, Wtd. Avg.)	1,521	3.80	1,362	3.91	-0.10***
Loan Rating Score (Wtd. Avg.)	1,521	11.41	1,358	11.43	-0.02
Loan Maturity (Months, Wtd. Avg.)	1,523	56.54	1,364	56.01	0.54
CLO Managers					
Manager Size ($ Billions)	1,627	11.46	1,526	11.78	-0.31
Manager Age (in Quarters)	1,627	35.96	1,526	32.52	3.44***
Insurer Shares					
Insurer Share (Senior Tranches)	1,604	23.37			
Insurer Share (Mezzanine Tranches)	1,605	47.05			
Insurer Share (All Tranches)	1,627	34.74			

Notes: Table A1 shows the average CLO deal and manager characteristics for CLOs with insurer investors and those without insurer investors during our sample period. Each observation corresponds to a unique CLO deal.

Table A2. Effect of Insurers' Operating Performance on their CLO Investments (All Insurers)

	(1) 1(CLO Purchase)	(2) # CLO Purchase	(3) Log(1+CLO Purchase)
Insurer Operating CF	0.02***	0.06***	0.10***
	(0.01)	(0.02)	(0.02)
$\overline{y}$	.03	.09	.1
SD(x)	.11	.11	.11
Insurer FE	Y	Y	Y
Year-Quarter FE	Y	Y	Y
Obs	233,190	233,190	233,190
Adj. R-squared	0.30	0.32	0.32

Notes: Table A2 analyzes the relationship between insurers' CLO investments and their operating performance. The sample contains all insurers in the sample. The specification is:

$$\text{Y}_{i,t} = \beta \times \text{Insurer Operating CF}_{i,t-4 \text{ to } t-1} + \alpha_i + \alpha_t + \varepsilon_{i,t}$$

$Y_{i,t}$ denotes outcomes for insurer i in year-quarter t: (i) $1(CLO\ Purchase)_{i,t}$ is an indicator for a CLO purchase transaction, (ii) $\#\ CLO\ Purchase_{i,t}$ is the number of CLOs purchased, and (iii) $Log(1 + CLO\ Purchase)_{i,t}$ is the dollar value of CLO tranches purchased, in natural logarithm. $Insurer\ Operating\ CF_{i,t-4 \text{ to } t-1}$ is insurer i's total cash flows from year-quarter $t-4$ to $t-1$ scaled by assets. α_i and α_t denote insurer and year-quarter fixed effects, respectively. We cluster standard errors at the insurer level.

Table A3. Effect of Insurers' Operating Performance on their Bond Investments

	(1)	(2)
	Log(1+Bond Purchase)	
	Industrial	Government
Insurer Operating CF	0.75***	0.39**
	(0.20)	(0.18)
$\overline{y}$	2.66	.95
SD(x)	.08	.08
Insurer FE	Y	Y
Year-Quarter FE	Y	Y
Obs	13,530	16,484
Adj. R-squared	0.95	0.73

Notes: Table A3 analyzes the relationship between insurers' bond investments and their operating performance. The sample contains all insurers in the sample that had nonzero CLO holdings in the previous year. The specification is:

$$\text{Y}_{i,t} = \beta \times \text{Insurer Operating CF}_{i,t-4 \text{ to } t-1} + \alpha_i + \alpha_t + \varepsilon_{i,t}$$

$Y_{i,t}$ denotes outcomes for insurer i in year-quarter t. In Column (1), it is the dollar value of industrial and miscellaneous bonds purchased minus CLO purchases, in natural logarithm. In Column (2), it is the dollar value of government bonds purchased, in natural logarithm. $Insurer\ Operating\ CF_{i,t-4 \text{ to } t-1}$ is insurer i's total cash flows from year-quarter $t-4$ to $t-1$ scaled by assets. α_i and α_t denote insurer and year-quarter fixed effects, respectively. We cluster standard errors at the insurer level.

