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ARTICLE

Dual holdings and shareholder–creditor agency conflicts: Evidence from the syndicated loan market

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Abstract

We examine implications from the expansion of private equity (PE) firms into the collateralized loan obligation (CLO) (i.e., leveraged lending) business. Due to similarities in the investment universes of CLO managers and PE firms, asset managers running both of them frequently hold debt and equity claims of the same company. Our results indicate lower credit costs for these companies through the mitigation of shareholder–creditor agency conflicts. The lower funding costs imply increased equity returns for the sponsoring PE firms. In addition, our findings suggest that PE-affiliated CLO managers benefit from informed trading in the secondary leveraged loan market.

KEYWORDS
conflicts of interest, credit costs, private equity, private information, syndicated loans

JEL CLASSIFICATION
G14, G23, G32

1 | INTRODUCTION

After the financial crisis of 2007–2008, a new trend was observed on Wall Street: the joint operation of *private equity (PE) firms* and *collateralized loan obligation (CLO)*[1] *managers* within the same *asset manager*. Specifically, either through the acquisition of existing or through the foundation of new CLO managers, a large number of asset managers, who are running well-known PE firms, have been expanding into the institutional leveraged loan market. We refer to CLO managers belonging to the same asset manager as a PE firm as *(PE-)affiliated*. Through their steady growth during the 2010s, these managers became dominant actors in the CLO business,[2] enabling them to generate a liquid market for the leveraged loans that are financing the buyout activities of their affiliated PE firms (Martellozzo et al., 2019). During our sample period, the Blackstone Group, for example, nearly doubled its CLO assets under management (AuM) from approximately 8 to almost 16 billion USD. Similar patterns can be found for Carlyle, KKR and numerous other PE firms.

CLOs are the largest investor group in the institutional leveraged loan market, estimated to hold about half of the outstanding credit amount in this segment (Financial Stability Board, 2019). Regarding the equity holders, approximately 60% of the leveraged loans are issued by PE-sponsored companies (Kakouris, 2022). These two facts suggest that the outstanding loans of PE-sponsored companies are often part of CLO portfolios. For PE-affiliated CLO managers, this means that some of the portfolio loans are issued by companies sponsored by PE firms, which belong to the same asset manager as the CLO managers themselves. In these cases, the asset manager becomes a simultaneous debt and equity holder of the company. In related literature (e.g., Jiang et al., 2010; Chu, 2018; Antón & Lin, 2020), this situation is referred to as a *dual holding*.

Analyzing the portfolios of large PE-affiliated CLO managers shows that dual holdings are indeed a common phenomenon. In our sample, CLO managers belonging to the Blackstone Group, for example, hold on average about 9.9% (or 37 million USD per CLO) of their AuM in debt instruments (loans and bonds) issued by companies owned by Blackstone's PE firm. The corresponding average dual holdings by Carlyle and KKR CLOs are 10.5% (42 million USD) and 17.7% (72 million USD) of the total portfolio amount.[3]

After having established the economically significant role of dual holdings, we aim to identify resulting implications on the leveraged loan market. Due to their different participation in a company's cash flow, equity and debt holders have diverging interests regarding the company's strategical orientation and its operational implementation. Jensen and Meckling (1976) show that, as a result, equity holders choose riskier investment projects as debt holders would prefer and as it would be in line with the aim of maximizing the value of the company's total capital. Another area where the incentives of equity holders are not in alignment with the interests of debt holders is the payout policy. The shareholders can transfer wealth from the creditors to themselves by increasing dividends (C. W. Smith & Warner, 1979). This agency problem increases the cost of capital for the company as debt holders will anticipate the shareholders' behavior and thus demand higher yields on their loans (Jensen & Meckling, 1976). In situations where the equity sponsor is connected to a debt holder of the company, the agency conflict may decrease.

Consistent with this hypothesis, Chu (2018) finds reduced dividend payouts for companies with shareholding creditors. As a result, interest rates for debt should be lower in these settings. Therefore, we expect that a company has to pay lower credit spreads if at least one of its loans is among the portfolio holdings of a CLO manager belonging to the same asset manager as a PE firm sponsoring the company. We are referring to this implication as the *incentive alignment hypothesis*. In line with the incentive alignment hypothesis, Jiang et al. (2010) find 18–32 basis points (bp) lower spreads in syndicated loans to publicly listed companies if one of the lending banks is also a shareholder of the

[1] CLOs are asset-backed securities that transfer cash flows from leveraged loans to investors. Their liability structure consists of several tranches with decreasing seniority and increasing yield. In their portfolios, they hold mostly leveraged loans, which bear an elevated default risk and pay higher spreads as compensation. For more information on the structure and functionality of CLOs, see Martin and Sayrak (2022).

[2] Blackstone and Carlyle, for example, were even the two largest CLO managers by AuM in 2022 (Clopremium, 2022).

[3] An anecdotal example for the important role of dual holdings in the leveraged loan market is Blackstone's takeover of Refinitiv in 2018. As there were rumors that it could be difficult to finance the takeover, CLOs managed by Blackstone itself were the largest buyers of the loans taken out to finance the deal (Gore, 2019).

company. Similarly, for loans financing PE transactions, Buchner et al. (2022) discover a 160 bp spread reduction if the creditor is a debt fund affiliated to the PE firm conducting the transaction.

We start our investigation of the incentive alignment hypothesis by introducing a novel proxy for the total cost of borrowing (the *effective spread*) that explicitly allows for the fact that a large number of institutional leveraged loan facilities are issued at a discount to par (original issue discount – OID). While previous research on loan pricing relies almost exclusively on the all-in-spread-drawn (*AISD*), we argue and provide supporting evidence that the *AISD* alone is an incomplete and likely misleading measure of borrowing cost.[4] In our sample of institutional loan facilities from DealScan, the *AISD* underestimates effective borrowing costs by 22 bp on average, and the bias even exceeds 50 bp for 10% of the facilities.[5]

We then proceed by regressing the loan spread at issuance on a dummy that indicates whether the issuing company exhibits a dual holding and several control variables. In our most comprehensive regression model, the results indicate a 32 bp lower *effective spread* for loan facilities issued by dual holding companies, with only little deviations in the other model specifications.

While these findings are in line with the incentive alignment hypothesis, there are also different interpretations of the negative relationship between dual holdings and spreads in the existing literature. Buchner et al. (2022) interpret the lower spreads in dual holdings as an interest rebate given to PE firm portfolio companies by affiliated debt funds. We conducted several regressions on subsamples with higher and lower risk shifting and interest rebate sensitivity. The spread reduction is especially pronounced in samples that are highly sensitive to risk shifting, whereas we cannot find a similar relationship for the rebate sensitivity. We see this as additional evidence for the incentive alignment hypothesis as a driving factor behind the debt funding cost reduction for companies with dual holding investors.

Although we use a wide range of control variables, it is still possible that the spread reduction is in fact caused by other unobserved factors that are positively related to the existence of a dual holding and negatively related to the loan spread or vice versa. In Section 3.2, we address these endogeneity concerns, using CLO manager takeovers as quasi-experimental setting. If a PE-affiliated asset manager acquires a CLO manager, some issuing companies of the CLO portfolio loans see a switch in their dual holding status. As it is highly unlikely that CLO manager takeover decisions are related to a specific portfolio loan, we expect no relation between the emergence of the dual holding status and any characteristic of the loan facility or its issuing company. To identify the relationship between dual holdings and credit cost, we observe the secondary market price changes in outstanding loan facilities issued by companies with an emerging dual holding exogenously caused by the takeover. As the relation of loan prices and yields (to maturity) is inverse, an increasing loan price would indicate a lower credit cost for the company. We control for time-varying factors influencing the loan price by using the simultaneous secondary market price development of three matched control loans with no change in dual holding status as benchmark. We find on average a 0.88%-1.45% higher price return after the newly established dual holding status compared to the control loans in the 2 months around the takeover which increases to 2–2.59% if we add four more months after the event. The results of the quasi-experiment provide further evidence for the incentive alignment effect of dual holdings.

Following the examination of the spread reduction, we briefly discuss the economic effects of dual holdings in one of the most important CLO business segments—the funding of leveraged buyouts (LBO). Using a *ceteris paribus* approach, we calculate a 73 bp higher internal rate of return (IRR) for an LBO with a typical capital structure.

In the final section, we observe an additional implication of dual holdings. If an asset manager's PE firm and CLO manager hold equity claims and loans of the same company, there could be private information spillover enabling the CLO manager to profitably trade in the secondary loan market. To investigate this effect, we look at round-trip (RT) trades (trades with a buy and at least one subsequent sale) executed by dual and nondual holders. We adjust realized

[4] The *AISD* is defined as the sum of the spread over London Interbank Offered Rate (LIBOR) or Euro Interbank Offered Rate (EURIBOR) plus the facility fee.

[5] Berg et al. (2016) note that upfront fees and the OID are conceptually the same. These authors further report that upfront fee information is largely missing in DealScan and that this deficiency is likely nonignorable. Since we do not rely on DealScan data to calculate the OID, our research is not subject to any shortcomings resulting from DealScan's limited coverage of upfront fees.

(net) price returns of RT trades for general market conditions by subtracting the contemporaneous price return of the leveraged loan index[6] from the raw trade return.

The baseline results indicate that dual holding RT trades outperform their nondual holding peers by between 2.8% and 4.1% in terms of annualized excess returns, conditional on facility and trade-level controls. Furthermore, the average CLO manager generates an additional return of 3.3–4.2% per year from loan investments as a dual holder compared to trades as a nondual holder. In addition, dual holding trades outperform nondual holding trades in the *same* borrowing company by 2.2–2.6% per year. These findings demonstrate that PE-affiliated CLO managers have substantial timing and facility selection abilities with respect to issuing companies sponsored by PE firms belonging to the same asset manager. Positive interaction effects between excess returns and three different information sensitivity proxies strengthen the interpretation of information spillover from PE firms to their affiliated CLO managers as a major cause of the measured outperformance in dual holding trades. Additional analyses provide evidence against private information about upcoming rating changes as the mechanism behind the excess returns.

Our paper contributes to the growing body of empirical literature on dual holdings as a channel to reduce the shareholder–creditor conflict of interest prominently introduced by Jensen and Meckling (1976) and Myers (1977). Chu (2018) indicates a more conservative payout policy after the merger of a shareholder and a creditor of the same company. Antón and Lin (2020) show that the presence of dual holders mitigates over- and underinvestment. As a result, the company's borrowing conditions improve. Jiang et al. (2010) show a reduction in syndicated loan spreads if noncommercial banks hold stocks and loans of the same company. Chava et al. (2019) find that dual holdings are associated with a lower probability of capital expenditure restrictions in the loan contract. J. Chen et al. (2023) discover an attenuating effect of dual holdings on the loan spread increase associated with proxy contests in companies.

We differ from past work in that we focus on syndicated loan (and not equity or bond) investments of CLO managers affiliated with PE firms (not commercial banks or private debt funds). This way, we make important contributions in terms of the markets and data analyzed. Specifically, while most other studies rely on publicly traded companies, we shed light on the much less covered market for nonlisted firms. As PE firms usually own a much larger share of the voting rights in their holding companies than for example commercial banks, they have a greater ability to mitigate agency risks if they are incentivized to do so. Furthermore, since PE firms' portfolio companies typically have a high default risk, creditor–shareholder conflicts are in principle pronounced in this market segment. On the other hand, the high relevance of a PE firm's reputational capital towards creditors for future financing activities might reduce the severity of interest misalignment between private equity and debt investors.

In comparison with the (to the best of our knowledge) only other paper that analyzes the effect of dual holdings in private companies by Buchner et al. (2022), our sample has vastly different characteristics. While our average loan spread is much smaller (392 vs. 800 bp), the facility amount is significantly higher (524.76 vs. 21.9 million USD). Moreover, Buchner et al. (2022) interpret the lower credit spreads as a method of wealth transfer from the debt to the equity fund of the asset manager. Due to our quite opposing incentive alignment hypothesis, the spread reduction in dual holdings is rather an effect of the reduced shareholder–creditor conflict instead of its exploitation by the equity side. We substantiate our incentive alignment hypothesis by analyzing the spread reduction in different separate subsamples and utilizing CLO manager takeovers as quasi-experimental setting for variation in the dual holding status.

Our additional results add to the literature on spillover effects between different business units within the same asset management group. Various other authors discovered evidence of informational spillover and informed trading in equity markets (see, e.g., Bodnaruk et al., 2009; Bushman et al., 2010; Ivashina & Sun, 2011b; and Massoud et al., 2011). To the best of our knowledge, we are the first to study how PE information translates into activities on the syndicated loan market, a market that is—compared to the equity market—much less known but more important in terms of size.

[6] The Morningstar Loan Syndications and Trading Association (LSTA) Leveraged Loan Index (formally known as S&P LSTA Leveraged Loan Index) uses data from PitchBook and Leveraged Commentary & Data (LCD) to cover the development of the leveraged loan market. For detailed information on the construction of the U.S. and Euro Leveraged Loan index, see Morningstar (2022, 2023).

2 | CONCEPTUAL FRAMEWORK

2.1 | Hypothesis development

Jensen and Meckling (1976) popularized the concept of risk shifting through equity holders. As residual claimants of the company, the equity holders indefinitely participate in the company's profits. Their liability, on the other hand, is limited since after reaching the inability to satisfy the creditors' claims all additional losses are born by the company's debt holders. This payoff structure incentivizes the equity holder to increase the risk above the level that would be optimal to maximize the expected asset value of the company.

Let us use a simplistic example to illustrate the underlying effect of wealth transfer from debt to equity holders. Consider a risk-neutral PE firm owning 100% of the equity in a company. The company can realize two possible projects, each of which leads to a specific asset value at the end of the following period. After the period, the PE firm uses the generated asset value to repay the company's debt and plans to liquidate or sell the company, receiving the remaining asset value as cash flow. Assuming no additional liability for the company, the PE firm receives the following payout at the end of the period:

$$\text{Payout}_{\text{PE firm}} = \max(\text{Asset Value}_{\text{Company}} - \text{Debt}_{\text{Company}}, 0). \tag{1}$$

With regard to the projects, the company can either realize P_{save} or P_{risky}. P_{save} leads to a certain asset value of 2. P_{risky} on the other hand, has a 35% chance of yielding an asset value of 4 but also a 65% probability of resulting in an asset value of 0 at the end of the period. Under risk neutrality, it is obvious that P_{save} with a certain asset value of 2 is superior to P_{risky} with an expected value of 1.4 from an overall perspective. However, disregarding potential reputational effects, the equity-owning PE firm would rather maximize their own expected payout instead of the company's asset value. Assuming a debt repayment (including interest) of 1 due at the end of the period, the two possible projects would result in the following expected payouts for the PE firm:

$$\text{Expected Payout}_{\text{P save}} = 2 - 1 = 1, \tag{2}$$

$$\text{Expected Payout}_{\text{P risky}} = 0.35 * (4 - 1) = 1.05. \tag{3}$$

Hence, in this constellation, the risk-neutral equity holder would prefer P_{risky} over P_{save} due to its higher expected payout. In the real world, it is very difficult to observe this kind of risk-shifting activity directly as the possible investment decisions are unknown to outsiders of the company. However, using the relation between investment and volatility, Eisdorfer (2008) finds evidence for the presence of risk shifting in distressed companies.

