

Navigating New Norms: The Response of LBO Financing to Post-Crisis Regulation and Market Shifts

Rüdiger Fahlenbrach, Sophie-Dorothee Rotermund, and Sascha Steffen*

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ABSTRACT

Banks incurred large losses from their exposure to committed but unfunded LBO deals during the global financial crisis. Post-crisis, banks significantly changed their LBO lending practices. Private equity sponsors provide about 40% more equity. Lending syndicates are larger, per lender exposure decreased, and non-banks provide more of the term funding. The portion of LBO debt retained by the lead arranger and not passed through became more expensive compared to debt held by non-banks. Investigating what explains these changes, we find evidence that the regulation of leveraged lending and shifts in the syndicated loan market significantly influenced banks' LBO lending post-crisis.

Keywords: Leveraged buyouts; Private equity; Institutional loans; CLOs; Secondary loan market; Leveraged loan guidance

JEL Classification: G01, G21, G23

* Fahlenbrach is with the Ecole Polytechnique Fédérale de Lausanne (EPFL) and affiliated with ECGI and the Swiss Finance Institute (E-Mail: ruediger.fahlenbrach@epfl.ch), Rotermund is with the Frankfurt School of Finance & Management (E-Mail: rotermund@fsf.com), and Steffen is with the Frankfurt School of Finance & Management (E-Mail: s.steffen@fs.de). We thank seminar participants at American University, Frankfurt School of Finance & Management, IWH Halle, Tulane, and Pierre Collin-Dufresne, Ralf Meisenzahl, Emmanuel Mönch, Anil Shivdasani, Daniel Streitz, René Stulz, Annette Vissing-Jørgensen, and Yihui Wang for their comments and suggestions. Jannik Callenberg, Samar Habibi, Hauke Lehnhoff, Lucas Peikert, and Idris Yahyapour provided excellent research assistance. Fahlenbrach gratefully acknowledges financial support from the Swiss Finance Institute. Steffen gratefully acknowledges financial support from the “Centre for European Transformation”. Address correspondence to Sascha Steffen, Frankfurt School of Finance & Management, Adickesallee 32-34, 60322 Frankfurt, Germany. Phone: +49 (0) 69 154008-794. Email: s.steffen@fs.de.

1. Introduction

In 2007, global financial institutions had committed around \$350 billion to finance U.S. leveraged buyout deals (LBOs). The subsequent freeze of the syndicated loan and high-yield bond markets led to significant "hung" LBO loans and notes, severely impacting bank balance sheets. For instance, Citigroup faced losses of \$4.9 billion due to its LBO exposure. Other banks also incurred large losses, marking LBO loans as a major driver of bank losses during the financial crisis (GFC).¹ By the end of the 2010s, the leveraged loan market rebounded, with deal leverage surpassing pre-GFC levels in 2019. Yet, the onset of the COVID-19 pandemic in 2020 and the Ukraine war in 2022 saw similar stress levels in LBO financing markets, with banks grappling with prior loan commitments.² Such a *deja-vu* prompts the question of whether current bank exposure to LBO debt is akin to that during the GFC and therefore just a reflection of the cyclical nature of the business, or whether banks have become more resilient to LBO debt?

We analyze the evolution of LBO funding structures post-GFC. We show that LBO market dynamics have shifted and examine the reasons behind the changes. Key inquiries include the entities securing LBO debt, determinants of leverage post-crisis, and the risk distribution between private equity firms and lenders. Understanding these shifts is paramount, considering the potential for significant losses and wider implications for bank credit provision. It is vital for banks and for regulators to discern where risks are concentrated and if they have been adequately mitigated to ensure financial stability.

Our first set of tests reveals five salient features when comparing LBO financing structures pre- and post-crisis. First, post-GFC, the fraction of LBO deal funding provided by bank debt has diminished by approximately ten percentage points, primarily due to a decline in senior unsecured debt. Second, private equity sponsors now inject a substantially higher equity portion

¹ Bruche et al. (2020) document significant pipeline risk for banks due to their LBO-related commitments, which encumbered bank capital and reduced (non-LBO) real sector lending. Ivashina and Scharfstein (2010) show that also bank commitments via credit lines substantially impaired bank balance-sheets during the GFC.

² By the end of 2022, Wall Street banks were stuck with roughly \$40 billion in unfunded loan commitments (Bloomberg, 2022, Wall Street's Lucrative Leveraged-Debt Machine Is Breaking Down).

into deals, corresponding to an economically significant 40% increase. Third, bridge loan commitments, serving as safety nets for the issuance of volatile high-yield notes, have been cut by more than half. Fourth, banks have increased the number of underwriters in LBO lending syndicates. Lastly, lenders now command higher premia for LBO loans, with the spread on syndicated institutional term loans averaging 150 basis points (bps) higher post-GFC, holding everything else constant. There is an added premium for those non-institutional loans (term loans as well as credit lines) that remain on bank balance sheets. These results are robust to a wide variety of regression specifications accounting for deal characteristics and financing conditions. In summary, our evidence indicates that banks have considerably curtailed their LBO risk exposure post-GFC.

A second key result suggests that overall LBO deal leverage has become driven by firm fundamentals rather than being dependent on cyclical credit market conditions. We investigate the determinants of LBO leverage post-GFC building on Axelson et al. (2013) to scrutinize the influence of credit market conditions. Employing credit market spreads, such as the one proposed by Gilchrist and Zakrajšek (2012), alongside measures of market volatility and institutional investor demand, we confirm findings in the prior literature that constricted credit markets curtail LBO debt. Importantly, however, and diverging from Axelson et al. (2013), our findings show that firm fundamentals wield greater influence over LBO leverage than credit market conditions post-GFC. A variance decomposition of LBO leverage confirms this shift: post-2008, the weight of firm fundamentals in explaining variation in leverage has increased, while the role of credit market conditions has weakened. Consequently, LBO debt now more closely mirrors firm fundamentals, potentially diminishing the inherent risks of LBO debt.

We then seek to understand what explains the observed changes to LBO financing, focusing on three hypotheses: (i) *Learning from Past Exposure*: Banks might have reduced their LBO exposure because they learned from their GFC losses; (ii) *Regulatory Influence*: Tighter regulations could have prompted banks to reduce exposure to leveraged loans; (iii) *Shifts in*

Demand and Business Models: An increase in institutional demand and an increase in borrowing from asset managers affiliated with PE sponsors may have resulted in banks reducing their exposure.

One plausible hypothesis posits that banks, hurt by their LBO exposures and subsequent loan losses during the GFC, have subsequently curtailed their involvement compared to those banks without such exposures. To test this conjecture, we ask whether banks with particularly high exposure to LBO debt just prior to the GFC changed their LBO lending behavior the most after 2008. We employ several metrics of bank exposure to pre-GFC LBOs, including a measure of high LBO lending volumes in 2007-2008, a measure of LBO-related losses, inclusion in the LISCC program³, and loan losses gauged by secondary loan market price drops during the GFC. Across the board, our surprising findings consistently show that pre-GFC exposure to LBO debt as well as losses incurred during the GFC did not significantly influence how banks structured LBO lending after the GFC.

We next consider the potential influence of an important piece of financial market regulation imposed on banks to create stability in the leveraged loan sector, the "Guidance on Leveraged Lending." Adapting the methodology of Kim et al. (2018), our findings indicate that the initial phase of the Leveraged Lending Guidance had a negligible impact on deal-level outcomes. However, after additional clarification by the Office of the Comptroller of the Currency (OCC) on how banks should comply with the Leveraged Lending Guidance, LBO lending witnessed notable changes: the commitment period reduced by approximately 32 days, and the equity share rose by 15pp. Lenders under the LISCC Program markedly curtailed their bridge loan commitments after the guidance clarification. While these lenders previously exhibited a higher propensity for bridge loans, the trend sharply reversed post-clarification, with a 17.3pp drop in the likelihood of offering such loans. Yet, our analysis also reveals that the Leveraged

³ The Board of Governors of the Federal Reserve System (Board) established the Large Institution Supervision Coordinating Committee (LISCC) Program in 2010. The LISCC Program coordinates the Federal Reserve's supervision of large financial institutions that pose the greatest risk to U.S. financial stability.

Lending Guidance left LBO leverage and the proportion of credit line and term loan A debt as a fraction of total deal debt largely unchanged.

We finally investigate the importance of changes in institutional demand for explaining the observed financing structure changes. Recently, there have been two notable trends in capital markets: firstly, the increasing prominence of private equity (PE) and LBOs, and secondly, the rising involvement of non-bank financial intermediaries, such as Collateralized Loan Obligations (CLOs), in credit markets, especially in the U.S. syndicated loan sector. These trends are interconnected, as a significant portion of LBO transactions are funded through syndicated loans (Shivdasani and Wang, 2011; Haque et al., 2023). Echoing the findings of Becker and Ivashina (2016), our results indicate a post-GFC surge in covenant-light institutional term loans B, which appeal to institutional investors because they minimize ex-post renegotiation costs in a widely dispersed debt scenario. Moreover, in stressed markets, banks can use "loan flexes" to facilitate syndication (see, *e.g.*, Bruche et al., 2020). These flexes, comprising changes like spreads or original issuance discounts (OIDs), have been employed more actively post-2008. Consistently, we find that banks leave more rent in form of underpricing for investors to reveal their loan demand. Collectively, our insights suggest a post-GFC shift in the syndicated loan market to increase the appeal of such loans for institutional investors, which in turn mitigates risks for banks.

We also demonstrate another important shift in the market for LBO debt. Post-2008, PE funds increasingly channeled their LBO debt through CLOs managed by their affiliated asset managers, optimizing the loan syndication process and reducing banks' LBO risk exposure. To gauge the extent of this practice, we examine the propensity of affiliated CLOs to hold LBO debt post-GFC. Our analysis reveals a 23.2pp increase in the likelihood of an affiliated CLO holding LBO debt for post-GFC deals. The involvement of affiliated CLOs significantly boosts the volume of term loan B debt in the total LBO debt, with a rise of 22.5pp.

One concern that may arise is the possibility that the observed tightening of LBO loan conditions post-GFC is influenced by lenders' private information about the risk profiles of borrowers, which is not fully captured by the control variables we employ in our analysis. We follow, for example, Saunders and Steffen (2011) and investigate the performance of borrowers after loan origination. If our post-GFC firms are riskier relative to the pre-GFC period, it is likely that their subsequent performance would deteriorate in comparison. As LBOs in our sample are public-to-private transactions, it is difficult to obtain balance-sheet information after firms have been taken private. We therefore exploit the fact that a substantial part of our LBO loans is traded in the secondary loan market and investigate the ex-post performance of these loans post loan origination, which we measure using the loans' internal rate of return (IRR). Our analysis reveals a 2pp to 2.8pp reduction in the IRR for loans issued post-crisis, signifying a substantial decrease in the risk premium and an uptick in loan quality.

In summary, post-financial crisis, LBO deal financing structures have notably evolved. Banks have reduced their exposure and changed pricing terms, leading to costlier yet more profitable LBO debt. Both firm attributes and market factors influence LBO leverage. The primary catalysts for these shifts are stricter regulations, rising institutional demand, and the growing appeal of CLOs.