Table A4. Effect of Investor CLO Demand on Purpose of New Leveraged Loans (2SLS Specification)

	(1) General Purpose/ Investments	(2) Refinance/ Payouts	(3) LBO	(4) Others
Panel (A): Instrumental Variable Specification				
Relation Manager # CLO	0.24***	0.02	-0.17***	-0.09***
	(0.06)	(0.03)	(0.06)	(0.03)
$\overline{y}$	.45	.09	.39	.07
SD(x)	.37	.37	.37	.37
Firm FE	Y	Y	Y	Y
Industry-Year-Quarter FE	Y	Y	Y	Y
State-Year-Quarter FE	Y	Y	Y	Y
Kleibergen-Paap Wald rk F	256	256	256	256
Obs	38,084	38,084	38,084	38,084
Panel (B): Multinomial Logit—Marginal Effect at Mean				
Firm Exposure to Insurer CF	0.17***	0.05***	-0.20***	-0.01
	(0.02)	(0.01)	(0.02)	(0.01)
$\overline{y}$	0.45	0.09	0.39	0.07
SD(x)	0.27	0.27	0.27	0.27
Year-Quarter FE	Y	Y	Y	Y

Notes: Table A4 analyzes the purpose of new loans issued when their relationship CLO managers launch a new CLO. The 2SLS specification in Panel (A) is analogous to that in Table 6. The outcome variables are indicator variables that equal one if the firm issued a leveraged loan with a stated purpose of Capital Investment (column (1)), Refinance (column (2)), LBO (column (3)), or Others (column (4)). In Panel (B), we use a multinomial logit model for estimation. α_f and $\alpha_{j,t}$ denote fixed effects at firm and industry-year-quarter level, respectively. We cluster standard errors at the firm level.

Table A5. Effect of Insurers' Operating Performance on their CLO Investments, Interaction with Fed Funds Rate

	(1) 1(CLO Purchase)	(2) # CLO Purchase	(3) Log(1+CLO Purchase)
Insurer Operating CF	0.23***	0.79***	1.45***
	(0.07)	(0.27)	(0.36)
Insurer Operating CF	-0.03	-0.15	-0.36*
× Fed Fund Rate	(0.04)	(0.15)	(0.19)
$\overline{y}$	.38	1	1.26
SD(x)	.08	.08	.08
Insurer FE	Y	Y	Y
Year-Quarter FE	Y	Y	Y
Obs	16,502	16,502	16,502
Adj. R-squared	0.39	0.47	0.51

Notes: Table A5 analyzes the relationship between insurers' CLO investments and their operating performance interacted with the Fed Funds rate. The sample contains all insurers in the sample that had nonzero CLO holdings in the previous year. The specification is:

$$\text{Y}_{i,t} = \beta \times \text{Insurer Operating CF}_{i,t-4 \text{ to } t-1} \times \text{Fed Fund Rate}_{t-1} + \alpha_i + \alpha_t + \varepsilon_{i,t}$$

$Y_{i,t}$ denotes outcomes for insurer i in year-quarter t: (i) $1(CLO\ Purchase)_{i,t}$ is an indicator for a CLO purchase transaction, (ii) $\#\ CLO\ Purchase_{i,t}$ is the number of CLOs purchased, and (iii) $Log(1 + CLO\ Purchase)_{i,t}$ is the dollar value of CLO tranches purchased, in natural logarithm. $Insurer\ Operating\ CF_{i,t-4 \text{ to } t-1}$ is insurer i's total cash flows from year-quarter $t-4$ to $t-1$ scaled by assets. $Fed\ Fund\ Rate_{t-1}$ is the end-of-quarter value of Fed Fund rate in year-quarter t. α_i and α_t denote insurer and year-quarter fixed effects, respectively. We cluster standard errors at the insurer level.

Table A6. Effect of Investor CLO Demand on Loan Issuance, Using Longer-Lagged Relationships

	(1)	(2)	(3)	(4)
	2SLS: 1st Stage	2SLS: 2nd Stage		
	Relation Manager # CLO	1(Loan Issuance) × 100	Log(Employment)	Log(Establishments)
Relation Manager # CLO		0.90***	0.18***	0.19***
		(0.32)	(0.05)	(0.03)
Firm Exposure to Insurer CF	0.71***			
(Instrument Using Long-Lagged Relationships)	(0.01)			
$\overline{y}$	.09	3.5	5.81	2.02
SD(x)	.17	.3	.32	.32
Firm FE	Y	Y	Y	Y
Industry-Year-Quarter FE	Y	Y	Y	Y
State-Year-Quarter FE	Y	Y	Y	Y
Kleibergen-Paap Wald rk F		6,536	2,624	2,624
Obs	535,952	535,952	35,266	35,266