The superiority of P_{risky} from the equity holder's perspective is based on the fact that below the threshold of 1 negative deviations of the asset value are entirely passed on to the debt holders of the company. Setting aside reputational concerns, these losses are irrelevant from the equity's perspective. This changes if some of the company's creditors are affiliated to the PE firm sponsoring the company. Continuing with our simplistic example, we introduce an asset manager owning the PE firm as well as a CLO manager, which holds 10% of the company's debt in its portfolio. The combined payout for this dual holding asset manager at the end of the period would be determined by the following function:

$$\begin{aligned}\text{Payout}_{\text{Asset manager}} =& \max(\text{Asset Value}_{\text{Company}} - \text{Debt}_{\text{Company}}, 0) \\ &+ 0.1 * \min(\text{Debt}_{\text{Company}}, \text{Asset Value}_{\text{Company}}).\end{aligned} \tag{4}$$

In the setting mentioned above, this would lead to the following expected payouts for the asset manager:

$$\text{Expected Payout}_{\text{P save}} = 2 - 1 + 0.1 * 1 = 1.1, \tag{5}$$

$$\text{Expected Payout}_{\text{P risky}} = 0.35 * (4 - 1 + 0.1 * 1) = 1.085. \tag{6}$$

Due to the partial internalization of the negative asset value deviation below the level of debt repayment, P_{save} has now a higher expected payout, which aligns the incentives on the equity and the debt side of the company and prevents the PE firm from realizing P_{risky}. This does not only increase the overall expected value of the company's assets but also lowers (in this specific example even eliminates) the credit risk for the debt holders.

Having set the theoretical framework for a credit-risk reduction through dual holdings, we aim to find a measurement to observe this effect. The relationship between interest rate and credit risk is well established in the economic literature. The structural model by Merton (1974) and Black and Scholes (1973) is based on the idea that the pricing of risky corporate debt is only determined by the risk-free interest until the debt matures and the expected credit loss, consisting of the probability of default and the loss given default. Longstaff and Schwartz (1995) have extended the model, making it applicable to floating rate debt, the typical form of credit pricing in leveraged loans.

The tight connection between credit risk and spreads is not only theoretically founded but also supported by empirical evidence. Huang and Huang (2012) show that calibrating the Longstaff and Schwartz (1995) model with values derived from historical rating class averages can explain 73–95% of the spread from B-rated corporate bonds over risk-free treasuries with the same maturity. On the single bond level, Nozawa (2017) finds that for corporate bonds rated B or below, a 1 unit increase in credit spread is associated with 0.89 additional units of credit loss. This implies that within the high-yield segment, changes in credit spreads largely reflect increased credit risk.[7]

Combining the relationship of credit risk with loan spreads and dual holdings, credit spreads for companies with a dual holding investor should be lower compared to otherwise equivalent companies. As described in the following sections, we generate a dummy indicating the presence of a dual holding investor in the borrowing company for a dataset of newly issued leveraged loans. Afterwards, we regress two different loan spread measurements on this *dual holding* dummy and several control variables. Under the incentive alignment hypothesis, we expect a negative coefficient of *dual holding* representing lower credit risk due to a less intense shareholder–creditor agency conflict.

2.2 | Empirical setting and prior evidence

In the related literature, using a sample of syndicated loans to publicly listed companies, Jiang et al. (2010) discover that if a bank is both a shareholder of the company and a member of the loan syndicate, credit quality improves and spreads decrease by 18–32 bp. Buchner et al. (2022) even find a 160 bp loan spread reduction in private equity transactions if a debt fund from the same asset manager as the acquiring PE firm (at least partially) funds the deal.

For several reasons, we expect the effect of dual holdings in our sample to defer from the results in previous studies. First, the transfer of expected wealth from debt to equity holders happens especially if there is a meaningful default probability as the company's cash flows are irrelevant for the debt holders as long as it is able (and willing) to repay its debt. On the one hand, due to their experience, PE firms may have advanced skills in managing financial distress (Hotchkiss et al., 2021). Several empirical studies support this hypothesis by showing a lower default risk for PE-owned companies after an IPO exit (Michala, 2019), if the PE sponsor is experienced (Tykvová & Borell, 2012) or even in general (Wilson & Wright, 2013) compared with otherwise similar non-PE-owned companies. A survey of general partners in private debt funds confirms that 58% of U.S. and 34% of European investors regard stronger distress recovery due to the sponsor's turnaround experience as an advantage of PE-sponsored loan deals (Block et al., 2023). On the other

[7] B is the median rating of the leveraged loans in our sample. Note, that the explanatory power of credit risk is much lower for bonds with investment-grade rating, a finding sometimes referred to as "credit spread puzzle" (e.g., L. Chen et al., 2009).

hand, the capability to manage distress debt increases the likelihood of acquiring companies with higher leverage and bankruptcy risk (Hotchkiss et al., 2021, Sudarsanam et al., 2011). Thirty-two percent of U.S. and 43% of European investors see a higher default probability due to increased leverage as a concern of PE-sponsored loans (Block et al., 2023). Comparing our sample to the public companies in Jiang et al. (2010), this selection effect considerably outweighs any risk reduction through sophisticated management skills of PE firms. The risk difference is reflected by an average loan spread of 164 bp for the public companies versus 392 bp in our sample.

Buchner et al. (2022), on the other hand, analyze loans that are used to finance PE transactions and granted by private debt funds. While CLOs mainly invest in broadly syndicated loans, private debt funds focus mostly on direct lending (Block et al., 2023). The borrowing companies and the loan sizes in the direct lending segment are significantly smaller, and the issuers are, unlike in the broadly syndicated market, typically unrated (Fritsch et al., 2022). The much lower facility amount of 21.9 million USD (524.76 million USD in our sample) and higher average loan spread of 800 bp (392 bp) represent this divergence and indicate a higher risk compared to our syndicated CLO portfolio loans. The risk differences indicate a higher effect as in Jiang et al. (2010) and a lower effect as in Buchner et al. (2022) for our sample.

Second, in order to prevent risk shifting, the dual holding asset manager must be sufficiently incentivized as well as capable of influencing the company's actions in the interest of both sides of the capital structure instead of unilaterally favoring the equity side. The incentive to consider the impact on the creditors increases with the share of funding provided by the debt arm of the dual holding asset manager. While the broadly syndicated facilities in our sample on average consist of 5.19 syndicate members and even more institutional investors, 40% of the loans in the Buchner et al. (2022) sample are not syndicated at all and the average number of debt investors is only 2.15. This again suggests a smaller spread reduction for our setting compared to Buchner et al. (2022). For the ability to influence the company's decisions, the equity-holding creditor must control a sufficient share of the voting rights. PE firms typically hold a much larger share of their portfolio companies' equity in comparison to investors in publicly listed companies. Within the sample used by Jiang et al. (2010), dual holding banks own on average only 0.67% of the total equity from their borrowing companies. PE firms, on the other hand, usually control a significant part of the voting rights and are often even majority owners (Fenn et al., 1997). Hence, PE firms have a stronger influence on the management of the company and can assert a financing and investment policy more in line with the interests of the debt holders. Just like the default risk, the higher share of voting rights indicates a larger reduction in the private market than determined for public companies by Jiang et al. (2010).

On the contrary, new debt-financed transactions occur perpetually in a PE firm's portfolio. As PE-owned companies can borrow against their sponsor's reputational capital, bankruptcies heavily influence the ability to fund future deals for the PE firm sponsoring the defaulting company. This leads, *ceteris paribus*, to a reduced shareholder–creditor conflict in PE-owned compared to publicly owned companies (Malenko & Malenko, 2015). The vast majority of responding debt investors in Block et al. (2023) see the signaling based on sponsor's reputation as an advantage, improving the quality of loans to PE-owned companies. A number of empirical papers support these considerations. Harford and Kolasinski (2014) find no relation between the payouts to PE sponsors and later bankruptcy or financial distress for a company, which is evidence against excessive dividend distributions as a common vehicle for wealth transfer from debt to equity holders. Meuleman et al. (2022) find that a company is less likely to go bankrupt, if it is part of a PE firm's first time fund or if the sponsoring PE firm is raising new capital for other funds during the company's period of financial distress. This indicates that increasing reputational concerns for a PE firm indeed tames the bankruptcy risk in its portfolio companies. Contrary to the leverage and voting rights aspects, the findings on reputational risk imply a smaller dual holding effect in our sample compared to Jiang et al. (2010).[8]

[8] We thank the anonymous reviewer for the insightful remarks that inspired us to consider the significant role of reputational risks in the private equity business.

2.3 | Data and variables

While asset managers utilize different vehicles to conduct their expansion into the field of private debt, CLOs are among the most important ones. Essentially, a CLO is similar to a managed[9] closed-end fund that invests primarily in the institutional segment of the leveraged loan market and to a lesser extent in high-yield bonds.[10] These investments are financed through the issuance of several debt and (one or two) equity tranches.

Our major data source covering the European and U.S. CLO markets is Creditflux's CLO-i.[11] CLO-i provides detailed information on CLO portfolio compositions and trading activity. These data are collected from monthly trustee reports that are sourced from CLO managers and investors alike. Although these parties report voluntarily to CLO-i, we believe a selection bias is unlikely to be present due to investor's strong incentives to report about bad-running CLOs. In line with this argument, Liebscher and Mählmann (2017) do not find any indication of an overrepresentation (underrepresentation) of good (bad) performing CLOs in CLO-i. Importantly, once CLO-i processes a trustee report the *full* sample of trades and holdings in this month is added to their data. Of course, CLO-i does not give a complete picture of the CLO market—neither in the time series nor in the cross section. Since CLO-i started covering the market in mid-2008, they tracked a growing number of CLOs but always relied on sources with interest in the CLO. In cases where a manager missed sending out a trustee report to CLO-i, the panel exhibits gaps. Moreover, there are cases where the CLO-i team uploaded a trustee report but did not copy trades and holdings into the respective data tables. To fill these gaps to the best possible extent, we manually add data whenever we get hands on a trustee report that has not been processed. Figure A.1 in the Appendix provides an insight into the depth of our sample in terms of trading activity (monthly number of trades) and CLO portfolio observations. As can be seen, coverage climbs significantly during the year 2008 and remains high thereafter. While we cannot benchmark the trade figures to publicly available data sources covering the overall market, we can compare the portfolio volume of U.S. CLOs in our sample to the USD-denominated outstanding CLO volume as published by the Securities Industry and Financial Markets Association (SIFMA). Using these data as a benchmark, we estimate that over the period 2009-Q1 to 2015-Q4 our sample has an average (median) coverage of 53% (52%).[12]

As described above, our main variable of interest is the *dual holding* dummy of newly issued loan facilities. The dummy captures whether a dual holding asset manager exists that simultaneously holds equity (via a PE firm) and debt (via a CLO manager) of the issuing company. To generate this variable, we track the dual holding status of every company occurring as borrower in our dataset on a monthly basis. We then match this list by company and month to our sample of newly issued loans to obtain the *dual holding* dummy on the loan facility level. In the time dimension, we use the month after the loan issuance for the matching. This way, we make sure that we not only tag facilities from issuing companies with pre-existing dual holders but also the ones with an arising dual holding status through CLO investments into the newly issued facility itself.

To generate the list of the monthly dual holding status of the companies, we follow two steps. In the first step, we determine whether a particular CLO manager belongs to the same asset manager as a PE firm. We use information from Fitch Ratings (2014), CLO manager websites and prospectuses downloaded from CLO-i to determine the ultimate parent of the CLO manager, and we take particular care of the dynamic nature of this relationship. Overall, we detect 83 PE-affiliated CLO managers, which manage 742 CLOs.

[9] A smaller fraction of the CLO market is not actively managed (balance sheet CLOs). These CLOs are not part of our study.

[10] Under the Volcker rule, CLOs that do not only hold loans are regarded as "covered funds." Because banks are prohibited to invest in these kind of funds, CLOs renounce from bond investments nowadays. However, our sample also covers pre-Volcker rule CLOs whose portfolios consist of bonds to a notable extent.

[11] Several papers use the same database (see, e.g., Benmelech et al., 2012; Liebscher & Mählmann, 2017 and Loumioti & Vasvari, 2019). Liebscher and Mählmann (2017) also detail important institutional features of CLOs and provide a discussion of coverage and selection bias issues potentially associated with CLO-i.

[12] In the SIFMA data arbitrage and balance sheet, CLOs are aggregated suggesting that our estimate of the sample coverage is rather conservative.

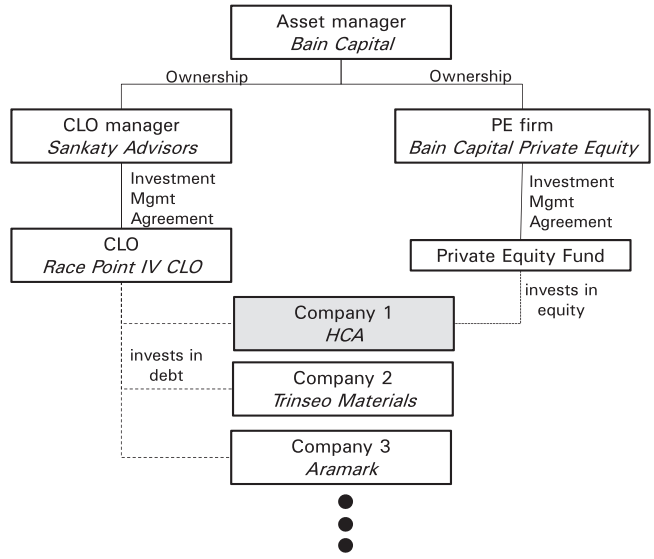

FIGURE 1 Definition of *dual holding*. A PE firm (Bain Capital Private Equity) sponsoring a company (HCA Healthcare) belongs to the same asset manager (Bain Capital) as a CLO manager (Sankaty) holding the debt of the company via its CLO.

Next, we examine at the company-month level, whether the two sufficient conditions for a positive dual holding status simultaneously occur. First, the company has to be sponsored by a PE firm belonging to an asset manager who also participates in the CLO business. Second, an outstanding loan facility issued by the company has to be part of the portfolio holdings of a CLO manager affiliated to this sponsoring PE firm.

We retrieve the information on the portfolio holdings from the CLO-i dataset described above. For the sponsoring relationship, we rely on the DealScan variable *sponsor* that contains the name of the PE firm, if any, holding the company's equity at the time a new loan is issued. For each company–PE firm combination, we define the issuance date of the first loan facility, where the PE firm is listed as sponsor as starting point for the equity holding period. For the end of the period, we use either the maturity date of the last facility listing or the issuance date of the first facility not listing the PE firm as sponsor of the company, whichever comes earlier.