Our paper adds to different strands of literature. First, we add to the literature on the financing of LBOs. Axelson et al. (2013) study the determinants of buyout leverage in the pre-GFC period and identify cyclical credit market conditions as the main driver. Our results suggest that company fundamentals have become more important relative to credit market conditions in determining LBO leverage after the GFC. Kaplan and Stromberg (2009) and recent theoretical and empirical work on private equity highlight how PE sponsors add firm value (Malenko and Malenko, 2015; Gryglewicz and Mayer, 2023; Haque et al., 2023a,b; Hotchkiss et al., 2021). Other papers, such as Ivashina and Kovner (2011), Demiroglu and James (2010), Shive and Forster (2022), Achleitner et al. (2012), or Haque and Kleymenova (2023) examine how PE sponsors

and their reputation affect the terms of debt financing in LBOs. We contribute by showing that PE sponsors facilitate the distribution of LBO-related risks using their affiliated CLOs.

Our paper adds more broadly to the literature on syndicated and non-bank lending. Some papers investigate the role of institutional investor demand on leveraged loans and their pricing structure. Shivdasani and Wang (2011) attribute the 2004-2007 leveraged buyout surge to the rise of CDOs and securitization, while Culp (2013) notes that institutional tranches constituted half of all leveraged loans in 2007, with their market exit significantly affecting loan volume and terms. Ivashina and Sun (2011) find that institutional demand notably influences leveraged loan features, and research by Becker and Ivashina (2016), Berlin et al. (2020), and Badoer et al. (2023) investigate the influence of banks, private equity, and institutional investors on the prevalence of covenant-lite loans. Our focus is on how the change in institutional loan demand changes LBO financing in the post-GFC period. Bruche et al. (2020) reveal that arrangers of leveraged loans perform crucial demand discovery, incurring pipeline risk by guaranteeing loans before confirming demand. They find that negative pipeline risk outcomes can deter banks from lending or arranging. Our study differs by examining if arrangers altered LBO financing structures after such risks materialized in 2007.

The paper proceeds as follows. In Section 2, we provide institutional details of the LBO market and LBO funding structures. Section 3 describes the data and offers summary statistics. Section 4 documents the post-GFC shifts in LBO lending. Section 5 analyzes what factors explain the observed shifts in financing structures. Section 6 concludes.

2. Institutional details on LBOs and LBO funding structures

In Section 2, we recap how lead arranger exposure arises in LBOs, why traditional remedies failed during the GFC, and how a typical LBO is funded pre- and post GFC.

2.1. Challenges for lead debt arrangers of public-to-private LBOs

In a typical LBO involving a publicly listed target, a consortium of banks, known as lead arrangers, extends a debt commitment letter to the private equity sponsors upon the deal's announcement. This commitment, required to demonstrate the transaction's financial viability, often consists of multiple components, including credit lines, term loans destined for syndication, and bridge loans that act as backstop financing for potential high-yield note issuance failures. While these commitments are firm, lead banks anticipate, and typically succeed in, significantly reducing their exposure by syndicating term loans and selling high-yield notes to institutional investors at consummation. Yet, this interim period subjects lead banks to pronounced risks.

Appendix B Table 1, based on Fitch (2007), describes the magnitude of exposure of large banks in the 2007 leveraged loan market, termed the 'forward calendar'. Financial giants like Citigroup, JP Morgan Chase, and Bank of America collectively bore approximately a third of the total exposure from the top 20 LBO deals pending during the 2007 market freeze. Culp (2013) succinctly highlights the banks' conundrum during this period. Traditional crisis responses—reducing exposure, enhancing deal terms to boost investor demand, or reneging on commitments—proved inadequate in 2007/2008. The stark difference between pre-crisis and crisis-era deal terms rendered upward flexes ineffective. Few loans underwent renegotiation, as the crisis was not deemed a material adverse event (MAE), preventing the activation of MAE clauses. Consequently, lead arrangers, bound by their firm commitments, faced a dilemma: either retain and restructure the forward calendar loans, thereby augmenting their risk exposure, or offload loans at substantial losses, either through hefty original issue discounts or in secondary markets at deflated prices.

2.2. A typical LBO financing structure: GFC vs. 10 years after

Panels A and B of Table 1 show the financing structures of two LBO transactions, one preceding and the other succeeding the financial crisis. Panel A shows the financing package for the privatization of HUB International on June 13, 2007, arranged by Apax Partners and Morgan Stanley. Panel B displays the financing package for the acquisition of Albany Molecular Research by GTCR and Carlyle on August 31, 2017.

These transactions, a decade apart, highlight a consistent utilization of similar debt instruments both pre- and post-crisis. Both deals include term loans A and B, with a pronounced skew towards term loans B. Additionally, banks furnished a revolving credit facility in both instances. However, the 2017 transaction also shows differences: the private equity sponsors injected more equity, and a broader consortium of banks were lead arrangers, thereby reducing individual lead arranger's exposure to the debt financing. Moreover, the debt commitment period contracted, and the cost of the term loan A surged. We will show in the following chapters that the changes to the financing structure across these two examples are representative of the changes across our entire sample.

3. Data and Summary Statistics

To understand the shifts in the LBO debt market post-financial crisis, we have compiled a comprehensive dataset, drawing from five databases: Capital IQ, SEC Edgar (the Electronic Data Gathering, Analysis, and Retrieval System from the U.S. Security and Exchange Commission), Dealscan (from Refinitiv's LPC), FISD (Mergent Fixed Income Securities Database), and Compustat. For data validation, we turned to S&P's LCD database and Refinitiv's Loan Connector.

Our initial sample comprises 563 US public-to-private LBO transactions, sourced from CapitalIQ, spanning the January 2003 to December 2021 period, each with a deal volume exceeding \$10 million. This dataset provides transactional specifics, including PE sponsors, timelines, and valuation metrics.

To enrich our data, we manually collect regulatory filings from Edgar, specifically SEC Form DEF14A, with details on equity and debt commitments for LBO transactions. Dealscan provides comprehensive data of actual bank financing at the deal's closure, offering information on lenders, pricing, and secondary market dynamics. We obtain details of high-yield notes from the FISD database, and financial information of each target company from Compustat.

Our data validation and matching process led to a final sample of 316 public-to-private US LBOs. It has 740 credit facilities linked to 261 deals and 141 bond issuances associated with 103 LBO deals.⁴ Seventy-three of the LBOs in our sample did not need a bank commitment letter at announcement, as they were scheduled to be 100% equity-financed, although 20 of these deals later secured debt financing upon closure. Our sample deals come from 54 different industries, as classified by their 2-digit SIC code. An important observation from Table 3 in the Appendix B is the different industry composition pre- and post-2008. While business services remained a constant, other industries witnessed notable shifts.

Table 2 provides summary statistics. Approximately two-thirds of our sample deals were consummated post-2008. As depicted in Panel A of Table 2, there is a marked decline in the average gross transaction value and total debt commitment post-2008, by around \$1.5 billion.⁵ The ratio of term loans / EBITDA consistently hovers around a multiple of 6.5 across both periods.⁶ Issuances of institutional term loans B have risen by 10pp, while credit line com-

⁴ Table 2 in Appendix B provides further information about the deals excluded from our initial sample and on the final sample composition.

⁵ Note that these calculations, and the calculations in Table 2 Panels B and C, exclude equity-only deals.

⁶ Section 1 in the Online Appendix provides additional summary statistics at the deal, facility, and bond level. The median deal had a volume of \$1 billion with a 42% equity share and \$600 million in bond issuance. 86% of all

commitments have declined by 7pp suggesting that a larger share of LBO debt is financed by institutional lenders (and less by banks) in the post-GFC period. The amount of bridge loan commitments decreased by approximately \$800 million after the GFC. The commitment period appears somewhat higher in the pre-GFC period (but is driven by a few outliers with extraordinary long periods) and about 44% of deals contained bridge-loan commitments as compared to 28% of deals in the post-GFC period.

Panel B examines differences of LBO financing structures across the pre- and post-2008 periods. Prior to the financial crisis, banks provided nearly 60% of LBO financing. This proportion contracted by 10pp post-crisis. Interestingly, the void was predominantly filled by increased equity contributions from PE sponsors. The PE equity share in total LBO financing increased from 30% pre-crisis to 40% post-crisis. The residual 10% financing came from high-yield bonds and mezzanine financing, exhibiting stability across both periods.

A salient observation from Panel B is the change in the use of bond financing. The 2007/2008 bond market break down forced lead arrangers to resort to bridge loan financing, significantly increasing their risk exposure. Our analysis of the combined contributions of bridge loans and high-yield bonds reveals a significant reduction from 17% to 11.5% post-crisis. Moreover, there is a tangible reduction in banks' bridge loan commitments post-GFC. Collectively, these insights hint at banks' strategic efforts to mitigate their LBO debt exposure in the aftermath of the financial crisis.

In Panel C of Table 2, we compare target characteristics before and after the GFC. Post-2008 targets are smaller. They exhibit a larger sales-to-PPE ratio and elevated R&D expenditures relative to sales, consistent with the change in industry composition. The operating income and earnings volatility are similar across periods. The creditworthiness of post-2008 entities –

sample facilities are secured. 33% of the sample are term loans B, and roughly 20% are term loans A, which banks do not syndicate.

measured by their credit rating – is somewhat lower, the deviation, however, is minimal and only weakly statistically significant.⁷

4. The Post-GFC Shift in LBO Lending

In Section 4, we document shifts in the LBO financing structure after the GFC. In Section 4.1., we provide a formal analysis of the changes in LBO structures at the LBO deal level. In Section 4.2., we examine whether the determinants of LBO leverage have changed, and in Section 4.3., we study lead arranger’s management of LBO risk at the financing facility level.

4.1. Changes to LBO financing structures in the post-GFC period

Our univariate analysis indicates that banks adjusted their exposure to LBO financing after 2008. We analyze this more formally estimating the following regression model:

$$y_{i,t} = \alpha + \beta Post\ 2008_i + \sum \theta_n Target_{i,n,t-1} + \sum \theta_m Macro_{m,t} + \sum \theta_k Debt_{i,k} + \theta_{ind} + u_{i,t} \quad (1)$$

$y_{i,t}$ are different LBO deal characteristics such as the length of the debt commitment period in days, the indicator variable *Bridge loan commitment*, the amount of committed bridge loan financing as a fraction of total committed financing, the equity share of a deal, the term loan B volume as a fraction of total deal debt, or the credit line volume as a fraction of total deal debt. $Post\ 2008_i$ is an indicator variable equal to one if deal i was announced after 2008 and zero otherwise. β is the main coefficient of interest that measures changes in the dependent variable after the GFC. $\sum \theta_n Target_{i,n,t-1}$ is a vector of n lagged control variables for different characteristics of target company i before the LBO. The control variables include the logarithm of total assets, representing the target firm's size, the ratio of sales to property, plant, and equip-

⁷ Figure 1 in Appendix A displays the rating distribution of pre- and post-crisis LBOs. The period means are almost identical, with the post-2008 mean being slightly worse. The figure suggests that the average pre- and post-crisis target had a bad B+ (14) or a good B (15) rating.

ment as an indicator of asset tangibility, R&D expenditure relative to sales to gauge R&D intensity, and the ratio of operating income to assets as a profitability metric. We also add earnings volatility.