Notes: Table A6 analyzes that firms take out new loans when their relationship CLO managers launch a new CLO. The IV specification is same as Table 6. However, we use longer lags on Insurer-Manager and Manager-Firm relationships when constructing the Firm Exposure to Insurer CF instrument. $1(Loan\ Issuance)_{f(j,s),t}$ is an indicator for when firm f in industry j and state s takes a new leveraged loan during year-quarter t (multiplied by 100). $Relation\ Manager\ \#\ CLO_{f,t}$ is the relationship-weighted-average number of CLO deals launched by f's relationship managers during year-quarter t. In columns (3) and (4), we add Log(Employment) and Log(Establishments) as outcome variables. IWe use Insurer-Manager and Manager-Firm relationships 8-quarters before the insurer CF.

Table A7. CLO Manager Exposure to Investor Demand and New CLO Creation, Using Longer-Lagged Relationships

	(1) 1(CLO Launched)×100	(2) # CLO Launched×100	(3) Log(1+Launched Volume)×100
CLO Manager Exposure	2.92**	3.54**	18.61***
(Using Long-Lagged Relationships)	(1.17)	(1.53)	(7.06)
$\overline{y}$	16.41	18.3	93.25
SD(x)	.19	.19	.19
Manager FE	Y	Y	Y
Year-Quarter FE	Y	Y	Y
Obs	13,633	13,498	13,428
Adj. R-squared	0.30	0.29	0.27

Notes: Table A7 analyzes the relation between CLO managers' exposure to relationship insurers' cash flows and their decision to launch a new CLO. The specification is same as that in Table 4. However, we use longer lags on Insurer-Manager relationship when constructing the CLO Manager Exposure variable. The specification is:

$$\text{Y}_{m,t} = \beta \times \text{CLO Manager Exposure}_{m,t-1} + \alpha_m + \alpha_t + \varepsilon_{m,t}$$

$Y_{m,t}$ denotes outcomes of manager m in year-quarter t - (i) $1(CLO\ Launched)_{m,t}$ is an indicator for CLO issuance (multiplied by 100), (ii) $\#\ CLO\ Launched_{m,t}$ is the number of CLOs launched (multiplied by 100), and (iii) $Log(1 + Launched\ Volume)_{m,t}$ is the CLO issuance volume (in logs, multiplied by 100). $CLO\ Manager\ Exposure_{m,t-1}$ is m's exposure to relationship insurers' cash flows in year-quarter $t-1$. However, we now use Insurer-Manager relationship 8-quarters before the insurer CF to calculate the exposure measure. α_m and α_t are the manager and year-quarter fixed effects. Standard errors are clustered at the manager level.

Table A8. Effect of Insurers' Operating Performance on their CLO Investments, Excluding Insurer Investment CF

	(1) 1(CLO Purchase)	(2) # CLO Purchase	(3) Log(1+CLO Purchase)
Insurer CF Excluding Investment CF	0.18***	0.57**	1.00***
	(0.06)	(0.23)	(0.30)
$\overline{y}$	.38	1	1.26
SD(x)	.08	.08	.08
Insurer FE	Y	Y	Y
Year-Quarter FE	Y	Y	Y
Obs	16,539	16,539	16,539
Adj. R-squared	0.39	0.47	0.51

Notes: Table A8 analyzes the relationship between insurers' CLO investments and their operating performance excluding insurers' investment cash flows. The sample contains all insurers in the sample that had nonzero CLO holdings in the previous year. The specification is:

$$\text{Y}_{i,t} = \beta \times \text{Insurer CF Excluding Investment CF}_{i,t-4 \text{ to } t-1} + \alpha_i + \alpha_t + \varepsilon_{i,t}$$

$Y_{i,t}$ denotes outcomes for insurer i in year-quarter $t-1$: (i) $1(CLO\ Purchase)_{i,t}$ is an indicator for a CLO purchase transaction, (ii) $\#\ CLO\ Purchase_{i,t}$ is the number of CLOs purchased, and (iii) $Log(1 + CLO\ Purchase)_{i,t}$ is the dollar value of CLO tranches purchased, in natural logarithm. $Insurer\ CF\ Excluding\ Investment\ CF_{i,t-4 \text{ to } t-1}$ is insurer i's operating cash flows after netting out both dividends and investment income from year-quarter $t-4$ to $t-1$ scaled by assets. α_i and α_t are the insurer and year-quarter fixed effects. Standard errors are clustered at the insurer level.