The generation of the *dual holding* dummy is best illustrated using an example. The Hospital Corporation of America (HCA) is a healthcare provider, taken private in 2006 by a group of PE firms including Bain Capital Private Equity, the equity arm of the asset manager Bain Capital (P. Smith & Politi, 2006). In May 2013, HCA issued a new syndicated loan for corporate purposes. During that time, Sankaty Advisors was the debt arm of Bain Capital, managing, among other vehicles, the Race Point IV CLO.[13] In June 2013, the portfolio holdings of Race Point IV CLO included two loan facilities issued by HCA. One of them was the newly issued facility, and the other was a previously syndicated loan. Thus, Bain Capital was simultaneously holding debt and equity of the company (see Figure 1), and HCA obtained a dual holding status for June 2013.[14] Therefore, the *dual holding* dummy of HCA's newly issued loan facility in May 2013 is set to 1. As Table 1 shows, 13% of all sponsored loan facilities in our sample have a *dual holding* dummy of 1, which underlines the practical relevance of dual holdings in the PE market.

In several of our analyses below, we rely on an extensive set of loan characteristics as control variables. Table A.1 in the Appendix provides a complete overview of every variable we use in this paper, including the data source, the unit and a short description of its meaning. Since CLO-i contains only limited loan-level information, we match facilities in CLO-i to DealScan using a multistep approach, which is detailed in Appendix A.2. This matching procedure results in 4007 DealScan matched *sponsored* facilities with nonmissing spread information. Recall that our sample is restricted

[13] Since a rebranding in 2016, Sankaty advisors operates under the name Bain Capital Credit (Donde, 2016).

[14] Note, that each of the two holdings on its own would have been sufficient to fulfill the criteria for a dual holding status.

TABLE 1 Summary statistics for DealScan-matched facilities in our CLO trading data.

	N	Mean	SD	Median	p10	p90
AISD	4042	391.77	143.61	375.00	225.00	550.00
Effective spread	2720	432.66	149.52	412.50	262.50	625.00
Price at issuance	2720	99.12	1.60	99.50	98.00	100.00
Dual holding	4042	0.13	0.34	0.00	0.00	1.00
# Syndicate members	4042	5.19	6.41	4.00	1.00	9.00
# Facilities	4042	1.75	1.20	1.00	1.00	3.00
Facility amount	4039	524.76	771.62	306.21	80.14	1179.10
Maturity	4011	6.24	1.45	6.04	4.68	7.24
LBO/SBO	4042	0.38	0.49	0.00	0.00	1.00
Secured	4042	0.95	0.22	1.00	1.00	1.00
Performance pricing	4042	0.11	0.31	0.00	0.00	1.00

Note: A facility has to be "sponsored" to be eligible for inclusion in our sample. All variables are measured as of the issuance of the facility. We report the mean, standard deviation and median as well as the 10th and 90th percentile to give an overview of the range of occurring values. All variables are described in detail in the appendix Table A.1.

to sponsored companies because for an observable dual holding to exist at all a company has to be sponsored (owned by a PE firm).

We believe that our CLO-i versus DealScan match, while manually cumbersome, offers the invaluable benefit of providing a wider and cleaner look into the lending activity of CLOs than DealScan alone. Other studies that investigate the role of institutional investors like CLOs in leveraged loans (e.g., Benmelech et al., 2012; Lim et al., 2014) rely solely on the information provided by DealScan to identify lenders in the syndicate. However, the lender composition seems incomplete in DealScan and underrepresents CLOs. The main reason for this incompleteness and the likely bias in DealScan's institutional loan share information is based on the fact that for the majority of loans, DealScan collects this information from regulatory filings that normally contain only the names of the lead underwriters/arrangers of the loan package. Hence, nonlead underwriter institutional investments are systematically missing. This is important in our context since CLOs are never lead arrangers of loan packages.[15]

3 | EMPIRICAL FINDINGS

3.1 | Credit spread analysis

As pointed out above, if loan ownership of equity holders reduces agency conflicts, we expect lower spreads for facilities originated by companies with dual holdings. To examine our hypothesis, we analyze the influence of an own debt holding by at least one of the company's PE firm sponsors on the spread of newly issued facilities. We are doing so by examining the existence of a dual holding as described above. We generate a *dual holding* dummy that takes the value 1 if the issuing company of a new loan facility exhibits a dual holding the month after the loan issuance and 0 otherwise. This way, we capture dual holdings arising from investments into the new facility as well as pre-existing

[15] Our finding of this institutional participation misrepresentation in DealScan is backed by the observation that according to the LSTA, roughly 60% of leveraged loan issuance is financed through CLOs but only a small fraction of sponsored loan facilities in DealScan have a lender in the syndicate classified as collateralized debt obligation (CDO) (including CLOs), hedge fund or other institutional investor (<8%). Furthermore, Ivashina and Sun (2011b) report that the average loan amendment agreement shows eight more entities than the original syndicate according to DealScan, which is probably the result of an incomplete collection of lender information in DealScan.

dual holdings via other outstanding loans. Afterwards, we regress the spread on the *dual holding* dummy and an extensive set of controls.

Actual loan pricing within the syndication process is determined through what is called "market-flex" in practitioners' jargon. Importantly, while loan amount and nonprice terms (maturity, collateral, covenants) are fixed in advance, the spread *and* the price (equivalently, the OID) will either be adjusted ("flexed") up or down during the syndication process depending on demand and general market conditions.[16] A voluminous literature in finance looks at loan pricing by taking the DealScan variable *AISD* as a proxy for total borrowing costs (e.g., Jiang et al., 2010; see Berg et al., 2016 and 2017, for notable exceptions).

One important underlying assumption of the *AISD* as cost measure is that loans are issued at par. However, the summary statistics shown in Table 1 indicate that the *price at issuance* is usually below 100. Indeed, the mean price across the whole sample of 2720 facilities for which we observe purchase prices in the primary market is 99.12, significantly lower than 100. This implies an average price discount of 88 bp. Moreover, the median price is 99.5, and more than two thirds of sample facilities are priced below 100. Price discounts can even become extreme. For example, 10% of facilities are priced at a discount of 200 bp and more! Looking only at the *AISD* would severely underestimate borrowing costs in these cases. Finally, the standard deviation in price discounts (or premiums) is large at about 160 bp. The main takeaway here is that one cannot ignore the price when studying total costs of borrowing at least not for institutional leveraged loans. This has long-since been recognized by practitioners. They usually add the price discount (called OID—original issue discount—in market jargon) to the spread by assuming an effective maturity for the loan (usually fixed at 4 years). We follow their approach and define a variable *effective spread* exactly this way:

$$\textit{Effective spread} = \textit{AISD} \text{ in } \% + \underbrace{(100 - \text{price})/4}_{\textit{OID}}. \tag{7}$$

Hence, for the average facility, yearly effective borrowing costs are 22 bp (over 4 years) higher than implied by the *AISD*.

For comparison, we run our regression with both, the *AISD* and *effective spread* as loan cost proxy. As we gather the *price at issuance* from CLO-i, we are missing this information when no CLO purchased the loan facility directly on the primary market. For that reason, our sample size is about one third smaller when we regress on the *effective spread* compared to the *AISD*. On the other hand, through this forced restriction we control for potential structural differences between loans with and without CLO primary market investments. In case this subsample of loans is simultaneously associated with significantly higher or lower loan spreads and *dual holding* rates, we would expect notable differences between the spread regression coefficients due to omitted variable bias in the *AISD* specification.

Our control variables are mostly loan or company specific, motivated by previous studies (e.g., Bharath et al., 2011; Berg et al., 2017; Ivashina & Sun, 2011a; Ivashina & Kovner, 2011) and rely on DealScan data. Table 1 gives an overview of the descriptive statistics for these variables.

However, the credit spread depends not only on company- or loan-specific factors but also on overall market conditions. During some periods, investors demand a higher premium over the risk-free rate to lend money to risky companies than at other times. To control for the overall conditions on the market for debt with elevated risk, we follow Axelson et al. (2013) and use the high-yield bond spread over LIBOR. We account for the possibility of a general relation between a facility's loan spread and the probability of a CLO investment in it by controlling for the share of the total facility amount purchased by CLOs on the primary market. To avoid overlaps with the dual holding dummy, we only use the investments of unaffiliated CLOs for the purchase volume calculation.

Furthermore, we use fixed effects to control for unobserved variation in several dimensions. We add year dummies for time-varying factors and loan-type fixed effects for variation related to the kind of facility. We capture otherwise unobserved risk factors by adding rating letter fixed effects.[17] To control for branch- and country-specific determi-

[16] For more details on how syndicated loan pricing works, see Ivashina and Sun (2011a).

[17] For the by far most common rating letter B, we use separate dummies for B+, B and B− as rating notch.

nants, we add industry and country fixed effects. While about 24% of all facilities are issued by companies with only one sponsor, the remaining 76% have two or more different sponsors. Thus, for sponsor fixed effects, we build a separate dummy for each distinct sponsor combination (i.e., "Blackstone Group, CVC Capital Partners") that occurs in our sample.

Table 2 presents the results, separately for the *effective spread* and *AISD* as dependent variables. Consistent with the idea of reduced agency cost, the coefficient on *dual holding* is always negative and significant at the 0.1% level. Columns (3) and (1) show a 42 bp lower *AISD* and a 40 bp reduction for the more accurate *effective spread* in facilities issued by companies with dual holding PE sponsors.

The signs of the control variable coefficients are mostly in line with previous empirical studies and economic theory. As in Ivashina and Sun (2011a), performance pricing is associated with lower and LBO as loan purpose with higher spreads. Like Ivashina and Kovner (2011), we find a negative relationship between the number of lenders (syndicate members) and loan spreads. The loan maturity is positively related to the spread (in accordance with Berg et al., 2017, and Ivashina & Kovner, 2011) whereas the correlation between the facility amount and the spread is negative (in accordance with Bharath et al., 2011; Berg et al., 2017; Ivashina & Sun, 2011a). As expected, we also see an increased loan spread when the risk premiums on the high-yield (HY) bond markets are higher. The fact that the coefficients of the control variables confirm previous findings strengthens our confidence in the general validity of our model and the quality of the data we used.

So far, we mainly used control variables that are either related to a facility's risk or to the overall market conditions to explain the loan spread aside from the dual holding. However, the relationship between the parties participating in the syndication process might also play an important role, especially as leveraged loans are not traded on public markets. Ivashina and Kovner (2011) find that an intense relationship between a PE firm and the lead arranger, measured by the underwritten loans to companies sponsored by the same PE firm, is associated with lower loan spreads. As the asset managers who run the biggest PE firms such as Blackstone, Carlyle and KKR also own some of the largest CLO managers, they likely have both, a strong relationship with the arranging investment banks and many dual holdings via their large PE funds and CLO portfolios. Thus, part of the lower spreads in dual holding facilities could be caused by the PE firm–arranger relationship instead of the incentive alignment effect. To control for this possibility, we add the inflation-adjusted facility amount of all loans that were issued by portfolio companies of the sponsoring PE firm and underwritten by the same lead arranger as the observed facility to the right-hand side of the equation. Bharath et al. (2011) find that the relationship also plays a role on the company–arranger level. They discover that repeated borrowing from the same creditor results in lower loan spreads for the issuing company. Therefore, we add the inflation-adjusted facility amount of the company previously underwritten by the same lead arranger as the observation facility as control variable. The relationship and market share variables are calculated on a rolling 5-year basis prior to the facility issuance.

Columns (2) and (4) show the results of the spread regression with the included relationship variables. The reduction effect through dual holdings decreases to 37 bp for the *AISD* and 32 bp for the *effective spread* measure. This result is in line with previous literature indicating that intensive past company–lead arranger relations (Bharath et al., 2011) and past lead arranger–PE firm relations (Ivashina & Kovner, 2011) lower spreads (*AISD*) and the presumption that dual holding facilities are associated with more frequent past interactions. The dual holding effect is comparable to the upper range of the estimates of Jiang et al. (2010) who find that the presence of at least one dual holder reduces syndicated loan spreads (*AISD*) by 18–32 bp and significantly below the 160 bp of Buchner et al. (2022). These results are in line with the diverging default risk, where our sample ranges between the two other ones. Furthermore, it reflects the different portions of outstanding equity and debt owned by the dual holding asset manager and their impact on the manager's capability and incentives to prevent wealth transfers from debt to equity holders.

In Appendix A.3, we examine whether large asset managers, who sponsor dual holding companies to a much higher proportion, are a dominant driver behind the results. However, we find no evidence for an especially pronounced spread reduction effect in the subsample of loans issued by companies with large asset managers as sponsors.

TABLE 2 Results from spread regressions.

	Effective spread		AISD	
	(1)	(2)	(3)	(4)
Dual holding	−39.791	−32.372	−41.766	−36.965
	(0.000)	(0.005)	(0.000)	(0.000)
Unaffiliated funding	−0.451	−0.382	−0.392	−0.359
	(0.006)	(0.013)	(0.004)	(0.008)
Log(# syndicate members)	−11.599	−10.887	−14.500	−13.364
	(0.025)	(0.031)	(0.000)	(0.000)
# Facilities	−3.625	−0.566	2.048	3.933
	(0.286)	(0.865)	(0.435)	(0.140)
Log(facility amount)	−21.099	−18.584	−19.688	−18.202
	(0.000)	(0.000)	(0.000)	(0.000)
Log(maturity)	75.589	56.905	80.162	71.937
	(0.000)	(0.000)	(0.000)	(0.000)
LBO/SBO	15.550	−4.186	8.765	−3.577
	(0.026)	(0.561)	(0.094)	(0.526)
Secured	9.183	13.290	−11.798	−10.259
	(0.638)	(0.494)	(0.426)	(0.498)
Performance pricing	−38.964	−36.266	−32.331	−30.575
	(0.000)	(0.000)	(0.000)	(0.000)
HY bond spread over LIBOR	42.792	41.507	21.602	20.561
	(0.000)	(0.000)	(0.000)	(0.000)
Log(1+5 year lead-company-vol)		−8.296		−4.679
		(0.000)		(0.000)
Log(1+5 year lead-sponsor-vol)		−2.295		−2.029
		(0.167)		(0.106)
Year FE	Yes	Yes	Yes	Yes
Loan type FE	Yes	Yes	Yes	Yes
Rating letter FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Sponsor FE	Yes	Yes	Yes	Yes
N	2706	2706	3984	3984
adj. R^2	0.492	0.515	0.488	0.497

Note: The dependent variable is the *Effective Spread* in Columns (1) and (2) or the *AISD* in Columns (3) and (4). The independent variable *Dual Holding* captures whether a PE sponsor of the borrowing company has an affiliated CLO manager investing in at least one of the company's loan facilities. Variables are explained in Table A.1 of the appendix. The constant is not reported. Standard errors are clustered at the company level with the corresponding p-values reported in parentheses.

The results presented in Table 2 support our hypothesis of better-aligned incentives in companies where some of the creditors are affiliated to the equity sponsors. However, there is a different hypothesis on the rationale behind the spread reduction in dual holding constellations advocated by Buchner et al. (2022). While we interpret the lower spreads as a result of creditors anticipating mitigation of the postlending shareholder–creditor conflict, they rather see it as a manifestation of the agency conflict in the lending process itself. Buchner et al. (2022) view the spread reduction as an interest rebate given by debt funds to companies sponsored by PE firms of the same asset manager as the debt fund. This interest rebate is perceived as a wealth transfer from the debt to the equity investors, which was rationale if the asset manager's exposure to the PE fund's performance is higher than to the debt fund's performance. To find out, which of these two explanations causes the spread reduction in our setting, we conduct several subanalyses on factors that aim to disentangle *risk-shifting sensitivity* from *interest rebate sensitivity*. There are some loan characteristics that heavily increase the possibility and importance of risk shifting but have no obvious connection to the likelihood of wealth transfer through interest rebates.