Moreover, we control for m macro conditions ($\sum Macro_{m,t}$) at the time of the LBO agreement by including the Chicago Board Options Exchange volatility index VIX , an indicator of expected market volatility, the consumer price index (CPI), and the term spread between the 10-year and 3-month T-Bill ($Term\ spread$). $\sum \theta_k Debt_{i,k}$ is a vector of k control variables for deal i 's debt package (number of lead arrangers and loans). We also include industry indicator variables for the target's industry using the Fama and French 49 industry classification (θ_{ind}).

[Table 3]

The results are reported in Table 3. We find that banks decrease the commitment period of LBO deals after the financial crisis (column (1)). While the commitment period shrinks by almost 20 days, banks remain exposed to the potential deterioration of market conditions between the financing commitment and deal consummation for a substantial amount of time after 2008.

The estimates from our linear probability model (LPM) in column (2) indicate that LBO financing after 2008 was less likely to comprise bridge loan commitments. β is negative, economically sizable, and statistically significant at the 1% level. The estimate suggests a 14.8pp reduction in the probability of receiving bridge loan commitments after 2008. Similarly, the estimated coefficient in column (3) indicates an economically sizable reduction in the share of committed bridge loan financing. According to the estimate, committed bridge loan financing decreased by 7.2pp, or 42% of the pre-crisis mean. The effect is also statistically significant at the 1% level. Target and deal characteristics also matter for the likelihood of receiving bridge loan commitments. For instance, a one standard deviation increase in $\log(Assets)$ increases the probability of having a deal with a bridge loan commitment by 27%.

Column (4) provides evidence for an increase in the equity share of LBO deals after 2008, defined as equity committed by the PE sponsors over total financing needs. Our estimation suggests that private equity sponsors needed to contribute significantly more equity (+16.5pp) after 2008. Until 2008, the average equity share was 40.5%. An increase by 16.5pp thus implies, on average, an economically large increase of 40.7% in the equity share for deals closed after 2008 compared to deals closed pre-crisis.

Column (5) indicates that the fraction of total debt stemming from term loans B significantly increases after 2008. The fraction of total debt provided by term loans B, which are intended for syndication to institutional investors including CLOs, increases by an economically sizeable and statistically significant 18.4 percentage points.

Finally, we show in column (6) that banks became more cautious in the provision of credit lines after the financial crisis. Credit line volume, expressed as a fraction of total debt volume, decreased by 9.1 percentage points.

Our estimates further indicate that several cross-sectional target characteristics matter for the financing structure of LBOs. Apart from the target's size, especially profitability (operating income/assets) is often statistically significant. Yet, the effects of the target characteristics are economically smaller than the effect of the Post 2008 indicator variable. For example, a one standard deviation increase in the target's profitability (0.06) reduces the equity share by about 3.9 percentage points. The negative relationship between the equity share and company profitability presumably derives from the higher debt capacity of these firms.⁸

⁸ Other control variables such as macro conditions, the number of lead arrangers, and the number of loans are also important determinants of the equity share. For instance, a one standard deviation increase in the term spread reduces the equity share by 5pp. Similarly, if a deal's financing package comprises one additional lead arranger or loan, the equity share is reduced by 2.4 or 6.9pp points, respectively.

4.2. Changes in the determinants of LBO leverage in the post GFC period

In prior work on LBO structures, Axelson et al. (2013) surprisingly found that prior to the Global Financial Crisis (GFC), buyout leverage was predominantly influenced by credit conditions or market sentiment, rather than specific firm or industry attributes. Ignoring firm characteristics in the lending decision may have resulted in LBO leverage that was too high and could have played a role in the substantial losses on LBO loans during the GFC. We now examine whether firm characteristics that are traditionally drivers of bank loan decisions play a more important role for LBO loan decisions post-crisis.

To empirically test this hypothesis, we estimate regressions of LBO leverage at the deal announcement on various indicators of credit market conditions and firm attributes, on a sample of deals announced in or before 2008, and on a sample of deals announced after 2008. The model we employ for this examination is as follows:

$$y_{i,t} = \alpha + \beta \times Proxy_t + \sum \theta_n Target_{i,n,t-1} + \sum \theta_k Debt_{i,k} + \theta_{ind} + u_{i,t} \quad (2)$$

$Proxy_t$ corresponds to our proxy for credit market conditions matched to the year and month of the debt commitment letter.

$\sum \theta_n Target_{i,n,t-1}$ and $\sum \theta_k Debt_{i,k}$ are the same vectors of n and k variables controlling for different characteristics of target i before the merger ($t - 1$) and deal i 's debt package, as in equation (1). θ_{ind} are the same industry indicator variables as in equation (1). The dependent variable represents LBO leverage, defined as the natural logarithm of committed debt over EBITDA ($\ln(Committed\ debt/EBITDA)$) at the close of the last fiscal year before the deal's announcement.

As proxy for credit market conditions, we use the Gilchrist-Zakrajšek (GZ) corporate bond spread, the impact of stock market volatility on LBO leverage via the Chicago Board Options Exchange volatility index VIX, and, following Shivdasani and Wang (2011), the count

of CLO issuances to represent institutional investor demand for leveraged loans.⁹ Table 4 shows the results.

[Table 4]

Consistent with Axelson et al. (2013), we find that credit market conditions significantly influence LBO leverage. Notably, credit spreads have a substantial negative impact on LBO leverage. A surge of 100bps in the GZ spread corresponds to a 23% reduction in LBO leverage (column (1)). While stock market volatility also inversely correlates with LBO leverage, its influence is more subdued than that of credit spreads (column (2)). Specifically, a one standard deviation (5.36) rise in the VIX corresponds to a 17% average decrease in LBO leverage. Furthermore, the coefficient for CLO issuance implies that heightened institutional demand increases LBO leverage. The impact of the quarterly count of new CLO issuances is statistically and economically meaningful: an addition of ten new CLOs boosts LBO leverage by 5.7%.

Importantly, our findings underscore the important role of firm fundamentals in shaping LBO leverage. The adjusted R^2 increases significantly in models that include firm characteristics relative to those without them. Factoring in cross-sectional target attributes increases the adjusted R^2 from 3% to a about 34 - 38%. In a next step, we analyze the relative significance of credit market conditions versus firm fundamentals in the periods before and after the GFC. Given concerns about limited statistical power due to a sparse dataset, we opted for a variance decomposition by period rather than interacting our explanatory variables with the *Post 2008* indicator.

[Table 5]

The findings are presented in Table 5. The different proxies for credit market conditions explain between 1.68% and 4.58% of the R^2 in the leverage regressions, with a lower fraction explained after 2008. All three regressions underscore the heightened relevance of firm attributes post-

⁹ In robustness regressions, we use alternative measures for credit market conditions, the Morningstar LSTA Leveraged Loan Spread (LSTA spread) and the aggregate loan spread from Saunders et al. (2022). We show these results in the Online Appendix.

2008. For LBO deals before 2008, firm characteristics explain approximately 13% to 16% of the variance in LBO leverage. The explanatory power of firm characteristics for transactions post-2008 increases to between 36% and 37% of the variance. The variance decomposition reinforces the notion that, following the GFC, firm fundamentals have become more important determinants of LBO leverage.

4.3. Changes in LBO financing in the post-GFC period – facility-level evidence

4.3.1. Underwriting LBO deals

We next analyze changes in LBO underwriting post-crisis by banks as well as non-bank financial institutions using the following model:

$$y_{i,j,t} = \alpha + \beta \text{Post 2008}_i + \sum \theta_f \text{Facility}_{f,j,t} + \sum \theta_n \text{Target}_{i,n,t-1} + \sum \theta_m \text{Macro}_{m,t} + \theta_{ind} + u_{i,j,t} \quad (3)$$

β remains our coefficient of interest. $y_{i,j,t}$ is a set of outcome variables related to loan underwriting, such as the number of underwriters, the loan share retained by lead banks as well as the share of non-banks in underwriting LBO loans. We further include a vector of f control variables $\sum \theta_f \text{Facility}_{f,j,t}$ for facility j 's characteristics structured at time t . $\sum \theta_n \text{Target}_{i,n,t-1}$ is the same vector of n characteristics of target i as in equations (1) and (2). $\text{Macro}_{m,t}$ controls for m macro conditions at the time of the loan origination, using the same variables as in equations (1) and (2). Again, θ_{ind} are industry indicator variables.

In Table 6, we show estimates of a Poisson regression of the number of lead arrangers in a lending syndicate on a post-crisis period indicator variable and a set of control variables. Moreover, we estimate a separate OLS regression with the lead arranger's loan share as the dependent variable.

[Table 6]

Table 6 indicates that the number of underwriters significantly increased post-GFC, thereby enhancing risk distribution among syndicate members. Post-2008 facilities witnessed

an addition of approximately 0.894 lead arrangers compared to their pre-crisis counterparts. Until 2008, a loan had, on average, 2.11 lead arrangers. An increase by 0.894 lead arrangers thus implies an economically large 42% increase. The increase in the number of lead arrangers, all else being equal, naturally dilutes the loan share for each participant. Our facility-level OLS regression, as presented in column (2) of Table 6, quantifies the dilution, revealing a substantial reduction in the loan share per participant post-GFC by an average of 23.3 percentage points or roughly \$70 million, even after accounting for other loan and target attributes.

Irani et al. (2021) posit that post-GFC regulatory stringency nudged banks away from the syndicated loan market, paving the way for non-bank lenders. We next test whether we observe a similar effect in our sample. We test whether non-bank lenders became more important for LBO lending post-crisis and estimate a regression of the fraction of non-bank lead arranger / total lead arrangers on the *Post 2008* indicator variable and controls. Column (3) of Table 6 shows the results. We do not observe that the fraction of non-bank lead arrangers increases after the Global Financial Crisis in the facilities that finance our large public-private LBO deals.

4.3.2. Changes in pricing of LBO loans

Figure 1 depicts the yearly average pricing for various LBO loan categories throughout our sample period, as measured by the annual average all-in-spread-drawn (AISD). After 2008, there is a noticeable uptick in loan spreads over Libor for all facility types. The pricing for non-institutional term loans (TLAs), typically retained on banks' balance sheets, exhibits a particularly pronounced increase.

[Figure 1]

Table 7 presents the results of regressions of various pricing metrics on a post-2008 indicator and control variables. Column (1) employs the AISD across all loan facilities as the dependent variable, while column (2) focuses on the AISD of contingent facilities, specifically credit lines.

Column (3) centers on the all-in-spread-undrawn (AISU) for credit lines, representing the commitment fee or the cost associated with the option to draw down the credit line (see Berg et al. (2016) for details). Column (4) estimates whether the issuance yield-to-maturity (YTM), a measure for the average total return of an institutional term loan, changed after 2008.

[Table 7]

Our regression analysis reveals a marked increase in the AISD post-2008, consistent with the trends depicted in Figure 1. Facilities introduced post-GFC exhibit a premium of 149.6bps compared to their pre-crisis counterparts. Note that the regression in column (1) includes a term loan A indicator, and a bridge loan indicator, and interaction terms for both with the *Post 2008* indicator. The coefficient for the *Term loan A* indicator suggests that such loans carry a premium of approximately 131bps over other loan types. Term loans A, which are typically held on banks' balance sheets, witnessed an additional pricing increase of around 118bps post-2008 relative to the pre-2008 period. Adding the individual coefficient estimates for *Post 2008*, *Term loan A*, and the interaction term, we hence observe a total price increase of 399bps for term loans A in post-2008 loan facilities. Bridge loans are expensive backstop financing solutions and command a premium of 276bps over the baseline loan categories. However, no discernible incremental effect on bridge loan pricing post-2008 emerges from our data. Overall, our findings in column (1), controlling for a host of facility and target characteristics, suggest that LBO loans became more expensive post-2008, especially those that banks typically retain.