Table A9. CLO Manager Exposure to Investor Demand and New CLO Creation, Excluding Insurer Investment CF

	(1) 1(CLO Launched)×100	(2) # CLO Launched×100	(3) Log(1+Launched Volume)×100
CLO Manager Exposure	5.33**	6.09**	30.65**
(Excluding Investment CF)	(2.15)	(2.69)	(13.58)
$\overline{y}$	16.45	18.33	93.54
SD(x)	.2	.2	.2
Manager FE	Y	Y	Y
Year-Quarter FE	Y	Y	Y
Obs	13,632	13,495	13,426
Adj. R-squared	0.30	0.29	0.27

Notes: Table A9 analyzes the relation between CLO managers' exposure to relationship insurers' cash flows and their decision to launch a new CLO, excluding insurers' investment cash flows. We calculate manager exposure using insurer operating CF after netting out both dividend and investment CF. The specification is:

$$\text{Y}_{m,t} = \beta \times \text{CLO Manager Exposure}_{m,t-1} + \alpha_m + \alpha_t + \varepsilon_{m,t}$$

$Y_{m,t}$ denotes outcomes of manager m in year-quarter t - (i) $1(CLO\ Launched)_{m,t}$ is an indicator for CLO issuance (multiplied by 100), (ii) $\#\ CLO\ Launched_{m,t}$ is the number of CLOs launched (multiplied by 100), and (iii) $Log(1 + Launched\ Volume)_{m,t}$ is the CLO issuance volume (in logs, multiplied by 100). $CLO\ Manager\ Exposure_{m,t-1}$ is m's exposure to relationship insurers' cash flows (after netting out both dividend and investment CF) in year-quarter $t-1$. α_m and α_t are the manager and year-quarter fixed effects. Standard errors are clustered at the manager level.

Table A10. Effect of Investor CLO Demand on Loan Issuance, Employment, and Number of Establishments, Excluding Insurer Investment CF

	(1)	(2)	(3)	(4)
	2SLS: 1st Stage	2SLS: 2nd Stage		
	Relation Manager # CLO	1(Loan Issuance) × 100	Log(Employment)	Log(Establishments)
Firm Exposure to Insurer CF (Excluding Investment CF)	0.54***			
	(0.01)			
Relation Manager # CLO		2.94***	0.23***	0.23***
		(0.71)	(0.08)	(0.05)
$\overline{y}$	.09	3.5	5.81	2.02
SD(x)	.09	.3	.32	.32
Firm FE	Y	Y	Y	Y
Industry-Time FE	Y	Y	Y	Y
State-Time FE	Y	Y	Y	Y
Kleibergen-Paap Wald rk F		1,512	682	682
Obs	535,952	535,952	35,266	35,266

Notes: Table A10 analyzes that firms take out new loans when their relationship CLO managers launch a new CLO, excluding insurers' investment cash flows in the construction of the instrument. The IV specification is same as Table 6. $1(Loan\ Issuance)_{f(j,s),t}$ is an indicator for when firm f in industry j and state s takes a new leveraged loan during year-quarter t (multiplied by 100). $Relation\ Manager\ \#\ CLO_{f,t}$ is the relationship-weighted-average number of CLO deals launched by f's relationship managers during year-quarter t. In columns (3) and (4), we add Log(Employment) and Log(Establishments) as outcome variables. However, we exclude both dividend and investment CF from insurer operating CF when constructing the Firm Exposure to Insurer CF instrument. α_f, $\alpha_{j,t}$, and $\alpha_{s,t}$ denote fixed effects at firm, industry-year-quarter, and state-year-quarter level, respectively. We cluster standard errors at the firm level.