As described above, loans with higher default risk are associated with a stronger incentive for risk shifting. This conventional wisdom can be substantiated with the corporate debt pricing model developed by Merton (1974). It implies that under certain conditions equity and debt of a company can be regarded as long-call and short-put options on the asset value with the liability amount as strike price. In this framework, a corporate default is equivalent to the long-call option expiring out of the money. When the market value of the assets and the principal amount of the liabilities are similar, the default risk of the company is very high and the asset value options are at the money. In this situation, the options vega factor is especially high, implying a high sensitivity of the option price to changes in the underlying volatility. As higher (asset) volatility benefits the long-call (equity holder) and harms the short-put (debt holder) position, the equity holder is incentivized to increase risk especially in a company with a high default probability.

For that reason, we split the sample used in Table 2 into a subsample with a higher and lower default risk. This division happens in two ways. First, we use the average rating by S&P, Moody's and Fitch as the basis for the risk assessment. B is the median rating of all loan facilities in the sample. Thus, we take the loans with average ratings of B or worse into the high-risk and facilities with ratings of B+ or better in the low-risk category. As nearly half of all loans in the sample have an average rating of B and the group of worse-rated as well as the group of better-rated loans each account for only a bit more than a quarter of all loans, the high-risk sample is much larger than the low-risk one despite a median-split by rating. Assuming efficient markets with rational participants, spread over LIBOR is another way to measure the default risk of a loan facility. Therefore, we separate the sample into loans with an *AISD* of above and below the median of 375 bp.

Barnea et al. (1980) show that the asset volatility of a company has a higher impact on the valuation of long-term debt than short-term debt. Hence, the risk-shifting effect through volatility increase should be more pronounced in loans with longer maturity and we expect a larger spread reduction through dual holding in these facilities under the incentive alignment hypothesis. Thus, we split the sample into loans with a maturity of more than 6 years and 6 years or less. We use 6 years as the threshold for long-term loans, as it is relatively close to the median loan maturity in the sample.

Panel A of Table 3 presents the results of the spread regression on the *dual holding* dummy we have used in Table 2 for the subsamples with high- and low-risk-shifting sensitivity. The reported number is the coefficient for *dual holding*, while all other variables from Table 2 remain in the regression but their coefficients are not reported. The model refers to the column number in Table 2, and the coefficients of each subanalysis are presented in a separate line.

As expected, we see a much more pronounced spread reduction in the high-risk samples compared to the low-risk samples. Using the *effective spread* regression with relationship controls (column (3)), we see a 37 bp reduction for loans with dual holders in the sample with worse ratings and a 36 bp reduction in the high-spread sample. Column (4), on the other hand, shows a 29 bp spread reduction for the better ratings- and a 4 bp effect for the low-spread sample. Comparing the loans by term, the dual holding effect on the *effective spread* is almost twice as high (38 bp vs. 21 bp) in the facilities with a longer time to maturity. While using other specifications than Model 2 results in slightly diverging coefficients, the difference between the two groups of each sample split has always the same sign and generally a

TABLE 3 Results for the *dual holding* coefficient from Table 2 in different settings either related to risk shifting or interest rebate sensitivity.

	Effective spread					AISD				
	Model 1		Model 2			Model 3		Model 4		
	High	Low	High	Low		High	Low	High	Low	
	(1)	(2)	(3)	(4)	*N*	(5)	(6)	(7)	(8)	*N*
					A: Risk shifting sensitivity					
Rating	−47.167	−34.631	−37.430	−28.895	High: 1982	−49.558	−19.824	−43.996	−16.655	High: 2955
	(0.000)	(0.056)	(0.008)	(0.109)	Low: 724	(0.000)	(0.152)	(0.000)	(0.240)	Low: 1029
Spread	−41.619	−4.619	−35.630	−3.650	High: 1640	−44.117	−3.263	−40.860	−2.133	High: 2098
	(0.011)	(0.488)	(0.033)	(0.582)	Low: 1066	(0.006)	(0.495)	(0.013)	(0.652)	Low: 1886
Maturity	−43.788	−37.029	−38.258	−21.110	High: 1824	−41.276	−28.896	−37.506	−18.906	High: 2742
	(0.001)	(0.102)	(0.003)	(0.325)	Low: 882	(0.000)	(0.001)	(0.000)	(0.040)	Low: 1242
					B: Interest rebate sensitivity					
Aff. purchase	−38.854	−35.838	−30.102	−28.269	High: 2563	−46.102	−35.330	−41.114	−28.494	High: 3794
	(0.003)	(0.010)	(0.029)	(0.047)	Low: 2416	(0.000)	(0.000)	(0.000)	(0.000)	Low: 3659
Lender type						−39.995	−45.053	−39.052	−40.747	High: 856
						(0.068)	(0.032)	(0.081)	(0.058)	Low: 1146

Note: The model number refers to the columns in Table 2. *Rating* divides the sample into facilities with ratings B or worse (High) and B+ or better (Low). *Spread* breaks the facilities into subsamples with *AISD* of at least (High) or lower than (Low) 375 bp. *Maturity* splits the sample into facilities with a maturity of more (High) and at most (Low) six years. *Aff. Purchase* takes into account whether a portion of the facility is purchased by a CLO manager belonging to the same asset manager as a PE firm sponsoring the borrowing company. The low interest rebate sensitivity subsample excludes all facilities with such an affiliated purchase. The high interest rebate sensitivity subsamples excludes all facilities with a dual holding coefficient of one but no affiliated purchase. *Lender type* shows the *Dual Holding* coefficients for the subsample of loan facilities from Table 2 with at least one bank loan facility in the same package (High) and the regression results for these related bank facilities (Low). Standard errors are clustered at the company level with the corresponding p-values reported in parentheses.

similar magnitude. In summary, we see a larger spread reduction effect for the samples with high-risk-shifting sensitivity in all three settings.

While risk-shifting sensitivity is primarily based on company characteristics, the interest rebate works through additional demand (or, put differently, capital supply) for the issued facility. Unlike Buchner et al. (2022) we do not observe the dual holding phenomenon via PE transaction but use data on CLO portfolio components. As a result, in 37% of our dual holding facilities, no dual holding asset manager purchases any portion of the newly issued facility. Instead, the dual holding status is solely caused by pre-existing portfolio positions of other outstanding loans to the same company. In these cases, there is no capital supply by a CLO manager affiliated to one of the company's PE sponsors that could be associated with an interest rebate.

In order to isolate the affiliated capital supply effect from the general dual holding effect, we build two different subsamples out of the facilities from Table 2. Both samples consist of the same nondual holding status facilities but differ in their dual holding status ones. The high-interest-rebate-sensitive sample excludes all facilities with a dual holding coefficient of one but no purchases from a CLO manager affiliated to the company's sponsor. In this sample, like in Buchner et al. (2022), the dual holding status means that the loan is to some extent funded by a debt arm of the asset manager operating one of the company's equity sponsors. In the other sample, all facilities with affiliated purchases are excluded. By design, all issuers of the excluded facilities are dual holding companies by the time the loan has been issued. In the remaining sample, none of the dual holding loans is funded by an affiliated CLO manager. Thus, under the interest rebate hypothesis, we would expect no spread difference between the facilities issued by dual holding and nondual holding companies in this subset.

Risk shifting works on the company level (i.e., affects all facilities of the company to a similar extent), whereas additional demand for a loan reduces the interest rate stronger in the facilities where the demand occurs. Ivashina and Sun (2011a) show that higher institutional demand pressure, both on the market and loan level, lowers the spread of the institutional facilities relative to the bank facilities of the same loan package. We would expect this effect to be especially pronounced under the interest rebate hypothesis, as there is no reason for a bank, to join a CLO manager in giving discounts on the loan spread for portfolio companies of their affiliated PE firms.

To observe the dual holding effect in noninstitutional loans, we are examining bank facilities of the same loan package as the institutional facilities in Table 2. We use DealScan data to identify bank loans in two ways: First, we look for facilities with loan type "Term Loan A" as these facilities are typically syndicated to banks (S&P Global Market Intelligence Inc., 2020). Second, we use a data file that shows the share of loan allocations distributed to each member of the loan syndicate. If the total bank allocation exceeds 50% of the facility amount we also define the facility as a bank loan. This way, we identify 1.146 "sibling" bank facilities for 856 of the 3.984 institutional facilities in the total sample. Since we do not observe primary market prices (and thus OIDs) for the bank facilities, we can only use the AISD specification as loan cost measurement in this analysis. Furthermore, bank loans typically do not exhibit funding via CLOs. For that reason, we omit *unaffiliated funding* from the set of control variables in both of the samples.

Panel B of Table 3 presents the estimators for the *dual holding* coefficients for the subsamples with high- and low-interest rebate sensitivity. As in panel A, the model number refers to the column in Table 2. The coefficients for the sample without facilities with affiliated purchases (low) show a statistically significant 28 bp reduction through dual holdings in the models with relationship controls. As these facilities are not funded by the dual holding asset manager, the interest rebate hypothesis cannot explain this effect. The estimators for the dual holding coefficient are 11–13 bp higher in the sample, where all dual holding status facilities are purchased by an affiliated CLO manager. This difference indicates a slight additional spread reduction through interest rebates from affiliated capital suppliers. However, the difference is very modest in comparison to the overall dual holding effect and hardly appears at all in the more accurate *effective spread* specification.

Separating by lender type, we see no relevant difference in the spread reduction effect for the institutional loans, we have used in Table 2 (high) and their "sibling" bank facilities from the same loan package (low). Reflecting empirical findings by Ivashina and Sun (2011a), we would expect a lower *dual holding* coefficient for the noninstitutional tranches, if excess demand by affiliated CLO managers were an important factor in the price building of loans to

dual holding companies. In conclusion, our subsample analysis shows additional evidence for the incentive alignment hypothesis and little indication for the interest rebate hypothesis as the driving mechanism behind the spread reduction in dual holdings.

3.2 | Quasi experiment

In Tables 2 and 3, we ran multivariate regressions to determine the effect of dual holdings on the loan spread. Although we used a broad set of variables connected to borrowing cost established by the previous literature, there could be unobserved variables, which are correlated to both, the loan spread and the probability of a dual holding. In case these unobserved factors were positively related to the probability of an investment by a PE-affiliated CLO manager and negatively related to the loan spread, the dual holding coefficients would be biased downwards, thus overestimating the loan cost-reduction effect through dual holdings.

One possible source of endogeneity can be explained by signaling theory. The utilization of a company's capital structure to signal private information to potential creditors is a well-established concept in the literature on information asymmetry. Leland and Pyle (1977) show that entrepreneurs with informational advantage can signal a high quality to creditors by retaining a larger share of the company's equity. Milde and Riley (1988) indicate that the requested loan amount may also serve as a quality signal to borrowers. Tykvová (2017) demonstrates that early-stage venture capital investors can use the choice between late-stage venture capital and venture lending as well as the offered share of equity and payment of interest to signal the quality of their company.

In our setting, it is possible that by investing on the debt side, asset managers signal hidden loan characteristics they know about through their position as PE sponsors. While the other debt investors might understand that signal and react by lowering their spreads, this effect cannot be captured by any control variable as the transferred information is by definition not observable for anyone but the PE sponsor. The resulting negative *dual holding* coefficient would then be misinterpreted as an incentive alignment effect, while in reality it just captures private information that the dual holding asset manager reveals through its debt investment. The described signaling mechanism is just one of many possible examples of the presence of endogeneity in our model.

To mitigate this endogeneity problem, we use CLO manager takeover events as a quasi-experiment. During our observation period, several large PE-affiliated asset managers established or extended their debt business. In many cases, they did so by buying existing CLO managers as a whole or taking over a number of CLOs previously run by another manager. Examples include the acquisition of GSO Capital Partners by Blackstone in 2008, the takeover of Mizuho's debt management platform by 3i in 2011 or the acquisition of the European manager Avoca Capital by KKR in 2014. Once a PE-affiliated asset manager acquires a CLO manager or takes over responsibilities for a CLO, some of the companies see a switch in their dual holding status. Since it is highly unlikely that asset manager's acquisition decisions are affected by unobservable factors at the individual company–CLO manager level, a CLO takeover creates exogenous variation in the dual holding variable. Hence, by utilizing M&A activities in the CLO market during our sample period, we are able to exploit variation in the dual holding status of a company–CLO manager pair that is arguably exogenous to unobservable factors affecting loan investment decisions. This way we can identify the causal effect of dual holdings on borrowing cost.

The loan spreads themselves are fixed during the process of issuance. Thus, they do not change along with the dual holding status. However, syndicated loans are traded on the secondary market. The relationship between loan prices and yield to maturity (YTM) is inverse: If the loan price increases, the yield decreases and vice versa. Hence, higher loan prices reflect, *ceteris paribus*, lower implied credit risk and lower cost of borrowing for the company, as a newly issued loan competes with outstanding traded loans to the same company on the capital market.

To identify event loans, we take all CLOs, which were taken over by a PE firm between 2008 and 2015. Among these CLOs, we observe the portfolio holdings reported by CLO-i in the month before and after the manager change. All loan facilities of companies which have at least one PE sponsor, belonging to the same asset manager as the new CLO

manager are potential event loans. However, some of the asset managers already have loans from the company in their debt portfolio through previously owned CLOs. In this case, the CLO takeover does not establish a new dual holding relationship. We separately analyze the price development for all loans with new and pre-existing dual holdings during a CLO takeover. If the existence of dual holding reduces agency conflicts, we expect higher loan prices after a newly established affiliation between an equity-owning PE firm and a debt holding CLO manager of the company.

We use IHS Markit quotes to observe the secondary market prices of the event loans. Markit offers bid and ask quotes for a wide range of syndicated loans on a daily basis. To find the corresponding LoanX ID (LXID),[18] we match our dataset with Markit using variables from CLO-i and DealScan. We use the trade date, unified company and loan designations as well as the loan type, currency and maturity to identify the correct LXID for each CLO-i portfolio holding. We take quotes from the last day of the penultimate month before the CLO manager changes until the last day of the takeover month. This way, we observe the loan prices for a time period of 2 months around the event. In addition, we use the last day of the fourth month after the takeover month as alternative end date to observe the price development in the first half year around the event as well.

To adjust the price change for the market development, we use the average midquotes[19] of three matched control loans as benchmark for the midquote development of each treatment loan. As stated above, it is highly unlikely that an asset manager bases its CLO (manager) takeover decision on characteristics related to a single portfolio loan, even if the issuing company is sponsored by the asset manager's PE firm. However, there could be unknown CLO characteristics correlated to both, the probability of a takeover by a PE-affiliated asset manager and the expected returns of the portfolio loans at a specific point in time. For that reason, we use the portfolio of the CLO taken over that includes the treatment facility as the matching universe for the potential control loans in our first setting. In case several CLOs overtaken by a PE-affiliated asset manager hold the same treatment facility, loans in each of the portfolios are potential controls.