The results in columns (2) and (3) indicate that credit lines became more expensive post GFC as well, with an increase in the AISD of 110.3bps, and in the AISU of 4bps. The increase in the AISD is economically large corresponding to an increase of about 42% relative to the pre-crisis mean. The increase in the AISU is somewhat smaller and corresponds to a 9% increase relative to the pre-crisis mean. In column (4), we focus on term loans B only and compute the yield-to-maturity (YTM), a commonly used measure for leveraged term loans. In addition to the credit spread, it also includes the upfront fee (commonly referred to as original-issue-

discount, or OID). The OID is spread over the effective maturity of the loan, which is usually assumed to be 4 years.¹⁰ Our analysis shows that the YTM of term loans B increased by an economically meaningful 161 basis points after the GFC, which is a 49% increase over the pre-crisis mean.¹¹

5. What explains the changes in LBO financing structures?

Following the financial crisis, LBO financing structures underwent notable changes. We now explore the underlying causes, focusing on three hypotheses. In Section 5.1, we test the *Learning from Past Exposure* hypothesis. The banks that were big LBO lenders prior to the GFC might have reduced their LBO exposure because they learned from their GFC losses. In Section 5.2 we examine the *Regulatory Influence hypothesis*, i.e. whether tighter regulations have prompted banks to reduce exposure to leveraged loans. Finally, Section 5.3 is devoted to the *Shifts in Demand and Business Models hypothesis*, which stipulates that an increase in institutional demand and an increase in borrowing from asset managers affiliated with PE sponsors may have resulted in banks being able to reduce their exposure.

5.1. Learning from Past Exposure hypothesis

The aftermath of the Global Financial Crisis (GFC) has raised pertinent questions about the LBO debt market. One such inquiry revolves around whether banks with heightened exposure to LBO debt during the GFC and resulting large losses subsequently altered their lending practices compared to their less-exposed counterparts to reduce risks from leveraged lending. To test such a hypothesis, we first need a robust metric to gauge a bank's exposure to the LBO

¹⁰ The effective maturity accounts for the fact that loans are frequently renegotiated before the maturity of the loan, which happens, on average, after four years.

¹¹ To discern whether the observed shifts in LBO lending are unique to the LBO market or reflective of broader trends in leveraged loans post-financial crisis, we use a difference-in-difference (DiD) approach comparing contract terms of LBO loans to those of leveraged non-LBO loans before and after 2008. Table 4 in Appendix B displays the results. We find that the strong repricing of risk post-2008 is specific to LBO loans, which underscores a heightened risk perception banks associate with LBO financing.

market during the GFC period.

Our metric, termed "LBO Risk Exposure" (Exposed), uses lending data from our sample deals. We consolidate individual loan shares of all lead arrangers active in our LBO dataset during 2007 and 2008. The aggregated lending volume is then normalized by the lead arranger's total assets, as recorded on December 31, 2006, data we sourced from Compustat.

A lead arranger is deemed "exposed" if its scaled lending volume situates it within the top quartile of the distribution. From our dataset, out of the 23 distinct lead arrangers active during 2007/2008, 6 were exposed. The exposed lead arrangers are important players in the period from 2009 to 2021. Over half (54%) of all LBO facilities included at least one such exposed lead arranger. We now test the hypothesis that changes in lending behavior after the GFC are more pronounced for lenders that incurred larger losses during the GFC by interacting the *Post 2008* indicator variable with an exposure indicator variable. The exposure indicator variable, *Exposed*, is one if at least one lead arranger of a facility had large LBO exposure during the GFC. Table 8 displays the results.

[Table 8]

As in Tables 6 and 7, we observe an increase in the number of lead arrangers, a decline in loan shares, and a surge in loan prices post-2008. Turning to facilities, in which at least one lender heavily exposed to GFC LBO risk is present, we observe that they are involved in deals with more underwriters and a lower loan share. One potential explanation for these larger lending syndicates is that LBO-risk-exposed lenders might be involved in financing not just a higher number of deals, but also more substantial ones. Consequently, additional lead arrangers might be required to meet the larger financing needs, which in turn increases the syndicate size and diminishes the proportion held by an individual lender. The interaction between the post-2008 variable and the exposed lead arranger variable shows a marginally significant increase in underwriters of 0.31 after 2008 (column (1)) and no change in the loan share (column (2)).

In column (3), we examine whether the loan pricing of facilities arranged by exposed lenders changed post-2008. Counter to our hypothesis, facilities arranged by lenders with heightened exposure to GFC LBO risk offer discernible pricing *discounts* post-crisis. Since we control for target and facility characteristics, the lower AISD spread cannot be explained by low risk deals, at least not when measured by observable characteristics.

Overall, we find little evidence that lead arrangers that were heavily exposed to LBO risk during the GFC changed their lending behavior in an economically meaningful way after the crisis, relative to lenders with little exposure.

We employ several alternative exposure measures to validate our findings. We gauge exposure using a 2007 Fitch Special Report (Fitch, 2007) on anticipated LBO loan losses (“Fitch measure”).¹² In addition, we create a continuous LBO-risk exposure metric using pricing data from the secondary loan market for all loans that banks initiated in 2007 and 2008. The results are tabulated in Online Appendix Table 2.3 and Table 2.4. Finally, we consider participation in the "Large Institutions Supervision Coordinating Committee (LISCC) Program" as another measure. The results for this approach are shown in Table 2.5 of the Online Appendix. Across the board, these alternative measures show similar results. In sum, we do not find evidence that the changes we observe in the LBO market post-2008 are driven by lead arrangers that got severely hit by their LBO exposure during the GFC. Instead, the changes are pervasive across all lenders.

5.2. Regulatory Influence Hypothesis

In March 2013, U.S. regulatory bodies introduced the “Guidance on Leveraged Lending” with the aim to change leveraged transaction lending practices.¹³ The guidance outlined what con-

¹² Table 1 in Appendix B displays the exposure of LBO lenders as estimated by this Fitch Special Report.

¹³ For information on the Guidance of Leveraged Lending see <https://www.occ.gov/news-issuances/bulletins/2013/bulletin-2013-9a.pdf>.

stitutes leveraged transactions and established a set of foundational underwriting and risk management standards. Further clarifications on how banks should comply with the guidance were made in December of 2014. In October 2017, however, the Government Accountability Office (GAO) issued an opinion requiring Congress to review the Leveraged Lending Guidance for it to take lawfully effect. Consequently, market participants widely considered the guidance as non-binding by 2018.

It is conceivable that the changes post-2008 we have documented in Section 4 could be attributed to the new regulatory guidance. To test this hypothesis, we follow the approach of Kim et al. (2018), and incorporate two period indicator variables and a lender-type indicator variable in our deal-level analyses. The first indicator variable, *LLG Period I*, is set to one for loans originated post the initial guidance but before its clarification, specifically in 2013 or 2014. *LLG Period II* is set to one for loans made after the guidance's clarification and before its 2017 revocation, between 2015 and 2017. The lender-type indicator, LISCC, is set to one if a lender falls under the purview of the “Large Institution Supervision Coordinating Committee” Program.

Our primary focus is on the deal-level, which was the main target of the guidance. If the changes in leveraged lending practices are more influenced by financial regulations than by the financial crisis itself, we anticipate significant coefficients for our period indicator variables. We also examine the interaction between the period indicator variables and the lender-type variable to gauge if LISCC-monitored lenders show greater changes in lending practices. Table 9 reports results of the tests of the regulatory influence hypothesis.

[Table 9]

Consistent with the findings of Kim et al. (2018), we find hardly any evidence that the first period of the Leveraged Lending Guidance affected any of our deal-level outcome variables. Most coefficients of the period indicator variable *LLG Period I* and all coefficients of its inter-

action terms with our lender-type variable are statistically insignificant, and most are economically very small.¹⁴ We detect changes to LBO lending for the second period of the Guidance on Leveraged Lending. The commitment period was significantly shortened by roughly 32 days (column (1), statistically significant at the 10% level), and the equity share increased by 15pp (column (4), statistically significant at the 1% level) in comparison to the times before the clarification at the end of 2014 and after the revocation in late 2017. Hence, during the period when the LLG was most binding, banks committed for a shorter period and required more equity contributions from private equity sponsors.

Moreover, we find that LISCC lenders significantly reduced their bridge loan commitments. While these lenders had, on average, a 26pp higher probability of issuing a bridge loan (column (2)) and provided 13pp more bridge loan financing (column (3)), the effect reverses after the clarification of the Leveraged Lending Guidance. The interaction effect of the LISCC indicator variable and the LLG Period II indicator variable is highly statistically significant and economically large for both specifications. LISCC lenders also had a 19 days higher commitment period (column (1)) compared to other lenders, both in the pre- and post GFC period.

Overall, LISCC lenders have a 14.7pp lower probability of giving a bridge loan post-clarification (column (2)) and provide 4.6pp less bridge financing (column (3)). The effect is entirely driven by the LISCC lenders as the baseline effect of the LLG Period II indicator variable is statistically insignificant and economically small in column (3). Bridge loans are risky loans since they are backstop financing vehicles for junior high yield bonds that are only used in times when bond markets are temporarily malfunctioning. Hence, it makes sense that more supervised institutions would reduce their exposure to these types of loans.

Our results suggest that the volume of credit line and term loan A debt as a fraction of total deal debt (column (6)) was unaffected by the Leveraged Lending Guidance. All period

¹⁴ The coefficient on LLG Period I in column (5) is positive and significant, indicating that during the first period of the LLG, deals had a higher leverage than in other periods, which appears inconsistent with a regulatory influence hypothesis.

effects are statistically insignificant, although not necessarily economically small. Also, the lender type had no effect on non-syndicated LBO debt. The direction of the effect of LISCC supervision is unclear, but all coefficients are statistically insignificant too. Overall, regulatory scrutiny had some effect on LBO risk management at the deal level.

5.3. Shifts in Demand and Business Models hypothesis

A third hypothesis to explain the observed changes in LBO financing in the post-GFC period is a shift in demand and business models. The surge in demand by institutional investors, coupled with more borrowing from asset managers linked to private equity sponsors, may have enabled banks to reduce their risk exposure.

We first investigate whether syndicated loan contracts have been adjusted to cater to institutional investors, specifically, through an analysis of covenants. Institutional loans have become more similar to high-yield bonds because of the large number and type of investors in these loans, which makes it harder to, for example, renegotiate if covenant violations occur. It is thus a testable hypothesis that the use of covenants has declined particularly in loans to institutional investors (i.e., term loans B). Columns (1) and (2) of Panel A of Table 10 show the results.

[Table 10]

The dependent variable in column (1) is an indicator variable that is equal to one if a loan tranche contains a covenant (*Covenant (0/1)*). The dependent variable in column (2) is an indicator variable that equals one if a loan is covenant-lit (*Covlite (0/1)*).¹⁵ As explanatory variables (in addition to the loan-level, firm and macro control variables described above), we add *Term loan B*, *Credit line*, and *Term loan A*, which are all indicator variables for the respective loan

¹⁵ The literature has documented a surge in the issuance of covenant-lite loans (i.e., loans without maintenance covenants) since the early 2000s. Becker and Ivashina (2016) argue that the trend can be attributed to a shift in investors in LBO loans.

type. We also add the *Post 2008* indicator variable as well as interaction terms between *Post 2008* and each loan type indicator.