Before an asset manager makes the choice to acquire a specific CLO (manager), it has to decide on an expansion in the debt business in the first place. It is possible that this decision is related to unobserved characteristics in the portfolio of the asset manager's PE firm. If these factors are also related to the returns of facilities issued by the PE firm's portfolio companies, these loans could systematically over- or underperform during the times of affiliated CLO takeovers. Therefore, in a second approach, we match the treatment loans to outstanding control loans, issued by companies that are also sponsored by the PE firm of the asset manager taking over the CLO.

For each of the two matching universes, we narrow down the potential controls by selecting the loans with available Markit quotes around the time of the takeover event as well as an identical currency and rating letter as the treatment facility. Since we treat "no rating" like a separate rating letter, unrated treatment loans can only be matched to unrated control loans. For the CLO-portfolio-based matching, we also limit the maturity difference between the treatment and control loans to 365 calendar days. In the PE-sponsor-based matching, we do not exclude potential control loans based on maturity differences as this would heavily reduce the number of possible matches. The reason for that is the way lower number of companies in the equity portfolio of a PE firm compared to the portfolio holdings of a CLO.

If the number of remaining controls for a specific treatment loan is three or lower, we use all of them as control loans. For cases with four or more possible control loans, we take the three facilities with the smallest midquote difference from the treatment loan before the takeover as controls. In occasional instances of two loans being tied for third place in terms of the closest quote difference, we include both of them, ending up with four control loans for the observation. We use the midquotes for matching since the current price level is closely related to the upside potential as all loans are eventually repaid at par if they are not defaulted by the maturity date. Thus, loan facilities with a current price of 80 and 100 will have a cumulative price return of 25% and 0% over their remaining outstanding time, provided both companies fully repay the principal amount on the day of maturity.

[18] The LXID is a unique identifier for syndicated loans provided by IHS Markit.

[19] We define the midquote as (bid quote+ask quote)/2.

TABLE 4 *Control-adjusted returns* of loans in the quasi-experiment.

	Two months		Six months	
Time frame	**CLO**	**PE firm**	**CLO**	**PE firm**
Matched holdings	**(1)**	**(2)**	**(3)**	**(4)**
New DH	1.45%	0.88%	2.59%	2.00%
	(0.008)	(0.063)	(0.017)	(0.105)
N	52	50	44	41
Existing DH	0.06%	0.44%	0.21%	−0.02%
	(0.893)	(0.102)	(0.665)	(0.954)
N	83	80	66	61

Note: Columns (1) and (2) show the mean difference between the Markit mid quote change of the treatment loans and the three matched control loans from one month before to one month after the CLO-manager takeover. Columns (3) and (4) capture the mean difference between the Markit mid quote change of the treatment loans and the three matched control loans from one month before to five months after the CLO-manager takeover. The control loans in uneven columns are part of the same CLO portfolio as their matched treatment loan. In even columns, the controls consist of outstanding facilities issued by companies with the same sponsoring PE firm (which belongs to the asset manager taking over the CLO) as the borrowing company in the corresponding treatment loan. New DH presents the *Control-adjusted Returns* for events where the manager takeover created new dual holdings. Existing DH shows the *Control-adjusted Returns* for loans with pre-existing dual holdings via loans of the same company in portfolios of other affiliated CLOs.
Abbreviation: DH, Dual Housing.

Table A.2 in the Appendix shows the summary statistics for the loans in our return analysis, separated by the universe of matched control loans, as well as the pre-existence of a dual holding investor in the treatment loans. The number of treatment loans is slightly lower in the samples with control loans sponsored by the same PE firm. This is because more unmatched event loans drop out of the analysis due to the unavailability of a suitable control as a result of the lower number of portfolio companies in PE firms compared with CLO holdings. For the same reason, each treatment loan in the CLO matched panel has a higher number of control loans compared to the PE firm one.

In the CLO-matched panel, neither the price (i.e., the Markit midquote) before the takeover event nor the rating or maturity shows statistically significant differences between the treatment and control loans. Among the PE firm matched loans, the mean maturity is somewhat higher (4.76 vs. 3.99) and the average pre-event price is lower (91.66 vs. 94.25) for the treatment compared to the control facilities. These differences, which only show up in the subpanel with newly emerging dual holdings, are likely a result of looser matching conditions. Unlike in the CLO holding universe, for the panel with treatment and control companies sponsored by the same PE firm, we do not require a maximum maturity difference of 365 days for matching. Moreover, as the number of potential control loans exceeds the value of three less often the pre-event price is less frequently used to select the control facilities.

Besides the variables we use for matching, Table A.2 also displays the summary statistics for the number of quoting dealers at the starting day of our return calculation. This can be interpreted as both, a measurement of the loan liquidity and the accuracy of the quoted prices. For all four subpanels, the mean number of quoting dealers is higher in the sample of treatments than in control loans with differences ranging from 0.17 to 2.45 dealers.

We refer to the difference between the return of the treatment loan and the average return of its control loans as the *control-adjusted return*. Table 4 shows the means of the *control-adjusted return* calculation for our event loans. The upper sample comprises all loans where the manager takeover established a new dual holding relationship. The lower sample contains the loans with a pre-existing dual holding relationship via other CLOs belonging to the same asset manager as (one of) the company's sponsoring PE firm(s). Columns (1) and (2) present the average *control-adjusted returns* in the 2 months around the takeover while (3) and (4) additionally include the following 4 months. The uneven columns show the results for the sample with control loans of the same CLO portfolio as the treatment loans. In the

even columns, the return adjustment is based on matched control loans issued by companies that are also sponsored by the PE firm of the asset manager taking over the CLO that holds the treatment loan.

The table shows economically and statistically significant positive effects on secondary market prices for loans in the 2 months around the emergence of a dual holding investor. For the sample with control loans of the same CLO portfolio, the mean *control-adjusted return* yields at 1.45%. Using the returns of facilities issued by portfolio companies of the same PE firm as benchmark, the excess return decreases by approximately 40% to 0.88% but still remains economically meaningful with regard to the usually relatively small price movements in the secondary loan market.

Adding the four subsequent months to the observation period, we are, respectively, losing 15% and 18% of the events in our two samples due to the unavailability of Markit quotes at the end of the time frame. For the remaining loans, the mean *control-adjusted returns* approximately doubled in comparison with the 2-month period. However, although increasing to 2% the mean excess return loses its statistical significance for the PE firm matched sample when we increase the time horizon. This is mainly the result of two factors: A higher variance of longer term loan returns and a sample size that becomes increasingly limited with the additional loss of nine treatment loans through missing Markit quotes. Despite being influenced by the same factors, in the sample with controls of the same CLO portfolio, the mean *control-adjusted returns* return remains statistically significantly different from zero and gets economically very large at 2.59%.

Besides the sample with new emerging dual holdings, we also observe the price development of loans to companies sponsored by PE firms of the same asset manager as the new CLO manager but with a pre-existing dual holding status. In this sample, we cannot observe any significant excess return over the control loans regardless of the observation period.

Despite the limited sample size, the results of this quasi-experiment strongly support our hypothesis of decreasing credit risk in companies with debt and equity holders belonging to the same asset manager. As all other loan terms remain equal, the increasing secondary market price goes along with a lower YTM and thus a lower risk premium for the facility. It is highly unlikely that the takeover decision of CLOs or even of a whole CLO manager is motivated by a single holding in its loan portfolio. Thus, we expect no relation between the new establishment of a dual holding status and any factor on the level of the event loan or borrowing company, which could also be correlated with the risk premium. As we calculate the *control-adjusted returns* against benchmark loans during the same period, an omitted variable bias through unobserved factors in the time dimension is also implausible. This mitigates endogeneity concerns and thus strengthens the interpretation that the increasing prices (decreasing yields) are caused by the emergence of a dual holding. The absence of significantly positive *control-adjusted returns* in loans with previously existing dual holdings suggests that an additional loan investment by a PE sponsor-affiliated CLO manager does not lead to a further loan cost reduction when the dual holding status is already established.

3.3 | Dual holdings in LBOs

Previous literature has established close connections between CLOs and the LBO business of PE firms. Benmelech et al. (2012) show that LBO-financing loans are more likely to involve CLO lenders than other syndicated loans. Therefore, credit conditions for LBO loans are significantly related to CLO activity. Axelson et al. (2013) observe that periods during which CLOs hold a higher fraction of LBO loans are associated with increased buyout leverage and thus looser lending standards. Shivdasani and Wang (2011) specifically focus on the role of CLOs in the LBO boom of 2004–2007 and discover a close relationship between growing CLO and LBO volume. Moreover, they find increased CLO underwriting activity of a bank to be associated with more LBO lending as well as lower spreads and looser covenants in LBO loans, implying a direct connection between these two business segments. After the turmoil in the LBO market during the global financial crisis, banks increasingly pre-syndicated LBO loans to CLOs before closing the deal in order to reduce their syndication risk (Fahlenbrach et al., 2023). This indicates the enduring relevance of CLOs for the funding of LBO deals lasting beyond the global financial crisis.

Considering the special relationship between CLOs and LBOs, we take a closer look at the economic impact of dual holdings on LBO transactions. Therefore, we first calculate the spread reduction effect by replicating the spread regression from Table 2 for the subsample of facilities where DealScan assigned "LBO" or "secondary buyout (SBO)" as primary loan purpose. As the summary statistics in Table 1 show, this is the case for 38% of all facilities in our sample. In comparison to the original regression, we omit the *LBO/SBO* dummy from the vector of control variables as it is one for all remaining loan facilities by design.

Table A.3 in the Appendix shows the estimators from this regression. With the exception of the insignificant *secured* dummy, all coefficients have the same sign as in the total sample, suggesting that similar factors are driving the spreads of LBO-financing facilities and other leveraged loans. However, depending on the model, 5–18 bp lower estimators for the *dual holding* coefficient indicate a stronger magnitude of the spread reduction effect in LBO loans.

After having estimated the spread reduction through dual holdings in LBO loans, we want to quantify the economic impact in terms of incremental equity returns of LBO transactions, measured by the change in IRR. In line with Ivashina and Kovner (2011), we assume that the typical LBO capital structure consists of 30% equity and 44% leveraged loans. We further assume that a PE firm's typical exit horizon is 4 years and that the LIBOR is flat at 0.5%.[20] Based on the *effective spread* model with relationship controls, the takeover company pays, *ceteris paribus*, 50 bp less credit spread if it has an equity-owning creditor compared to a peer company without a dual holder. This results in annual interest savings of approximately 2.62 million USD on an affiliated facility of mean size (524.76 million USD, from Table 1). The present value of these interest savings, received over 4 years (the PE firms' exit horizon) and discounted at 4.25% (LIBOR of 0.5% + median *AISD* of 375 bp for affiliated facilities in Table 1), is 9.47 million USD. This yields an incremental additional cumulative return of 265 bp, given a 30% (or 357.79 million USD) equity share in the LBO's initial capital structure and a corresponding 73 bp higher IRR.

We want to point out that the informative value of the results on the economic effect is limited. On the one hand, we likely underestimate the economic impact of dual holdings on borrowing conditions and LBO equity returns. While we look only at price terms (OID and *AISD*), the incentive alignment might also have a favorable impact on nonprice terms like maturity and financial covenants. On the other hand, PE firms reduce the opportunity to exploit their position as agents. The initially higher agency cost represents anticipated risk-shifting activity. We expect equity holders to be partly compensated for the additional funding cost by higher returns through wealth transfer from the debt holders. How much of the additional equity return from cost savings is lost through lower expected cash flows to the owner as result of a reduced risk-shifting exploitation could be part of future research.

Moreover, we only calculate the effect for the PE firms. On the asset manager level, the return is also affected by the profit of the debt holding CLO manager. In principle, lower spreads would reduce this return channel. However, in this section, we provided evidence that the spread reduction is related to shareholder–creditor agency conflict mitigation, which reduces credit risk for the company's debt holders. It is impossible for us to evaluate whether the credit spreads also decrease on a risk-adjusted basis. Nevertheless, for facilities with subsequent secondary market sales, the additional results in Section 4 contradict the hypothesis of overall lower returns for the CLO managers through dual holdings.

4 | ADDITIONAL RESULTS

Besides the incentive alignment effect of dual holdings, PE firms' superior access to information as majority owners of their portfolio companies can have positive spillover effects on affiliated CLO managers. That is, without effective "Chinese walls," communication between the CLO manager and the PE firm of the same asset manager may confer private information from the equity to the debt management part of the business. Eventually, CLO managers may

[20] Over the time period between 2009 and 2015, the 3-month LIBOR had a mean value of 0.37%.

exploit this information when trading dual holding facilities in the secondary loan market. In this case, we would expect the trades in dual holding facilities to be a source of outperformance for PE-affiliated CLO managers.[21]

However, if affiliated CLO managers are informed traders ("insiders"), who are the "outsiders," the ones that trade at an informational disadvantage? Indeed, since trading in the secondary market for a given facility is typically organized by the facilities' lead arranger acting as dealer, informational advantages on the part of affiliated CLO managers are not obvious. Moreover, it is generally believed that the number of uninformed liquidity (or "noise") traders is limited in the institutional syndicated loan market, compared to equity markets (Allen et al., 2012). Hence, consistent with the idea of secondary loan market trading being informationally efficient, Addoum and Murfin (2020) find that the public prices of traded facilities predict cross-sectional variation in future stock returns. On the other hand, evidence of significant performance persistence has been discovered for CLO managers (Liebscher & Mählmann, 2017) and general partners in private debt funds (Böni & Manigart, 2022), a finding in line with exploitable loan market inefficiencies. In the end, it remains an empirical question whether CLO managers benefit from informational advantages relative to their counterparty.

To investigate the potential effect of an information advantage by dual holding CLO managers, we analyze realized returns of *dual holding* and *nondual holding* RT trades. Transactions are dual-holding trades when both, the trading CLO manager and the PE firm owning the company underlying the trade belong to the same asset manager. Because spreads (*AISD*) in DealScan are only measured at origination and are therefore time-invariant, we rely on pure "price returns" to capture the information acquired and "priced" by secondary market traders. We compute returns according to the First In, First Out (FIFO) principle, that is, we assume that the first sale of a loan or bond belongs to its first purchase.[22] Importantly, all prices are *realized*, that is, actual prices paid or received by the CLO. Hence, we do not rely on quoted midpoints to construct *paper* returns. We restrict our analysis to trades in facilities from companies owned by PE firms to address the concern that sponsored companies might be fundamentally different from nonsponsored ones (Ivashina & Kovner, 2011).

Our setting offers several important advantages compared to studies trying to determine the returns to informed trading in equity markets. For equity markets, data limitations make it generally impossible to infer true holding periods which in turn prevent researchers from computing actual returns to insider trading (Jeng et al., 2003). Instead, researchers have to rely on proxy returns. Even worse, some studies (e.g., Ivashina & Sun, 2011b) must employ SEC 13(f) institutional investor filings and deduce informed trading from quarterly holding changes. However, nothing is known about the exact trading behavior of investors within a quarter. Moreover, equity studies often utilize close-to-close (*paper*) returns computed from daily closing midpoints not from actual prices paid or received by informed traders. Our return calculation, in contrast, is not subject to any of these limitations. Hence, we believe that our analysis of RT returns provides a valid proxy for what potential insiders (dual holding CLO managers) can earn in the secondary loan market.

Par building trades. Before we turn to our return comparison exercise, we highlight an important institutional feature that likely influences the trading behavior of CLOs. As a result of their compensation structure, CLO managers are motivated to sell appreciating facilities ("winners") early and depreciating facilities ("losers") only at times when liquidity is needed. This behavior is commonly referred to as "par building" and helps managers to fulfill CLO covenants.[23] Consequently, we would expect to see higher returns for "younger" trades and weaker results for trades with a longer time period between purchase and sale. Table 5 provides descriptive information for trades of dual holding (in panel A) and nondual holding (in panel B) trades. The table shows separate return statistics for winning and losing trades

[21] Anecdotal evidence in line with the information spillover effects can be found in an *Wall Street Journal* interview (see Tan, 2014); Brian Sheth, one of the two founders of Vista Equity Partners, was asked the question:"*You've got a debt fund, Vista Credit Opportunities. Does it invest alongside your equity fund?*" He replied: "*We've made 35 investments across 21 companies. Of those [investments], only six are not affiliated with Vista and three are Vista minority investments. We've got unique insights on how these companies are managed and how credit should be priced.*"

[22] The results are unchanged if we follow the Last In, First Out (LIFO) approach instead.

[23] In particular, by selling losers CLO managers likely reduce the nominal value of their portfolio. This, in turn, lowers their compensation and exposes them to the risk of violating collateral and interest rate coverage tests (Antczak et al., 2009, p. 94).

TABLE 5 Summary statistics for dual holding and nondual holding trades.

	N	Mean	SD	p5	p10	p25	p50	p75	p90	p95
Panel A: Dual holding trades										
– Winners										
Returns	554	3.6%	4.9%	0.3%	0.3%	0.6%	1.5%	4.1%	12.0%	15.6%
Holding time	554	325	353	3	13	48	241	455	818	1,025
– Losers										
Returns	472	−2.7%	6.4%	−8.6%	−5.7%	−2.3%	−0.8%	−0.6%	−0.3%	−0.1%
Holding time	472	509	432	69	136	174	344	867	1,209	1,221
Panel B: Nondual holding trades										
– Winners										
Returns	28,560	4.3%	12.6%	0.2%	0.3%	0.6%	1.4%	4.1%	10.2%	16.2%
Holding time	28,560	292	325	5	12	53	177	412	749	991
– Losers										
Returns	14,942	−6.5%	11.6%	−29.6%	−19.3%	−6.4%	−2.0%	−0.6%	−0.3%	−0.1%
Holding time	14,942	411	372	35	64	143	293	553	951	1,245

Note: The returns are computed according to the FIFO principle, i.e., first sale of a loan is assumed to belong to the first purchase of this loan. Holding time measures the difference in calendar days between the purchase and the sale date.

and also the corresponding holding period statistics. Looking at dual holding trades, the mean winning return is 3.6% and the mean losing trade returns are −2.7% (medians are 1.5% and −0.8%, respectively). As expected, there are large differences in holding periods. Winners are on average realized after 325 calendar days, whereas losers are held for additional 184 days (or 56.6% longer). A similar picture emerges for nondual holding trades in panel B. Hence, the par building effect generates a negative relation between holding periods and returns. Note that the par building effect can be considered the rational twin of the likely irrational disposition effect found among individual investors in equity markets (Odean, 1998).

Univariate tests. We now look at the association between the return and the dual holding status of a trade. We start with univariate comparisons. To control for the par building effect, we sort all RT trades into quintiles based on the time between the purchase and sale of the facility. Furthermore, to account for overall loan market conditions, we subtract the contemporaneous price return of the leveraged loan index from the raw trade return.[24] We call these returns *excess returns*. Table 6 presents the results, both for simple and annualized *excess returns*. In line with the par building effect, price returns decrease significantly with the time between the purchase and sales date (i.e., from Q1 to Q5). This holds especially true for the larger sample of nondual holding trades. More interestingly, looking at within-quintile differences reveals a consistent outperformance of dual holding over nondual holding trades. Mean *excess returns* in the dual holding subsample are between 30 and 310 bp larger than for the group of nondual holding trades. This translates into 40 to 330 bp on an annualized basis. While these univariate tests provide a somewhat volatile estimate of the value of private information, the overall picture strongly supports the information advantage hypothesis.

Multivariate tests. Table 7 presents results from multivariate tests, that is, ordinary least squares (OLS) regressions with the annualized *excess return* as the dependent and the *dual holding* dummy[25] as the independent variable. The pos-

[24] We use the Morningstar LSTA US Leveraged Loan Index for dollar trades and its European counterpart for trades in other denominations. Both indexes are designed to capture the overall price development in the respective institutional segment of the leveraged loan market. Hence, they should provide appropriate benchmarks.

[25] The definition of the *dual holding* dummy diverges slightly from the one we used above. In the spread analysis, the dummy measured the dual holding status on the company level. Here we measure the dual holding status on the trade level, meaning that the specific CLO manager participating in the observed trade must be affiliated to the company's PE sponsor and thus cause the dual holding.

TABLE 6 (Annualized) excess returns of dual holding and non-dual holding trades by holding duration quintile (Q1 to Q5).

	Excess return			Annualized excess return		
	Nondual holding	Dual holding	Difference	Nondual holding	Dual holding	Difference
Q1	0.8%	1.1%	0.3%	30.3%	33.6%	3.3%
	9,190	193	(0.022)	9,190	193	(0.366)
Q2	0.3%	1.4%	1.1%	2.6%	5.0%	2.4%
	9,165	148	(0.000)	9,165	148	(0.004)
Q3	−0.3%	1.4%	1.7%	0.1%	2.4%	2.3%
	8,966	246	(0.000)	8,966	246	(0.000)
Q4	−2.5%	0.6%	3.1%	−2.3%	0.4%	2.7%
	9,103	225	(0.000)	9,103	225	(0.000)
Q5	−5.4%	−4.5%	0.8%	−2.4%	−2.0%	0.4%
	8,997	265	(0.176)	8,997	265	(0.244)

Note: Returns are computed according to the FIFO principle, i.e., the sale price of an instrument is matched to the price of its first purchase. All variables are winsorized at the 1% and 99% percentile. Benchmark for the *Excess Returns* is the Morningstar LSTA US Leveraged Loan Index for trades in USD, respectively the Morningstar European Leveraged Loan Index for trades in Euro. The p-values for two-sided t-tests, allowing for unequal variances, are reported in parentheses and the number of observations within each group stands below each group-level mean.

TABLE 7 Results from OLS regressions of annualized *excess returns* on the *dual holding* dummy and controls.

	Dependent variable: Annualized excess return in %								
	Full sample			Only affiliated managers			Only affiliated companies		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dual holding	2.867	2.608	3.401	2.826	2.185	3.294	4.060	2.335	4.186
	(0.044)	(0.004)	(0.056)	(0.042)	(0.031)	(0.028)	(0.003)	(0.017)	(0.025)
Log(trade volume)	0.314	0.105	0.483	0.163	−0.035	0.237	0.815	0.411	0.961
	(0.166)	(0.506)	(0.064)	(0.577)	(0.884)	(0.366)	(0.023)	(0.231)	(0.008)
Log(holding time)	−9.682	−9.811	−9.668	−9.831	−9.842	−9.784	−8.620	−8.848	−8.642
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Bond dummy	5.268	6.977	5.189	5.785	6.837	6.079	8.770	12.730	8.957
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.010)	(0.014)
USD dummy	1.719	−0.092	2.833	0.587	0.570	2.093	3.371	0.705	5.894
	(0.138)	(0.962)	(0.051)	(0.628)	(0.799)	(0.131)	(0.068)	(0.711)	(0.034)
Company FE	No	Yes	No	No	Yes	No	No	Yes	No
Manager FE	No	No	Yes	No	No	Yes	No	No	Yes
Rating letter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	44,484	44,484	44,484	22,107	22,107	22,107	10,299	10,299	10,299
Adj. R^2	0.293	0.408	0.311	0.312	0.469	0.318	0.293	0.350	0.326

Note: The dependent variable is winsorized at the 1% and 99% percentile. The constant is not reported. Columns (1) through (3) show results for a sample of PE-affiliated and unaffiliated managers where Columns (3) to (6) are only for a subsample of trades from managers affiliated to a PE firm. In Columns (7) through (9) the sample is confined to observations from affiliated companies. Standard errors are double-clustered (Cameron et al., 2011) along sale date quarters and companies with the corresponding p-values reported in parentheses.

itive dual holding effect holds when we add further controls for the trading volume, a bond dummy, a dollar dummy as well as rating letter fixed effects (see column 1). In this specification, dual holding trades show a 2.9% higher annualized *excess return*. The regressions in the first three columns of Table 7 are run on the full set of RT trades in sponsored facilities from all CLO managers (PE affiliated or not) for which we observe trading data. However, independent (non-PE-affiliated) managers might be fundamentally different from their affiliated peers, for example, in terms of trading skill or style. This might bias the *dual holding* coefficient because all trade return observations from unaffiliated managers are assigned the value zero for *dual holding*. To address this concern, we replicate the baseline regression from column (1) for the subsample of trades executed by PE-affiliated CLO managers. The results, shown in column (4), remain unchanged.

Similarly, the facilities from some companies are never traded by affiliated CLOs. If these "unaffiliated" companies differ in unobservable ways from their affiliated peers, and this heterogeneity is correlated with trade returns, the *dual holding* coefficient will still be biased. Accordingly, we verify our results in the last three columns of the table by restricting the sample to trades in facilities from affiliated companies. The *dual holding* coefficient in the baseline regression (column 7) becomes highly statistically significant, and its magnitude is now even larger, implying an outperformance of 4.1% annually. Therefore, the findings are not specific to trades by the group of PE-affiliated CLO managers or to trades in affiliated facilities in general, but only to dual holding trades.

The outperformance of dual holding trades is consistent with the spillover of nonpublic information from the PE firms to CLO managers belonging to the same asset manager. However, access to private information may not be the only possible explanation for the observable outperformance. To further rule out alternative explanations of this result, we start by addressing the concern that there might be something special about the sponsored companies in which dual holding trades take place. If this is true, then all trades in a given company's facilities should perform equally well, that is, outperformance should not be characteristic of trades by CLO managers of the same asset manager as the company's PE sponsor. We turn to demanding specifications and add company fixed effects in columns (2), (5) and (8). Hence, the *dual holding* coefficient is now identified by affiliated and unaffiliated trades in facilities from the *same* issuing company. The estimated coefficients are reduced but remain meaningful in economic terms, implying an outperformance of dual holding trades by 2.2–2.6% and always statistically significant at least at the 5% level. These findings suggest that dual holding CLO managers beat their peers in terms of timing trades in affiliated companies.

As argued above, it could be that there is something unique about PE-affiliated CLO managers. For example, they follow superior investment styles or are simply more skilled as a result of manager self-selection when talented managers view PE-affiliated CLO managers as presenting more prestigious career paths. Taking into account this alternative, we add CLO manager fixed effects in columns (3), (6) and (9). In this way, we compare the performance of dual holding and nondual holding trades across the *same* manager. The intuition is that if there is something special about the manager, then there is no reason why this "special" skill should only apply to dual holding trades. For the within-manager regressions, the average outperformance of dual holding trades increases to 3.3–4.2%. This implies that private information acquired through PE affiliations is not only valuable for market timing but also helps to evaluate which facilities to select for trading.

Overall, the fixed effects regressions verify that outperformance is CLO manager-specific (dual holding trades outperform nondual holding trades within the same company) *and* company-specific (dual holding trades outperform nondual holding trades within the same CLO manager). Hence, outperformance is not representative of managers' or companies' overall characteristics.

We can use the findings in Table 7 to estimate the total benefits of dual holding trades for CLOs. In particular, assuming an average within-manager outperformance of dual holding trades of 4.2% (from column 9), and setting the size of all dual holding RT trades to 1114 million USD (grand total across years), the monetary benefit of insider trading amounts to 46.8 million USD (on an annualized basis). To better understand the economic value of this number, several points are noteworthy. One is that we look at excess returns, over and above what can be earned by simply investing in the market. Furthermore, the returns are *price* returns of debt instruments which do not include interest income and naturally provide only limited upside potential. Finally, while the number of dual holding trades is relatively low (annual

average of 152 over the period 2009–2015), the growth rate is high, at 140% a year. Hence, this type of informed trading in the loan market might become an even bigger issue in the future.

What are the likely sources of CLO managers' informational advantages in dual holding trades? One obvious possibility is that they are better able at timing rating changes due to tips received from their affiliated PE firm regarding upcoming rating events. Hence, they buy before unanticipated rating upgrades and/or sell in advance of downgrades.[26] This strategy, however, is unlikely to be profitable here due to the institutional structure of loan trading. Investors trade with lead arrangers acting as dealers in the secondary market, and lead arrangers should be equally well informed about upcoming major events like rating changes. Nevertheless, to test this "rating tipping" mechanism, we control for the change in facility ratings (transformed into 1-year implied probabilities of default)[27] over the course of a trade. Results for regressions similar to the ones in Table 7 are displayed in the Appendix (Table A.4). Unsurprisingly, we find that rating upgrades are associated with higher trade returns: one standard deviation (8.26%) decrease in the rating-implied probability of default (PD) over the life of a trade raises the return by 1.43%. More importantly, the coefficients for *dual holding* are qualitatively similar to those in Table 7, inconsistent with a rating tipping story.

Cross-sectional tests. We now examine cross-sectional predictions of the information spillover effect. We rely on the notion that informed investors will concentrate their trades on information-sensitive instruments because these are the ones from which they can hope to earn informational rents. Hence, if privileged access to private information is indeed the driver behind the results in Table 7, we would expect the marginal effect of dual holding trades to vary with a facilities' information sensitivity and, more broadly, with the value of information. To test this hypothesis, we run regressions where we interact *dual holding* with proxies for a facility's information sensitivity.

Our first proxy is the rating-implied 1-year *PD*. Han and Zhou (2014) provide evidence indicating that bonds become more information-sensitive when the issuer is closer to default. If a company's credit quality is low but a CLO manager has private knowledge about upcoming positive fundamentals from an affiliated PE firm sponsoring the company, buying its loan facilities before the positive news becomes public results in excess returns. We thus expect the sign on the interaction between *dual holding* and *PD* to be positive.

Similarly, the return on private information may be stronger for facilities that are priced at a discount. Since lead arrangers (informed relationship banks) act as dealers and post daily bid- and ask-price quotes, secondary market prices (or midquotes) should be more timely measures of credit quality than infrequently updated ratings (Addoum & Murfin, 2020). To account for time-series variation in market liquidity and other market-wide characteristics, we define an adjusted "price discount" dummy that is one if the trade price is lower than the median price of all traded instruments (loans and bonds) in the same quarter and zero otherwise. We conjecture that the interaction term between this variable (*distress*) and *dual holding* is positive.

As our final proxy, we take the fraction of managers in our sample that hold the instrument in question in the month prior to the start of the trade. We argue that if more managers invest in a given facility, private information about the borrower is more widespread. This might be because lenders benefit from information rights through their participation as syndicate members (e.g., Ivashina & Sun, 2011a; Bushman et al., 2010). In contrast, if the number of managers holding a facility is low, the information asymmetry between a CLO manager affiliated to a PE sponsor of the issuing company and the rest of the market should be high. This suggests that the value of private information is decreasing in the number of managers holding a facility, implying a negative coefficient for the interaction term between *dual holding* and *# managers*.