Column (1) shows that the likelihood that a *Term loan B* has covenants is about 27pp lower in the post-2008 period. Consistently, we also observe an economically meaningful increase in the likelihood that loans are covenant-lite. For example, the likelihood that a *Term loan B* is covenant-lite increases by about 37pp post-2008. While also bank-loan tranches (credit lines and term loan A) are more likely to be cov-lite, their effect is somewhat lower.

In columns (3) and (4), we only focus on *Term loans B*. Bruche et al. (2020) argue that lenders use loan flexes to identify investor demand and adjust loan terms to match supply and demand for leveraged loans. As a rent for investors to reveal their loan demand, lenders adjust the pricing of these loans at issuance, which is commonly referred to as “underpricing”. We use the indicator *Flexed (0/1)*, which is one if any LBO loan term (e.g., spread, upfront fee or loan amount) has been flexed, as the dependent variable in column (3)). Our results suggest that the likelihood that loan terms have been flexed increased by about 37pp in the post-GFC period. In column (4), we use Underpricing (pp) as dependent variable. As in Bruche et al. (2020), we define *Underpricing (pp)* as $Break\ price - (100 - (100 - Break\ OID))$.¹⁶ Consistent with bank catering to institutional investor demand, underpricing increases significantly in the post-GFC period. The estimate suggests that underpricing increased by 0.33pp after 2008 or 50% of the pre-crisis mean. Overall, this evidence is consistent with the interpretation that loans become more attractive for institutional loan investors.

Since 2008, private equity (PE) funds have more frequently channeled LBO loans through CLOs managed by associated asset managers. Rising demand for LBO debt from such entities could have reduced banks’ exposure to LBO-financing. To investigate the extent to which PE firms use affiliated CLOs for loan syndication, we analyze the likelihood of affiliated

¹⁶ *Break price* is the first trading price in the secondary loan market and *Break OID* is the “original issue discount”, i.e., the upfront fee at loan origination.

CLOs holding post-GFC LBO debt. We estimate a regression of the indicator variable *Affiliated CLO* on a *Post 2008* period indicator and other control variables at the deal level. The indicator variable *Affiliated CLO* is one if at least one PE-affiliated CLO held some share of an LBO loan belonging to a specific deal. The variable is zero if no PE-affiliated CLO or no CLO at all held any of a deal's debt. Panel B of Table 10 presents results.

The Linear Probability Model (LPM) indicates a 23.2pp surge in the likelihood of an affiliated CLO holding LBO debt for deals finalized post-GFC (column (1)). Furthermore, the strength of the relationship between PEs and their affiliated CLOs could influence the proportion of LBO debt syndicated. Column (2) of Panel B of Table 10 investigates this, examining if the volume of term loans B, as a fraction of the total deal volume, increase when affiliated CLOs participate in the debt purchase. We document that deals with affiliated CLOs significantly increase the volume of term loan B debt as a fraction of the total LBO debt. When an affiliated CLO holds a portion of the deal's debt, the term loan B volume as a fraction of the total deal volume rises by 23.6pp. The number of underwriters in these loans, however, does not change (column (3)). Column (4) studies whether the relationship between PEs and CLOs not only affected volumes but also loan prices. Our evidence suggests that loans bought by affiliated CLOs experience an economically large and statistically significant 85bps pricing advantage compared to loans not bought by affiliated CLOs.¹⁷

5.4. Loan performance in the secondary loan market post-origination

One concern with our results is the possibility that the observed tightening of LBO loan conditions post-GFC is influenced by lenders' private information about the risk profiles of borrowers, which may not be fully accounted for in our analysis. We follow Saunders and Steffen (2011) and investigate the performance of borrowers after loan origination. If the post-GFC

¹⁷ A potential caveat is the enhanced data coverage of CLO holdings in the 2010s. Loan holdings from the pre-crisis era were often only documented from 2010 onwards, complicating a direct comparison. Thus, we estimate baseline effects in columns (2) – (3). Our results should be viewed as indicative of the evolving role of CLOs in the LBO market across the GFC divide.

target firms are riskier relative to the pre-GFC period, it is likely that their subsequent performance would deteriorate in comparison. As LBOs in our sample are public-to-private transactions, it is difficult to obtain balance-sheet information after firms have been taken private. We therefore exploit the fact that a substantial part of our LBO loans is traded in the secondary loan market and investigate the performance of these loans post loan origination, which we measure using the loans' internal rate of return (IRR).

We first assess loan quality using the IRR of all traded LBO loans in our sample. If loan quality decreased after 2008, investors' risk premia should increase. Hence, the IRR of post-2008 issued loans should be higher compared to the IRR of loans issued until the crisis. We test whether the quarterly median IRR of pre-crisis loans was significantly lower than the quarterly median IRR of post-crisis loans in a simple panel regression. Importantly, we need to account for the discrete increase in loan spreads after the financial crisis we documented in section 4.3.2. Higher spreads mechanically increase the IRR through larger cash flows. Our discrete jump in loan spreads post-2008 captures that banks price the risks of LBOs differently after the GFC. Yet, it does not speak to the quality of the loans. We include pricing fixed effects to control for higher spreads in the post-crisis period. Table 11 displays the results.

[Table 11]

Our panel regressions suggest that the IRR of loans issued after the GFC was, on average, 2pp (200bps) to 2.8pp (280bps) lower compared to the IRR of loans issued until the crisis. All results are economically large and statistically significant. For instance, considering column (4), a 2.3pp (230bps) lower IRR for post-crisis loans implies a 28% reduction of the average pre-crisis IRR (8.1pp). Our results thus suggest a significant reduction in the risk premium associated with loan quality and, thus, an improvement in loan quality.

[Figure 2]

Finally, we assess the risk profile of our LBO loans after their issuance following Cordell et al. (2023). We regress median quarterly loan spreads on observation year-quarter, issuance period, and deal fixed effects to control for time-invariant characteristics. Then we average over the residuals by quarter after issuance. If LBO loans were riskier post-2008, we expect the loan spread residuals to increase over the quarters after issuance. Figure 2 displays the results. While we observe a clear and strong upward trend in the loan spread residuals for LBO loans issued until 2008, we uncover even a small decline in loan spread residuals for post-2008-issued LBO loans. Therefore, we conclude that LBO loans issued until the GFC were riskier than those issued after the GFC. Overall, our results suggest that the quality of LBO loans has improved post-2008.

6. Conclusion

Financial institutions experienced substantial losses from committed but unfunded LBO loans during the global financial crisis. The LBO market, however, recovered quickly after the GFC. LBO leverage exceeded pre-GFC levels when banks ran into new troubles, selling LBO debt as financial markets became stressed during the Covid crisis and the beginning of the war in Ukraine. In this paper, we investigate the changes to LBO lending since the GFC and assess whether and how lenders have changed their exposure to the risks associated with the financing of LBOs.

We find evidence that LBO funding structures have substantially changed after the GFC. Deal leverage is more dependent on firm fundamentals and less on credit market conditions. Banks have reduced individual commitments and funded exposures to LBO debt. Private equity firms have a higher stake through substantially larger equity investments. Loan spreads have increased (holding other firm and loan terms constant), in particular those of the bank portion of LBO debt.

We then seek to understand what explains the observed changes to LBO financing, and find support for the hypothesis that tighter regulations have prompted banks to reduce exposure to leveraged loans. We also show evidence in favor of the hypothesis that an increase in institutional demand and an increase in borrowing from asset managers affiliated with PE sponsors has resulted in reduced bank exposure. Banks adapted loan terms to make them more attractive to institutional investors and to make placing them outside the banking sector easier. Overall, our results suggest that the banking sector is more resilient to the recent turmoil in the LBO market compared to the GFC.

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Figure 1: Pricing of credit facilities by type and year

The figure displays the annual average all-in-spread-drawn (AISD, in bps) for different loan types. TLA stands for term loan A, and TLB stands for term loan B.

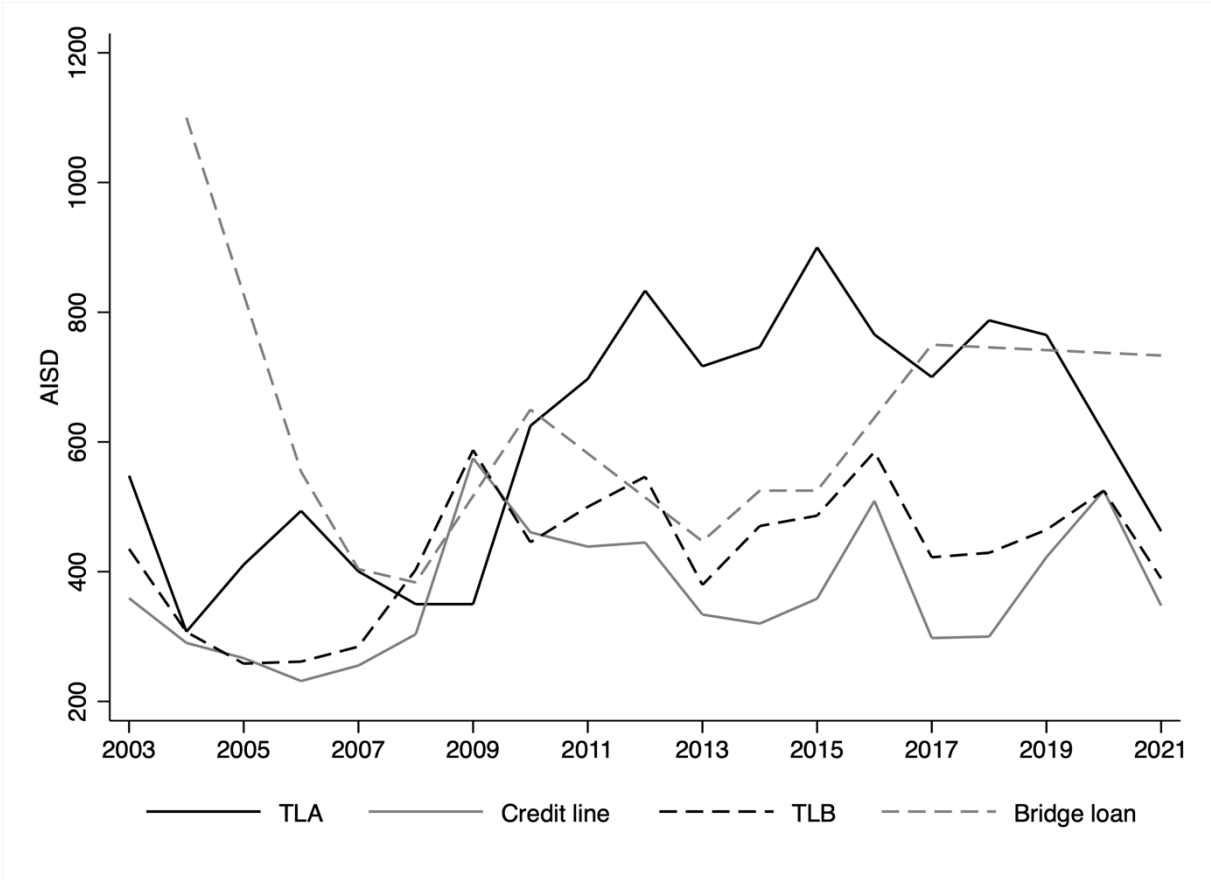


Figure 2: Loan spread residuals by post-issuance

The figure displays the residuals from a panel regression of the quarterly average loan spread on deal, issuance period, and observation year-quarter fixed effects. The residuals are averaged by the respective quarter after loan issuance for loans issued until (black line) and after (grey line) 2008. Dashed lines depict trends.

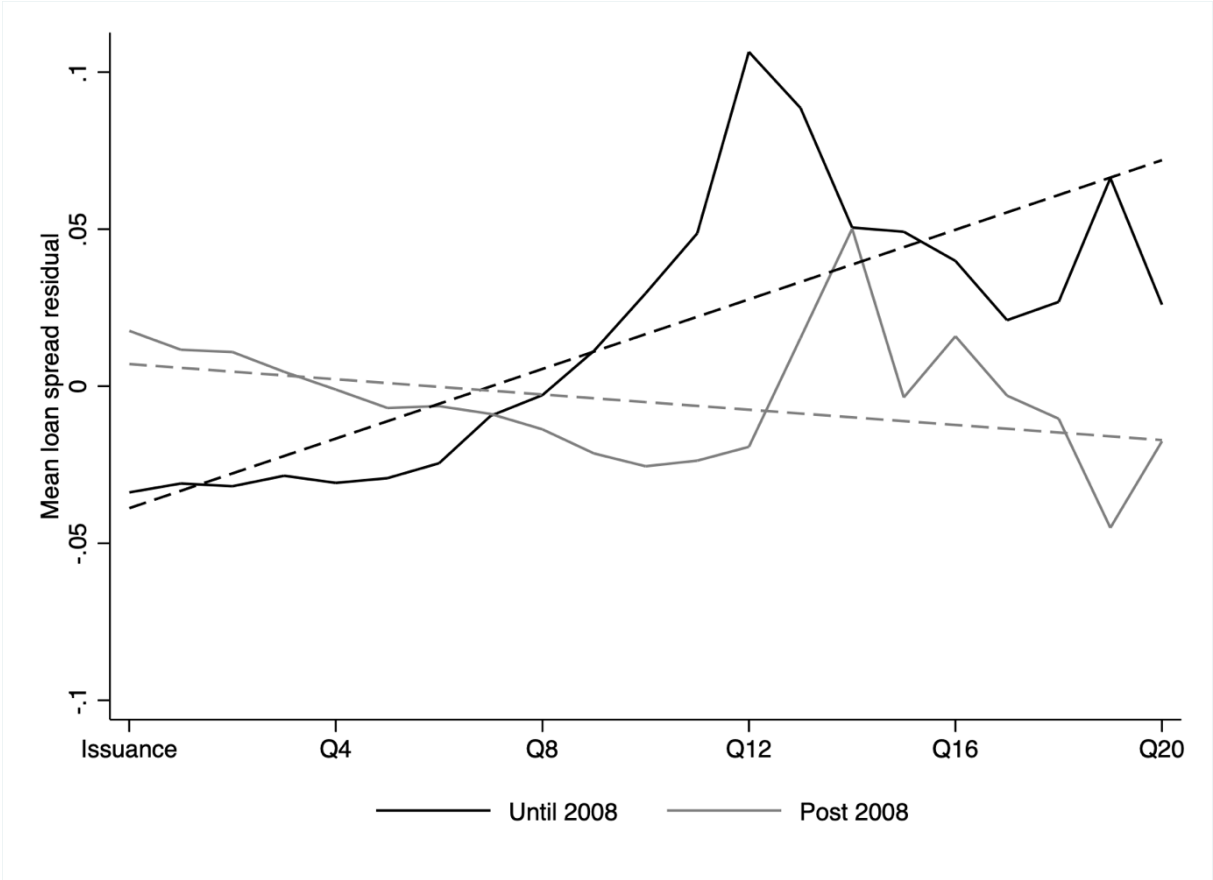


Table 1: Representative LBO deals before the GFC and 10 years after

Panel A displays the financing structure of an average-sized deal closed in 2007 (before the GFC), HUB International, which was closed on June 13, 2007. Panel B depicts the financing structure of an average-sized deal closed in 2017 (10 years after the GFC), Albany Molecular Research Inc., which closed on August 31, 2017. The debt commitment letter of HUB International (Panel A) had a contractual length of 200 days. The realized commitment period was 108 days. HUB International had an S&P long-term issuer rating of B. The debt commitment letter of Albany Molecular Research (Panel B) had a contractual length of 166 days. The realized commitment period was 87 days. Albany Molecular Research had an S&P long-term issuer rating of B. In both panels, the *Pricing* column refers to the all-in-spread-drawn (AISD, in bps) over Libor.

Panel A. HUB International Ltd.

	Amount	Terms	Pricing	# Underwriter
Equity characteristics				
<i>Number of private equity sponsors</i>	2	/	/	
	[Apax Partners, Morgan Stanley]			
<i>Equity</i>	\$724mln	/	/	
Debt characteristics				
<i>Debt commitment</i>	\$1525mln	/	/	
<i>Debt</i>				
Term loan A	\$140mln	7-year secured	250bps	2
Term loan B	\$200mln	7-year secured	475bps	2
	\$525mln	7-year secured	250bps	2
Bridge loan financing	/	/	/	
<i>Contingent debt</i>				
Revolving credit facility	\$100mln	6-year secured	250bps	2
Total senior debt	\$865mln			
Total contingent debt	\$100mln			
Total debt	\$965mln			

Panel B. Albany Molecular Research Inc.

	Amount	Terms	Pricing	# Underwriter
Equity characteristics				
<i>Number of private equity sponsors</i>	2	/	/	
	[GTCR, Carlyle Group]			
<i>Equity</i>	\$995mln	/	/	
Debt characteristics				
<i>Debt commitment</i>	\$960mln	/	/	
<i>Debt</i>				
Term loan A	\$205mln	8-year secured	700bps	6
Term loan B	\$655mln	7-year secured	655bps	6
Bridge loan financing	/	/	/	
<i>Contingent debt</i>				
Revolving credit facility	\$100mln	5-year secured	325bps	6
Total senior debt	\$860mln			
Total contingent debt	\$100mln			
Total debt	\$960mln			

Table 2: Summary statistics

Panel A shows deal characteristics by period. Panel B shows the sample LBOs' financing structures as a percentage share of total realized financing by period. Panel C depicts target characteristics by period. In all panels, columns (2) and (3) show period averages. Column (4) displays the difference in period means and indicates whether the difference in means is statistically significant. ***, **, and * indicate the statistical significance for a difference in means test at the 1%, 5%, and 10% level, respectively. Term loans/EBITDA in Panel A and EBITDA in Panel C omit negative values and the data are winsorized at the 1st and 99th percentile, respectively. The numerical ratings in Panel C are mapped such that a rating of 14 equals a B+ rating and 15 equals a B rating. The sample in all panels omits equity-only deals. It consists of 243 public-to-private deals, 110 deals for the period between 2003 and 2008, and 133 deals for the period between 2009 and 2021.

Panel A. Deal characteristics by period

	2003-2008 (110 obs.)	2009-2021 (133 obs.)	Difference in means
Gross transaction value (\$USmn)	4186	2714	-1472**
Debt commitment (\$USmn)	3079	1636	-1443***
Term loans/EBITDA	6.11	6.68	0.57
Term loan B financing (% of total deal debt)	43	53	10***
Credit line financing (% of total deal debt)	20	13	-7***
Committed bridge financing (\$USmn)	1614	803	-811***
# Underwriters	2	4	2***
Commitment period (Days)	214	178	-36***
# Deals with bridge loan commitment (% of all deals)	44	28	-16***

Panel B. Type of LBO financing as a percentage of total realized financing by period (bold categories sum to 100%)

	2003-2008 (110 obs.)	2009-2021 (133 obs.)	Difference in means
Bank debt	60.14	49.94	-10.20***
Senior secured	48.93	46.64	-2.29
Senior unsecured	9.81	3.30	-6.51*
Subordinated debt	1.39	0.00	-1.39***
Bridge loan	9.19	4.19	-5.00**
Contingent debt	8.83	7.78	-1.05***
Equity	31.49	41.54	10.05***
PE equity	29.74	39.76	10.02***
Rollover equity	1.55	1.55	0.00
Other equity	0.19	0.24	0.05
Bond financing	7.74	7.26	-0.48
Mezzanine financing	0.80	1.07	0.27***

Panel C. Target characteristics by period

	2003-2008 (110 obs.)	2009-2021 (133 obs.)	Difference in means
Assets (\$USmn)	2427	1498	-929**
EBITDA (\$USmn)	306	166	-140**
Sales/PPE	10.27	14.80	4.53*
R&D/sales	0.03	0.06	0.03***
Operating income/assets	0.13	0.12	0.01
Earnings volatility	0.04	0.05	0.01
Rating	14.35	14.69	0.34*

Table 3: Effect of the GFC on LBO financing structures

Column (1) displays the results of an ordinary least squares (OLS) regression of the debt letter commitment period in days on a *Post 2008* indicator variable and a set of control variables. Column (2) shows the results of a linear probability model (LPM) regression of the indicator variable *Bridge loan commitment* on a *Post 2008* indicator variable and a set of control variables. Column (3) depicts the results of an OLS regression of the committed bridge loan financing as a fraction of total committed debt financing on a *Post 2008* indicator variable and a set of control variables. Column (4) shows the results of an OLS regression of the equity share (committed equity by private equity (PE) sponsors over total committed funds) on a *Post 2008* indicator variable and a set of control variables. Column (5) displays the results of an OLS regression of the term loan B volume as a fraction of total deal debt on a *Post 2008* indicator variable and a set of control variables. Column (6) displays the results of an OLS regression of the credit line volume as a fraction of total deal debt on a *Post 2008* indicator variable and a set of control variables. The indicator variable *Bridge loan commitment* is one if a deal had a bridge loan commitment and zero otherwise. The indicator variable *Post 2008* is one if a deal was announced after 2008 and zero otherwise. All control variables are defined in the data appendix. Industry FE denote Fama French 49 industry fixed effects. Standard errors are clustered at the quarter-year level. *T*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. The sample consists of 316 public-to-private LBO deals.