Turning to the results shown in Table 8, all the interaction terms have the predicted sign. The coefficients for the *PD* proxy in column (1) indicate that dual holding trades do not outperform nondual holding trades for BB− rated facilities (1-year PD of 3.8%), but the outperformance becomes a significant 4.9% ($8.1 * 1.245 - 5.233$) a year for facilities rated one full letter below at B−, representing a 1-year PD of 8.1%. Moreover, column 2 suggests that the outperformance of dual holding trades is concentrated in *distress* instruments (at 4% a year) and is not significant for instruments

[26] Irvine et al. (2007) find evidence consistent with tipping behavior before the release of stock analysts' initial buy recommendations.

[27] see Table A.1 in the Appendix for more information on the construction of the rating implied 1-year PD variable.

TABLE 8 Coefficient estimates from a regression of *annualized excess returns* on the *dual holding* dummy, an information sensitivity proxy and the interaction term between these two.

	Dependent variable: Annualized excess return								
	Full sample			Only affiliated managers			Only affiliated borrowers		
	PD	Distress	# Man	PD	Distress	# Man	PD	Distress	# Man
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dual holding	−5.233	−1.070	2.980	−3.536	−0.773	3.072	−5.846	−0.686	4.375
	(0.184)	(0.459)	(0.128)	(0.383)	(0.540)	(0.112)	(0.100)	(0.610)	(0.011)
Inf. sens. proxy	−0.385	1.336	−3.731	−0.149	1.052	−2.854	−0.597	0.615	−2.064
	(0.001)	(0.159)	(0.015)	(0.356)	(0.287)	(0.058)	(0.000)	(0.556)	(0.187)
Dual holding*Inf. sens. proxy	1.245	5.095	−1.300	0.994	4.657	−1.801	1.474	6.146	−3.229
	(0.000)	(0.011)	(0.738)	(0.000)	(0.007)	(0.658)	(0.000)	(0.006)	(0.335)
Rating letter FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Further controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	44,484	44,484	44,484	22,107	22,107	22,107	10,299	10,299	10,299
Adj. R^2	0.300	0.293	0.294	0.312	0.312	0.312	0.319	0.294	0.293

Note: PD is the one-year rating-implied probability of default averaged over Moody's and S&P's rating. Distress is a dummy equal to one if the price of the loan or bond is below the median for all trades in the same quarter. # Man (short for # Manager) is the number of managers that hold the loan or bond in the month before the trade. Other control variables are the same as in Table 7. The dependent variable is winsorized at the 1% and 99% percentile. Standard errors are double-clustered (Cameron et al., 2011) along sale date quarters and borrower names with the corresponding p-values reported in parentheses.

without a noticeable price discount as measured relative to other instruments of the same type (loan or bond) and quarter. Although showing the hypothesized sign, the interaction term with *# managers* is insignificant. All the results remain qualitatively similar when we restrict the sample to trades executed by affiliated managers (columns 4–6) or in affiliated borrowers (columns 7–9). In sum, the cross-sectional tests strongly support information advantages as the driving factor behind the outperformance in dual holding trades.

5 | CONCLUSION

This paper studies implications of PE firms' expansion into the CLO market starting in the late 2000s. Due to large overlaps among the companies in the PE and leveraged loan segment, asset managers owning PE firms and CLO managers often become equity and debt holders in the same company. These dual holdings can mitigate the conflict of interest between debt and equity holders and thus decrease the cost of borrowing for the company.

In our regression analysis, we find loan spreads to be 32 bp lower in companies that exhibit dual holdings. This result is in the upper range of estimates for the effect of noncommercial banks holding debt and equity of public companies discovered by Jiang et al. (2010) but below the effect of dual holdings generated by private debt funds through middle-market loans determined by Buchner et al. (2022). Subsample analyses strengthen the incentive alignment hypothesis as the driving factor behind the spread reduction. A quasi-experimental setting using CLO manager takeovers mitigates endogeneity concerns.

As lower credit spreads lead to, *ceteris paribus*, higher equity returns, intentional borrowing from affiliated debt investors may be a way for equity holders to increase their returns. Yet, only some asset managers in the PE business use this type of financing to fund their deals. The factors influencing the decision for or against dual holding structures in PE portfolio companies could be an interesting topic for future research.

Finally, we find that CLO managers generate excess returns from dual holding compared to nondual holding trades. The fact that excess returns of dual holding trades increase with a higher level of information asymmetry gives evidence for information spillover from PE firms to CLO managers belonging to the same asset manager. Controlling for rating changes suggests that the information advantage is unrelated to upcoming rating events for the facilities underlying the dual holding trades.

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DATA AVAILABILITY STATEMENT

The data we have used for the analysis are available from several third party providers that are cited in the main text as well as in Table A.1 of the appendix. Availability is restricted for most of the data, as CLO-i, DealScan and IHS Markit require a paid subscription.

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APPENDIX A

A.1 | Trading and holding data from CLO-i

We obtain data on CLO trading activity and portfolio composition from CLO-i. We drop all observations that belong to structured finance instruments or equity securities. Moreover, we delete duplicate entries and delete restructurings which we identify as purchases and sales with the same size and in the same borrower, at the same date and at the same price. Figure A.1 shows the final number of CLOs and trades in each month of our sample period.

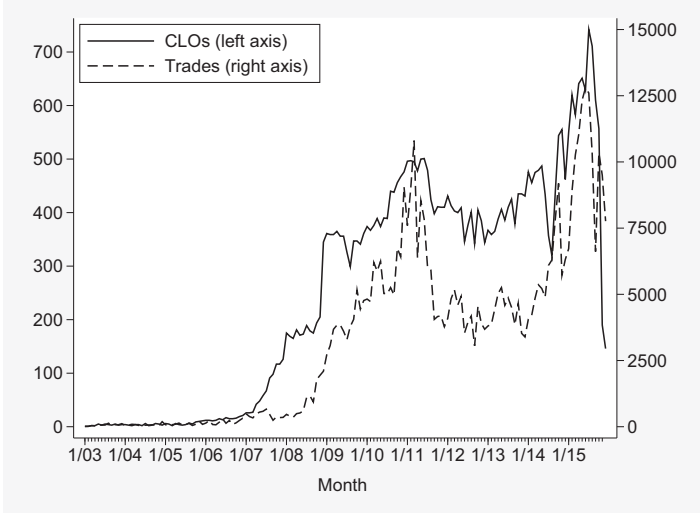

FIGURE A.1 The number of trades and portfolio observations. The trade series is based only on loans and bonds but no equities or structured finance products. For the portfolio observations, we only count one observation per CLO month.

A.2 | Loan and borrower matching between CLO-i and DealScan

Although DealScan provides a—not always unique—identifier (loan identification number, LIN), CLO-i does not offer such a variable. This complicates the matching of the two databases. Therefore, we conduct a rigorous revision of the crucial string variables in DealScan and CLO-i. This involves, for example, the loan description in CLO-i as well as the name of the borrower. Specifically, we rename the borrower to conform with the name in DealScan. As for the DealScan data, we aggregate different borrower names in case they represent the same legal entity or are subsidiaries of one and the same parent firm. We further clean the sponsor variable in DealScan. For instance, we aggregate the sponsors named "Kravis Kohlberg Roberts," "Kohlberg Kravis Roberts & Co [KKR]," "KKR Capital Markets" etc. to one single entity labeled "KKR." This enables us to measure the relationship variables more precisely. Moreover, we use this cleaned data for the identification of the borrower–sponsor relation (see Section 2.3). Figure A.2 illustrates how we merge the cleaned datasets to finally identify dual holdings.

Because the *FacilityEndDate* and *LoanType* variables in DealScan have counterparts in CLO-i, we are able to match DealScan data with CLO-i on a loan-by-loan basis. To identify the appropriate loan, we merge all sponsored loans of a borrower in DealScan with all observations of the same borrower in CLO-i. To nail down the "correct" match, we successively delete observations based on a comparison of the variables in DealScan with those in CLO-i[28]:

1. We delete loan tranches whose issuance date (*FacilityStartDate*) comes later than the holding date (or trade date) in CLO-i.
2. We drop observations where the holding or trade date in CLO-i is later than the maturity of the loan according to DealScan (*FacilityEndDate*).

[28] Data in CLO-i have been cleaned before this procedure is applied. The clearance includes borrower names, maturities, loan descriptions and the issue variable.

TABLE A.1 Variables used in our analysis.

Variable	Source	Unit	Description
Panel A: Metric facility characteristics			
# Dealers	IHS Markit	Count	Number of dealers quoting the loan facility at a specific trading date.
# Facilities	DealScan	Count	Number of facilities in the loan package (PackageID).
# Manager	CLO-i (own computation)	count	Number of CLO managers that currently hold the facility.
# Syndicate members	DealScan	Count	Number of lenders in the syndicate according to DealScan.
5-year lead-company-vol	DealScan	Mio. USD	For every lead arranger of the facility the sum of all inflation-adjusted facility amounts the arranger had with the same company in the five years prior to the issuance date is computed. The mean value across all lead arrangers is taken.
5-year lead-sponsor-vol	DealScan	Mio. USD	For every lead arranger of the facility the sum of all inflation-adjusted facility amounts the arranger had with the same sponsor in the five years prior to the issuance date is computed. The mean value across all lead arrangers is taken.
5 year sponsor market share	DealScan	%	The ratio of the sponsor's sum of all facility amounts in the five years prior to issuance to the total amount issued at this time.
AISD	DealScan	basis points	All-In-Spread-Drawn, defined as the sum of the spread over LIBOR or EURIBOR plus the facility fee.
Control-adjusted return	IHS Markit (own computation)	%	$(\text{midquote treatment loan}_{\text{after takeover}} / \text{midquote treatment loan}_{\text{pre takeover}} - 1) - 1/3 * \sum_{k=1}^{3}((\text{midquote control loan}_{\text{k, after takeover}} / \text{midquote control loan}_{\text{k, pre takeover}} - 1))$
Effective spread	DealScan, CLO-i	% or basis points	Effective spread, defined as the sum of AISD and the price discount distributed over four years: Effective Spread = AISD in % + (100 − price)/4. In most analyses converted into bp.
Facility amount	DealScan, FRED	Mio. USD	Facility amount as available from DealScan adjusted to end of 2015 USD (FRED ticker CPIAUCSL).
Maturity	CLO-i, DealScan	Years	Difference between variables *FacilityEndDate* and *FacilityStartDate* from DealScan divided by 365. If *FacilityEndDate* is not available in DealScan then Maturity is computed as the difference between the expiration date according to CLO-i minus *FacilityStartDate* from DealScan. In the quasi-experiment the last day in the penultimate month before the takeover event is used instead of the *FacilityStartDate*.
Moody's PD	CLO-i, Yoshizawa (2003)	%	One year rating-implied probability of default. The measure is constructed by mapping Moody's rating into an idealized default rate using the table in Yoshizawa (2003, p. 19).

(Continues)

TABLE A.1 (Continued)

Variable	Source	Unit	Description
Panel A: Metric facility characteristics			
Pre-event price	%	IHS Markit	Midquote of the loan at the last trading date in the penultimate month before the CLO takeover event.
Price at issuance	CLO-i	%	Price CLOs paid at the issuance date of a facility.
PD	CLO-i (own computation)	%	Mean of Moody's PD and S&P's PD.
Unaffiliated funding	CLO-i (own computation)	%	$\sum_i$ CLO Investments$_i$/Facility Amt across all CLOs with managers unaffilaited to PE firms sponsoring the issuing company, measured at the primary market.
S&P PD	CLO-i, Barnett-Hart (2009)	%	One year rating-implied probability of Default. The measure is constructed by mapping S&P's rating into an idealized default rate using the table in Barnett-Hart (2009, p. 113).
Panel B: Facility indicator variables			
Bond dummy	DealScan	0/1	Indicator variable that is one if the facility is a bond.
Country	DealScan	Factor	Indicator variable for the country of loan origin.
Dual holding	CLO-i, DealScan (own computation)	0/1	Indicator variable that is one if at least one of the company's outstanding loans is among the portfolio holdings of a CLO manager belonging to the same asset manager as one of the company's current sponsoring PE firms. (See *Panel C* for the slightly diverging definition on the trade level).
Industry	DealScan	Factor	Indicator variable for the two-digit was obtained from variable *PrimarySICCode* in DealScan.
LBO/SBO	DealScan	0/1	Dummy that is one if *PrimaryPurpose* of loan is "LBO" or "SBO."
Loan type	CLO-i, DealScan	Factor	Indicator variable for the nature of the loan tranche (e.g., institutional term loan, revolving credit line)
Performance pricing	DealScan	0/1	Dummy that is one if the facility has a performance pricing schedule.
Rated	CLO-i	0/1	Dummy that is one if the facility is rated.
Rating letter	CLO-i	Factor	Indicator variable for letter of average rating from S&P, Moody's and Fitch. For the by far most common letter B, there is a separate indicator for the B+, B and B- notch.
Secured	DealScan	0/1	Dummy that is one if the facility is secured.
Sponsor	DealScan	Factor	Indicator variable that captures the exact composition of sponsors in alphabetical order (i.e., "Blackstone Group, CVC Capital Partners").
US	DealScan	0/1	Dummy that is one if *Country* is "USA."
USD	CLO-i	0/1	Dummy that is one if the facility is denominated in USD.

(Continues)

TABLE A.1 (Continued)

Panel C: Trade-level variables			
Distress	CLO-i (own computation)	0/1	Binary indicator that is one if the price of a traded facility is below the median of all traded facilities in the same quarter.
Dual holding	CLO-i, DealScan (own computation)	0/1	Indicator variable that is one if the trading CLO manager belongs to the same asset manager as one of the company's sponsoring PE firms. (See *Panel B* for the slightly diverging definition of the facility level.)
Excess return	CLO-i, S&P (own computation)	%	$(1 + (\text{realized sale price}/\text{realized buy price} - 1) - (\text{LLI}_{\text{price index, sale date}}/\text{LLI}_{\text{price index, buy date}} - 1))^{1/\text{Holding Time}_{\text{years}}} - 1$
Holding time	CLO-i (own computation)	Days	Difference between sale and purchase date. If more than one purchase is associated with the sale the principal weighted average of the time differences is computed.
Trade volume	CLO-I	Mio. USD	One-sided volume of roundtrip trade (purchase and sale)
Panel D: Macro variables			
HY bond spread over LIBOR	Merril Lynch, FRED	%	U.S. High Yield Corporate Bond Index (Yield) minus 3-month-LIBOR motivated by its use as proxy for debt market conditions in Axelson et al. (2013).