	(1)	(2)	(3)	(4)	(5)	(6)
	Commitment period (days)	Bridge loan commitment (0/1)	Committed bridge loan financing (fraction of total)	Equity share (fraction of total)	Term loan B volume (fraction of total debt)	Credit line volume (fraction of total debt)
Post 2008	-19.529* (-1.79)	-0.148*** (-2.67)	-0.072*** (-2.75)	0.165*** (4.70)	0.184** (2.57)	-0.091* (-1.88)
log(Assets)	21.505*** (7.17)	0.224*** (11.78)	0.083*** (7.34)	-0.044*** (-3.48)	0.048** (2.47)	-0.011 (-1.05)
Sales/PPE	0.173 (0.47)	0.005* (1.87)	0.002 (1.42)	-0.002 (-1.03)	-0.000 (-0.10)	-0.001 (-0.96)
R&D/sales	11.104 (0.14)	0.035 (0.06)	0.107 (0.46)	0.508 (1.66)	0.468 (0.80)	-0.693*** (-3.04)
No R&D (0/1)	-4.507 (-0.41)	0.003 (0.03)	-0.011 (-0.30)	0.050 (1.26)	-0.053 (-0.80)	-0.034 (-0.71)
Income/assets	40.383 (0.76)	1.796*** (5.95)	0.736*** (5.05)	-0.652*** (-3.65)	0.949*** (3.29)	-0.631*** (-3.65)
Earnings volatility	163.996 (1.39)	0.650 (0.87)	0.270 (0.81)	0.127 (0.34)	0.416 (0.51)	0.033 (0.08)
VIX	0.687 (0.71)	-0.002 (-0.42)	-0.001 (-0.23)	0.003 (1.02)	-0.001 (-0.17)	0.001 (0.30)
CPI	10.619 (0.82)	0.092 (1.38)	0.038 (1.25)	0.046 (1.43)	-0.071 (-1.07)	-0.003 (-0.08)
Term spread	-6.283 (-1.50)	0.030 (1.38)	0.017 (1.63)	-0.040*** (-4.47)	-0.059*** (-2.88)	0.017 (1.18)
# Underwriters	0.101 (0.03)	-0.005 (-0.27)	-0.004 (-0.55)	-0.024*** (-3.45)	-0.015 (-0.86)	0.004 (0.50)
# Loans	8.042* (1.95)	-0.001 (-0.05)	-0.011 (-0.95)	-0.069*** (-5.75)	0.002 (0.08)	-0.025* (-1.88)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	235	303	303	297	251	251
Adjusted R^2	0.386	0.380	0.255	0.531	0.138	0.236

Table 4: Determinants of LBO leverage

The table shows OLS regression results of the determinants of LBO leverage ($\log(\text{Committed debt}/\text{EBITDA})$) on different proxies for credit market conditions and target and deal financing characteristics. Industry FE denote Fama French 49 industry fixed effects. *T*-statistics based on quarter-year clustered standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. All variables are defined in the data appendix. The sample omits equity-only deals and deals with negative EBITDA. It consists of 232 public-to-private LBO deals between 2003 and 2021.

	(1) log (Committed debt/ EBITDA)	(2) log (Committed debt/ EBITDA)	(3) log (Committed debt/ EBITDA)
GZ spread	-0.228** (-2.28)		
VIX		-0.0338*** (-4.30)	
CLO issuance			0.00573*** (2.87)
log(Assets)	-0.0984 (-1.46)	-0.107 (-1.58)	-0.125* (-1.73)
Sales/PPE	-0.00693 (-1.19)	-0.00667 (-1.19)	-0.00341 (-0.58)
R&D/sales	2.233 (1.28)	2.171 (1.29)	2.640 (1.51)
No R&D (0/1)	0.0115 (0.13)	0.0266 (0.31)	0.0363 (0.40)
Income/Assets	-4.405*** (-3.80)	-4.420*** (-3.94)	-4.623*** (-4.06)
Earnings volatility	0.620 (0.38)	0.381 (0.23)	0.761 (0.47)
# Underwriters	0.0346 (1.06)	0.0465 (1.48)	0.0425 (1.34)
# Loans	0.0904 (1.67)	0.0797 (1.56)	0.0691 (1.35)
Industry FE	Yes	Yes	Yes
Observations	231	231	226
Adjusted R^2	0.341	0.363	0.378
Adjusted R^2 without controls & FE	0.029	0.033	0.048

Table 5: Variance decomposition

The table shows the results of a variance decomposition of deal leverage. The estimations use the same proxies for credit market conditions and firm and deal characteristics as in Table 4. Column (1) uses the GZ spread as a proxy for credit market conditions. Column (2) uses the VIX as a proxy for credit market conditions, and column 3 uses CLO issuances. *Until 2008* denotes the proxies at closing/characteristics of target companies that were acquired until 2008, and *Post 2008* denotes those after 2008. Industry FE denote Fama French 49 industry fixed effects. Standards errors are clustered as in Table 4. The estimations exclude equity-only deals and deals with negative EBITDA. The sample consists of 232 public-to-private LBO deals between 2003 and 2021.

	(1) <i>GZ spread</i> % of R^2	(2) <i>VIX</i> % of R^2	(3) <i>CLO issuance</i> % of R^2
Proxy – Until 2008	4.58	4.07	3.40
Proxy – Post 2008	1.68	2.66	2.70
Firm characteristics – Until 2008	13.24	13.85	15.65
Firm characteristics – Post 2008	37.16	35.78	36.08
Loan package characteristics – Until 2008	1.71	1.28	1.51
Loan package characteristics – Post 2008	4.43	4.08	3.43
Industry FE	37.74	38.28	37.22
Observations	231	231	226
R^2	0.529	0.523	0.536

Table 6: Underwriting LBO debt

The table displays the results of regressions of the number of underwriters (Poisson regression) and the lead arranger's individual loan shares as a fraction of one (OLS regression) on a Post 2008 indicator variable and a set of control variables. Column (3) shows the results of an OLS regression of the *Non-bank share*, defined as the number of non-bank lead arrangers divided by the total number of lead arrangers, on a Post 2008 indicator variable and a set of control variables. The variable *Post 2008* takes the value of one if a facility was originated after 2008, and zero otherwise. All regressions include the following facility control variables: $\log(\text{loan size})$, $\log(\text{maturity})$, the indicator variable *Secured* which is equal to one if the facility is secured and zero otherwise, the indicator variable *Bridge Loan* which is equal to one if the loan was a bridge loan and zero otherwise, the indicator variable *Term Loan A* which is equal to one if the loan was a term loan A and zero otherwise. All regressions also use the following target control variables: interest coverage ratio, operating income/assets, sales/PPE, current assets/current liabilities, book leverage, and the indicator variable *Rated* which is one if the target company had an S&P long-term issuer rating and zero otherwise. Moreover, all columns include the VIX, the CPI, and the term spread as macro controls. All control variables are defined in the data appendix. Industry FE denote Fama French 49 industry fixed effects. Standard errors are clustered at the deal level. *T*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. The sample consists of 740 loans.

	(1) # Underwriters	(2) Loan share (fraction)	(3) Non-bank share (fraction)
Post 2008	0.894*** (8.40)	-0.233*** (-6.25)	0.00487 (0.10)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	592	589	589
Adjusted R^2		0.486	0.292
Pseudo R^2	0.198		

Table 7: Price and non-price terms of LBO loans

Column (1) displays the results of an OLS regression of the all-in-spread drawn (AISD, in bps) on a Post 2008 indicator variable, two loan-type indicator variables, and a set of control variables. Column (2) shows the results of an OLS regression of the AISD on a Post 2008 indicator variable and a set of control variables for the revolving credit facilities of the sample. Column (3) shows the results of an OLS regression of the all-in-spread-undrawn (AISU, in bps) on a Post 2008 indicator variable and a set of control variables for the revolving credit facilities of the sample. Column (4) shows the results of an OLS regression of the yield to maturity (YTM defined as Spread + OID/4) on a Post 2008 indicator variable and a set of control variables for a matched Leveraged Commentary sample of term loans B. The variable *Post 2008* takes the value of one if a loan was originated (columns (1) – (3)) or fully syndicated (column (4)) after 2008 and zero otherwise. The indicator variable *Term loan A* takes the value of one if a loan is a term loan A and zero otherwise. The indicator variable *Bridge loan* takes the value of one if a loan is a bridge loan and zero otherwise. The estimations use the same control variables as the estimations in Table 6, but column (4) excludes the variable *Secured*. All control variables are defined in the data appendix. Industry FE denote Fama French 49 industry fixed effects. Standard errors are clustered at the deal level in columns (1) – (3) or at the quarter-year level in column (4). *T*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. The sample consists of 669 loans in column (1), of 283 loans in columns (2) and (3), whereby only 140 credit lines have information on their AISU, and of 200 loans in column (4).

	(1)	(2)	(3)	(4)
	<i>All loans</i>	<i>Credit lines</i>	<i>Credit lines</i>	<i>Term loans B</i>
	AISD	AISD	AISU	YTM
	(bps)	(bps)	(bps)	(bps)
Post 2008	149.6*** (7.96)	110.3*** (4.86)	4.371 (1.47)	169.1*** (6.46)
Term loan A	131.3*** (4.92)			
Post 2008 # Term loan A	118.4*** (2.91)			
Bridge loan	275.9*** (4.13)			
Post 2008 # Bridge loan	54.44 (0.83)			
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	556	214	129	117
Adjusted R^2	0.510	0.594	0.434	0.493

Table 8: Exposure to LBO debt during the GFC

Column (1) displays the results of a Poisson regression of the number of lead arrangers in a lending syndicate on a Post 2008 and an exposure indicator variable, and a set of control variables. Column (2) displays the results of an OLS regression of lenders' individual loan share as a fraction on a Post 2008 and exposure indicator variable, and a set of control variables. Column (3) displays the results of an OLS regression of the AISD in bps on a Post 2008 and exposure indicator variable and a set of control variables. The variable *Post 2008* takes the value of one if a facility was originated after 2008 and zero otherwise. The variable *Exposed* is defined as follows. First, we aggregate the loan shares by lead arrangers for all loans issued in 2007 and 2008. Subsequently, we scale the amount lent by a lead arranger's total assets as reported on December 31, 2006, which we obtain from Compustat. A lead arranger is classified as exposed if the scaled lending volume is in the top quartile of the distribution. The variable *Exposed* takes the value of one if at least one lead arranger in the facility's lending syndicate was LBO-risk exposed according to our measure, and zero otherwise. All estimations employ the same control variables as in the corresponding regressions from Tables 6 and 7. All control variables are defined in the data appendix. Industry FE denote Fama French 49 industry fixed effects. Standard errors are clustered as in the corresponding estimations of Tables 6 and 7. *T*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	(1) # Underwriters	(2) Loan share (fraction)	(3) AISD (bps)
Post 2008	0.743*** (5.73)	-0.263*** (-4.95)	188.3*** (7.44)
Exposed	0.182* (1.78)	-0.175*** (-3.74)	-28.07 (-1.32)
Post 2008 # Exposed	0.310** (2.10)	0.0121 (0.19)	-87.49*** (-2.72)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	592	589	556
Adjusted R^2		0.544	0.547
Pseudo R^2	0.215		