3. We exclude observations where the maturity in CLO-i and the *FacilityEndDate* in DealScan differ by more than 30 days.
4. From the remaining observations, we keep all cases where the *LoanType* variable from DealScan aligns with the corresponding variable in CLO-i, that is, we match institutional loan tranches to institutional loan tranches, revolving loans to revolvers and bank loan tranches to bank loan tranches, etc.
5. Based on the loan description in CLO-i, we construct a *seniority* variable like the one in DealScan and drop subordinated loans[29] that have been matched to senior loans from DealScan and vice versa.
6. We drop observations where the "coupon" in CLO-i (the yield) is *smaller* than the *AISD* in DealScan.
7. From the resulting matches, we search for the observation[30]:
   (a) with the same LIN,
   (b) with the same spread,
   (c) with the LoanType closest to the issue in CLO-i. For example, from the two remaining matches of the LoanTypes "Term Loan" and "Term Loan B," we would take the latter if the issue according to CLO-i is "Term Loan B," and
   (d) with the smallest difference between maturity according to CLO-i and *FacilityEndDate*.

A.3 | Sponsor size and dual holding effect

In Section 3.1, we found a, depending on the model, 32–42 bp reduction effect through dual holdings. Even though we used sponsor fixed effects (FEs), we do not know if the effect is concentrated in a specific set of sponsors sharing similar characteristics. As big asset managers typically have both, a large equity and debt portfolio, the probability of

[29] We define a loan as subordinated if the description contains one of the words "subordinated," "second lien," "third lien" or "junior."

[30] In descending order, if variables are not in both datasets, go to the next step. The LIN and spread information in the CLO-i data was manually added by us in a few cases and is not available in the original data.

TABLE A.2 Summary statistics for the treatment and control loans of the quasi-experiment in Table 4.

Panel A: Matching universe: CLO holdings									
	Treatment loans				Control loans				
A.1: New DH	*N*	Mean	SD	median	*N*	Mean	SD	Median	*p*-Value
Pre-event price	52	91.26	8.93	92.58	148	92.58	7.79	93.46	0.35
Rated	52	0.92	0.27	1	148	0.93	0.26	1	0.95
Rating letter	48			B	137			B	
Maturity	52	4.77	1.71	4.23	148	4.72	1.85	4.5	0.85
# Dealers	50	5.56	3.54	4.5	146	4.47	3.34	4	0.06
	Treatment loans				Control loans				
A.2: Existing DH	*N*	Mean	SD	Median	*N*	Mean	SD	Median	*p*-Value
Pre-event price	83	93.70	11.37	97.16	256	95.02	7.34	97.31	0.32
Rated	83	0.88	0.33	1	256	0.86	0.35	1	0.63
Rating letter	73			B	220			B	
Maturity	83	4.13	1.37	4.01	256	4.10	1.36	3.84	0.83
# Dealers	82	5.66	3.30	6	254	5.49	3.60	5	0.69
Panel B: Matching universe: PE firm holdings									
	Treatment loans				Control loans				
B.1: New DH	*N*	Mean	SD	Median	*N*	Mean	SD	Median	*p*-Value
Pre-event price	50	91.66	8.65	92.58	110	94.25	7.98	96.11	0.08
Rated	50	0.94	0.24	1	110	0.95	0.21	1	0.71
Rating letter	47			B	105			B	
Maturity	50	4.76	1.83	4.23	110	3.99	1.48	4.21	0.01
# Dealers	48	5.35	3.43	4	109	2.90	2.13	2	0.00
	Treatment loans				Control loans				
B.2: Existing DH	*N*	Mean	SD	Median	*N*	Mean	SD	Median	*p*-Value
Pre-event price	80	94.76	7.87	97.23	228	94.06	5.40	94.51	0.46
Rated	80	0.90	0.30	1	228	0.95	0.21	1	0.16
Rating letter	72			B	217			B	
Maturity	80	4.18	1.37	4.08	228	4.10	1.31	4.08	0.68
# Dealers	79	5.82	3.25	6	202	4.89	3.30	4	0.03

Note: Panel A refers to the samples, with control loans that are part of the same CLO portfolio as their matched treatment loan. Panel B shows the statistics for the samples with control loan facilities issued by companies with the same sponsoring PE firm as the borrowing company in the corresponding treatment loan. The subtables with suffix .1 show data for the samples with newly emerging dual holdings, while those with suffix .2 refer to samples, in which the borrowing companies of the treatment loans already have dual-holding investors prior to the event. The p-value originates from a Welch's t-test, comparing the variable means of the treatment and control loans. All variables are explained in Table A.1 in the appendix.

a dual holding should increase in companies sponsored by them. Thus we would expect a higher fraction of ones in the *dual holding* dummies of loan facilities, whose issuing companies are sponsored by the PE firms of large asset managers.

We use the occurrence of an asset manager as a sponsoring PE firm in our dataset as a proxy for its size during our sample period. The five asset managers that most frequently appear as equity sponsors are "Blackstone Group", "KKR", "Carlyle Group", "Bain Capital" and "TPG Capital." Just under 20% of the facilities in our sample are issued by

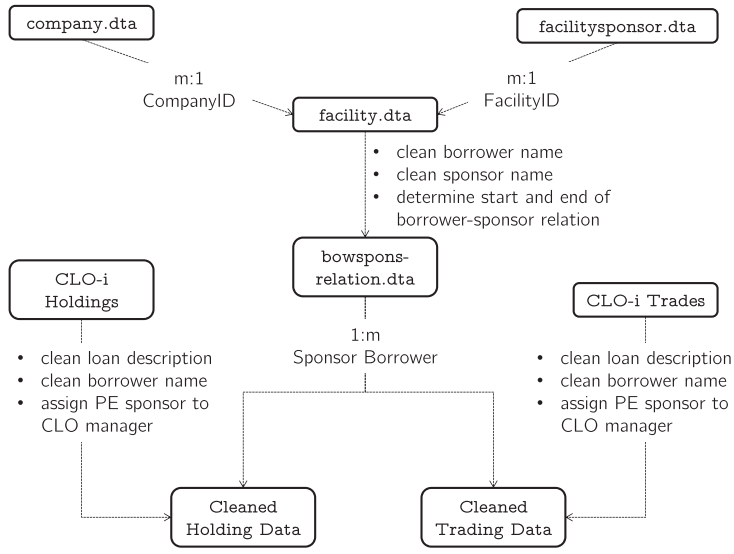

FIGURE A.2 The matching procedure to identify dual holdings.

a company sponsored by at least one of these five *large* sponsors. However, this fifth of all loan facilities accounts for approximately 60% of the dual holdings in our sample underlining the dominance of big sponsors among dual holding companies.

Next, we want to evaluate whether loans to portfolio companies of these sponsors are also the main driver behind the dual holding reduction effect. Therefore, we repeat the spread regression from Table 2 separately for the subsample of loans issued by companies with and without a large equity sponsor. By large sponsors, we mean the five asset managers listed above. In the following, we refer to the sample of loan facilities issued by companies without any of these five sponsors as the small sponsor sample.

Table A.5 shows the regression results for all four model specifications from Table 2. The *dual holding* coefficients are negative and in a similar order of magnitude as in the full sample regression. The absolute values of the coefficients in the large sponsor sample are slightly smaller than in the full sample, with differences in the single-digit bp range. In the *effective spread* models, the *dual holding* coefficient loses its statistical significance for the large sponsors sample, which primarily results from an 80% smaller sample size. For the small sponsor sample on the other hand, the estimated effect is, depending on the model, between 9 and 12 bp larger than for the full sample. Hence, the regression results indicate no specific role for the companies with large equity sponsors and high dual holding share in the spread reduction effect. If anything, the estimated coefficients hint at a slightly smaller dual holding effect, if the issuer is sponsored by a large asset manager.

TABLE A.3 Results from spread regressions for the subsample of facilities with the loan purpose "LBO."

	Effective spread		AISD	
	(1)	(2)	(3)	(4)
Dual holding	−55.278	−49.500	−46.544	−41.912
	(0.003)	(0.010)	(0.001)	(0.003)
Unaffiliated funding	−1.014	−0.874	−0.459	−0.409
	(0.001)	(0.004)	(0.174)	(0.216)
Log(# Syndicate members)	−28.486	−26.483	−14.405	−13.319
	(0.013)	(0.017)	(0.113)	(0.140)
# Facilities	−6.652	−2.208	5.936	7.587
	(0.245)	(0.712)	(0.141)	(0.071)
Log(facility amount)	−13.286	−13.937	−17.942	−17.679
	(0.046)	(0.037)	(0.001)	(0.001)
Log(Maturity)	77.809	65.963	187.862	182.077
	(0.010)	(0.020)	(0.000)	(0.000)
Secured	−4.867	−4.253	−45.566	−45.129
	(0.889)	(0.905)	(0.092)	(0.096)
Performance pricing	−54.559	−52.941	−44.536	−44.130
	(0.001)	(0.003)	(0.000)	(0.000)
HY bond spread over LIBOR	57.122	56.166	20.923	20.190
	(0.000)	(0.000)	(0.000)	(0.000)
Log(1+5 year lead-company-vol)		−5.644		−2.792
		(0.003)		(0.073)
Log(1+5 year lead-sponsor-vol)		−1.719		−1.281
		(0.560)		(0.506)
Year FE	Yes	Yes	Yes	Yes
Loan type FE	Yes	Yes	Yes	Yes
Rating letter FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Sponsor FE	Yes	Yes	Yes	Yes
N	937	937	1519	1519
adj. R^2	0.550	0.558	0.487	0.489

Note: The dependent variable is the *Effective Spread* in Columns (1) and (2) or the *AISD* in Columns (3) and (4). The independent variable *Dual Holding* captures whether a PE sponsor of the borrowing company has an affiliated CLO manager investing in at least one of the company's loan facilities. Variables are explained in Table A.1 in the appendix. The constant is not reported. Standard errors are clustered at the company level with the corresponding p-values reported in parentheses.

TABLE A.4 Results from OLS regressions of annualized *Excess Returns* on the *Dual Holding* dummy and controls.

	Dependent variable: Annualized excess return in %								
	Full sample			Only affiliated managers			Only affiliated borrowers		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dual holding	2.605	2.573	3.115	2.637	2.165	3.087	3.604	2.239	3.884
	(0.065)	(0.005)	(0.077)	(0.056)	(0.034)	(0.036)	(0.007)	(0.025)	(0.037)
Log(Trade volume)	0.270	0.091	0.446	0.132	−0.034	0.226	0.689	0.358	0.853
	(0.225)	(0.558)	(0.087)	(0.644)	(0.884)	(0.384)	(0.019)	(0.260)	(0.007)
Log(Holding time)	−9.534	−9.759	−9.522	−9.713	−9.806	−9.671	−8.403	−8.701	−8.494
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Bond dummy	5.189	6.899	5.149	5.755	6.838	6.099	8.579	12.015	8.846
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.006)	(0.008)
USD dummy	1.648	−0.096	2.809	0.593	0.488	2.104	2.931	0.447	5.336
	(0.151)	(0.960)	(0.050)	(0.625)	(0.827)	(0.133)	(0.078)	(0.823)	(0.047)
Δ PD	−0.173	−0.094	−0.180	−0.128	−0.083	−0.129	−0.403	−0.304	−0.358
	(0.003)	(0.103)	(0.015)	(0.035)	(0.078)	(0.029)	(0.004)	(0.167)	(0.006)
Borrower FE	No	Yes	No	No	Yes	No	No	Yes	No
Manager FE	No	No	Yes	No	No	Yes	No	No	Yes
Rating letter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	44,484	44,484	44,484	22,107	22,107	22,107	10,299	10,299	10,299
Adj. R^2	0.295	0.409	0.314	0.313	0.469	0.320	0.308	0.356	0.336

Note: Specifically and contrary to Table 7, we add a variable that captures the change in the rating-implied one-year PD between purchase and sale date (Δ PD). The dependent variable is winsorized at the 1% and 99% percentile. The constant is not reported. Columns (1) through (3) show results for a sample of PE-affiliated and unaffiliated managers, whereas Columns (3) to (6) are only for a subsample of trades from managers affiliated to a PE firm. In Columns (7) through (9) the sample is confined to observations from affiliated borrowers. Standard errors are double-clustered (Cameron et al., 2011) along sale date quarters and borrower names with the corresponding p-values reported in parentheses.

TABLE A.5 Results from separate spread regressions for the subsample of facilities sponsored by at least one (sponsor size: large) and none (sponsor size: small) of the five most common PE firms in our sample.

	Effective spread				AISD			
Sponsor size	Large	Small	Large	Small	Large	Small	Large	Small
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dual holding	−31.329	−52.107	−24.589	−44.587	−41.198	−50.992	−36.741	−46.429
	(0.106)	(0.000)	(0.189)	(0.001)	(0.022)	(0.000)	(0.039)	(0.000)
Unaffiliated funding	−1.059	−0.383	−1.018	−0.303	−0.831	−0.366	−0.838	−0.326
	(0.003)	(0.012)	(0.005)	(0.028)	(0.011)	(0.006)	(0.013)	(0.013)
Log(# Syndicate members)	−9.185	−11.712	−11.087	−10.302	−10.741	−15.828	−9.012	−14.370
	(0.380)	(0.052)	(0.260)	(0.082)	(0.207)	(0.001)	(0.230)	(0.001)
# Facilities	−9.482	0.398	−5.588	3.634	3.027	2.094	4.789	4.067
	(0.193)	(0.922)	(0.434)	(0.363)	(0.458)	(0.515)	(0.257)	(0.211)
Log(Facility amount)	−27.850	−19.792	−25.361	−17.069	−13.741	−21.833	−12.285	−20.133
	(0.001)	(0.000)	(0.001)	(0.000)	(0.008)	(0.000)	(0.017)	(0.000)
Log(Maturity)	40.940	84.400	25.328	64.892	55.200	86.729	44.802	78.503
	(0.210)	(0.000)	(0.418)	(0.000)	(0.140)	(0.000)	(0.225)	(0.000)
LBO/SBO	−5.623	22.109	−30.122	2.609	−16.863	13.834	−29.851	1.329
	(0.750)	(0.005)	(0.111)	(0.744)	(0.218)	(0.016)	(0.040)	(0.828)
Secured	39.907	2.785	35.347	8.085	18.138	−14.668	15.660	−12.420
	(0.163)	(0.901)	(0.211)	(0.718)	(0.554)	(0.371)	(0.621)	(0.458)
Performance pricing	−53.771	−41.418	−47.922	−39.697	−46.179	−34.949	−42.884	−33.662
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HY bond spread over LIBOR	31.078	45.509	28.994	43.797	11.877	23.057	8.813	22.057
	(0.016)	(0.000)	(0.025)	(0.000)	(0.176)	(0.000)	(0.328)	(0.000)
Log(1+5 year lead-company-vol)			−6.855	−9.052			−3.302	−5.167
			(0.006)	(0.000)			(0.066)	(0.000)
Log(1+5 year lead-sponsor-vol)			−6.723	−2.259			−7.112	−2.314
			(0.542)	(0.190)			(0.210)	(0.082)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rating letter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sponsor FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	511	2195	511	2195	774	3210	774	3210
adj. R^2	0.547	0.484	0.564	0.510	0.482	0.487	0.488	0.498

Note: The dependent variable is the *Effective Spread* in Columns (1)-(4) or the *AISD* in Columns (5)-(8). The independent variable *Dual Holding* captures whether a PE sponsor of the borrowing company has an affiliated CLO manager investing in at least one of the company's loan facilities. Variables are explained in Table A.1 in the appendix. The constant is not reported. Standard errors are clustered at the company level with the corresponding p-values reported in parentheses.