Table 9: Effect of the Guidance on Leveraged Lending on LBO financing structures

Column (1) displays the results of an OLS regression of the commitment period in days on two period indicator variables, a lender-type variable, and a set of control variables. Column (2) shows the results of an LPM of the indicator variable *Bridge loan commitment*, which is equal to one if a deal had a bridge loan commitment and zero otherwise, on two period indicator variables, a lender-type variable, and a set of control variables. Column (3) depicts the results of an OLS regression of the committed bridge financing as a fraction of total committed debt financing on two period indicator variables, a lender-type variable, and a set of control variables. Column (4) shows the results of an OLS regression of the (PE) equity share on two period indicator variables, a lender-type variable, and a set of control variables. Column (5) shows the results of an OLS regression of deal leverage ($\log(\text{Committed debt}/\text{EBITDA})$) on two period indicator variables, a lender-type variable, and a set of control variables. Column (6) displays the results of an OLS regression of the total credit line and term loan A debt as a fraction of total deal debt on two period indicator variables, a lender-type variable, and a set of control variables. The indicator variable *LLG Period I* is equal to one if a deal was announced in 2013 or 2014 and zero otherwise. The indicator variable *LLG Period II* is equal to one if a deal was announced in 2015, 2016, or 2017 and zero otherwise. The indicator variable *LISCC* is equal to one if a lender is under supervision by the Large Institution Supervision Coordinating Committee (LISCC) Program and zero otherwise. All estimations employ the same set of control variables as the estimations in Tables 3 and 4. All control variables are defined in the data appendix. Industry FE denote Fama French 49 industry fixed effects. Standard errors are clustered as in Tables 3 and 4, and the according *t*-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	(1) Commitment period (Days)	(2) Bridge loan commit- ment (0/1)	(3) Committed bridge loan financing (fraction of total)	(4) Equity share (fraction of total)	(5) $\log(\text{Committed}$ $\text{debt}/\text{EBITDA})$	(6) Credit line & Term loan A debt (fraction of total)
LLG Period I	2.464 (0.13)	0.028 (0.24)	-0.030 (-0.64)	0.091 (1.30)	0.281** (2.42)	-0.157 (-1.35)
LLG Period II	-31.788* (-1.90)	-0.009 (-0.15)	0.006 (0.14)	0.153*** (2.98)	0.091 (0.86)	-0.039 (-0.32)
LISCC	18.765* (1.86)	0.259*** (4.03)	0.126*** (4.22)	-0.043 (-1.35)	0.135 (1.44)	0.050 (0.83)
LLG Period I # LISCC	-11.537 (-0.55)	-0.066 (-0.44)	-0.084 (-1.14)	-0.020 (-0.29)	-0.295 (-1.63)	-0.006 (-0.06)
LLG Period II # LISCC	9.439 (0.42)	-0.397*** (-3.10)	-0.178** (-2.58)	-0.012 (-0.15)	-0.155 (-0.99)	0.010 (0.08)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	231	299	299	293	227	249
Adjusted R^2	0.396	0.422	0.307	0.516	0.353	0.273

Table 10: Institutional investor demand

Panel A displays the results of OLS regressions for different loan characteristics pertaining to institutional investor demand. Column (1) displays the results of an LPM regression of the indicator variable *Cov-lite* on a Post 2008 indicator variable and a set of control variables. Column (2) displays the results of an LPM regression of the indicator variable *Covenant* on a Post 2008 indicator variable and a set of control variables. Column (3) displays the results of an LPM regression of the indicator variable *Flexed* on a Post 2008 indicator variable and a set of control variables. Column (4) displays the results of an OLS regression of the loan underpricing in percentage points on a Post 2008 indicator variable and a set of control variables. Panel B displays the results of OLS regressions of the effect of affiliated CLOs on LBO deal and loan characteristics. Column (1) displays the results of an LPM of the indicator variable *Affiliated CLO* on a Post 2008 indicator variable and a set of control variables. Column (2) displays the results of an OLS regression of the term loan B volume as a fraction of total deal debt on a CLO-type indicator variable and a set of control variables. Column (3) shows the results of an OLS regression of the number of lead arrangers in a facility's lending syndicated on a CLO-type indicator variable and a set of control variables. Column (4) shows the results of an OLS regression of a loan's AISD in bps on a CLO-type indicator variable and a set of control variables. In Panel A, the variable Post 2008 takes the value of one if a loan was originated (columns (1) and (2)) or fully syndicated (columns (3) and (4)) after 2008 and zero otherwise. In Panel B, the variable Post 2008 takes the value of one if a deal was announced after 2008 (columns (1) and (2)) or if a facility was originated after 2008 (columns (3) and (4)) and zero otherwise. The indicator variable *Cov-lite* is one if a loan is cov-lite and zero otherwise. The indicator variable *Covenant* is one if a loan has at least one covenant and zero otherwise. The indicator variable *Flexed* is one if a loan has been flexed (spread or OID has been changed) and zero otherwise. The indicator variable *Term loan B* takes the value of one if a loan is a term loan B and zero otherwise. The indicator variable *Credit line* takes the value of one if a loan is a credit line and zero otherwise. The indicator variable *Term loan A* takes the value of one if a loan is a term loan A and zero otherwise. In columns (1) and (2) of Panel B, the indicator variable *Affiliated CLO* is one if any of a deal's debt was held by an affiliated CLO (CLO manager affiliated with PE firm) and zero if none of a deal's debt was held by a PE-affiliated CLO or if none of a deal's debt was held by any CLO. In columns (3) and (4) the indicator variable *Affiliated CLO* is one if some share of a loan was held by a PE-affiliated CLO and zero if no PE-affiliated CLO ever held any share of a loan. In Panel A, the estimations use the same control variables as the estimations in Table 6, but columns (3) and (4) exclude the variable *Secured*. In Panel B, columns (1) and (2) employ the same control variables as the estimations in Table 3. Columns (3) and (4) employ the same set of control variables as the corresponding estimations in Tables 6 and 7. All control variables are defined in the data appendix. Industry FE denote Fama French 49 industry fixed effects. In Panel A, standard errors are clustered at the deal level in columns (1) and (2) or at the quarter-year level in columns (3) and (4). In Panel B, Standard errors are clustered at the quarter-year level in columns (1) and (2) and at the deal level in columns (3) and (4). *T*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. In Panel A, the sample consists of 740 loans in columns (1) and (2), and of 200 loans in columns (3) and (4). Note that the estimation in column (1) omit 49 loans issued after 2019 due to their lack of coverage in Dealscan. In Panel B, the sample consists of 261 deals in columns (1) and (2), and of 283 deals in columns (3) and (4) due to a different aggregation of CLO data.

Panel A: Loan characteristics pertaining to institutional investor demand

	(1) Covenant (0/1)	(2) Covlite (0/1)	(3) Flexed (0/1)	(4) Underpricing (pp)
Post 2008	-0.154 (-0.98)	-0.0328 (-0.34)	0.373*** (3.10)	0.329* (1.70)
Term loan B	0.111 (1.05)	-0.0356 (-0.51)		
Post 2008 # Term loan B	-0.268* (-1.86)	0.369*** (3.59)		
Credit line	0.134 (1.31)	-0.0604 (-1.02)		
Post 2008 # Credit line	-0.215 (-1.59)	0.152* (1.66)		
Term loan A	0.0836 (0.76)	0.0669 (1.00)		
Post 2008 # Term loan A	-0.138 (-0.83)	0.295** (2.45)		
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	562	594	117	99
Adjusted R^2	0.260	0.341	0.235	0.437

Panel B: Affiliated CLO

	(1) Affiliated CLO (0/1)	(2) Term loan B vol- ume (fraction of total)	(3) # Underwriters	(4) AISD (bps)
Post 2008	0.232** (2.45)			
Affiliated CLO		0.225*** (4.81)	-0.223 (-0.56)	-84.243** (-2.25)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	253	253	239	235
Adjusted R^2	0.263	0.278	0.238	0.485

Table 11: Loan performance in the secondary loan market post-origination

The table displays the results of panel regressions for the median quarterly internal rate of return (IRR) of traded LBO loans on a Post 2008 indicator variable and different sets of fixed effects. The variable *Post 2008* takes the value of one if a facility was originated after 2008 and zero otherwise. The estimations do not include any additional control variables. Pricing FE denote loan price (AISD, in bps) fixed effects. Industry FE denote Fama French 49 industry fixed effects. Year-Quarter FE denote observation quarter-year fixed effects. Standard errors are clustered at the quarter-year level. *T*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. The sample consists of 3629 quarterly loan observations.

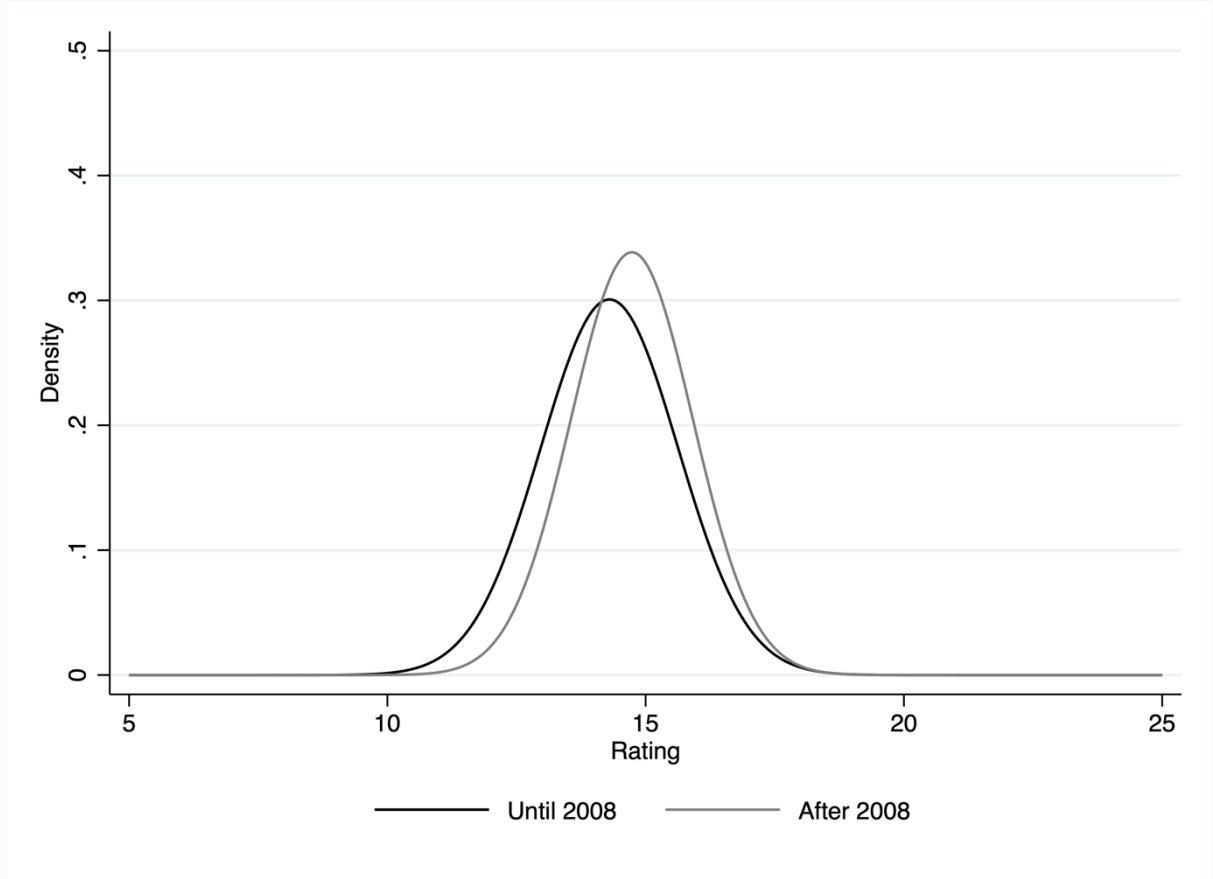
	(1) Median IRR	(2) Median IRR	(3) Median IRR	(4) Median IRR
Post 2008	-0.026*** (-4.65)	-0.028*** (-7.14)	-0.020*** (-3.48)	-0.023*** (-6.74)
Controls	No	No	No	No
Pricing FE	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Year-Quarter FE	No	Yes	No	Yes
Observations	3621	3621	3600	3600
Adjusted R^2	0.190	0.332	0.255	0.392

Appendix

Appendix A. Figures

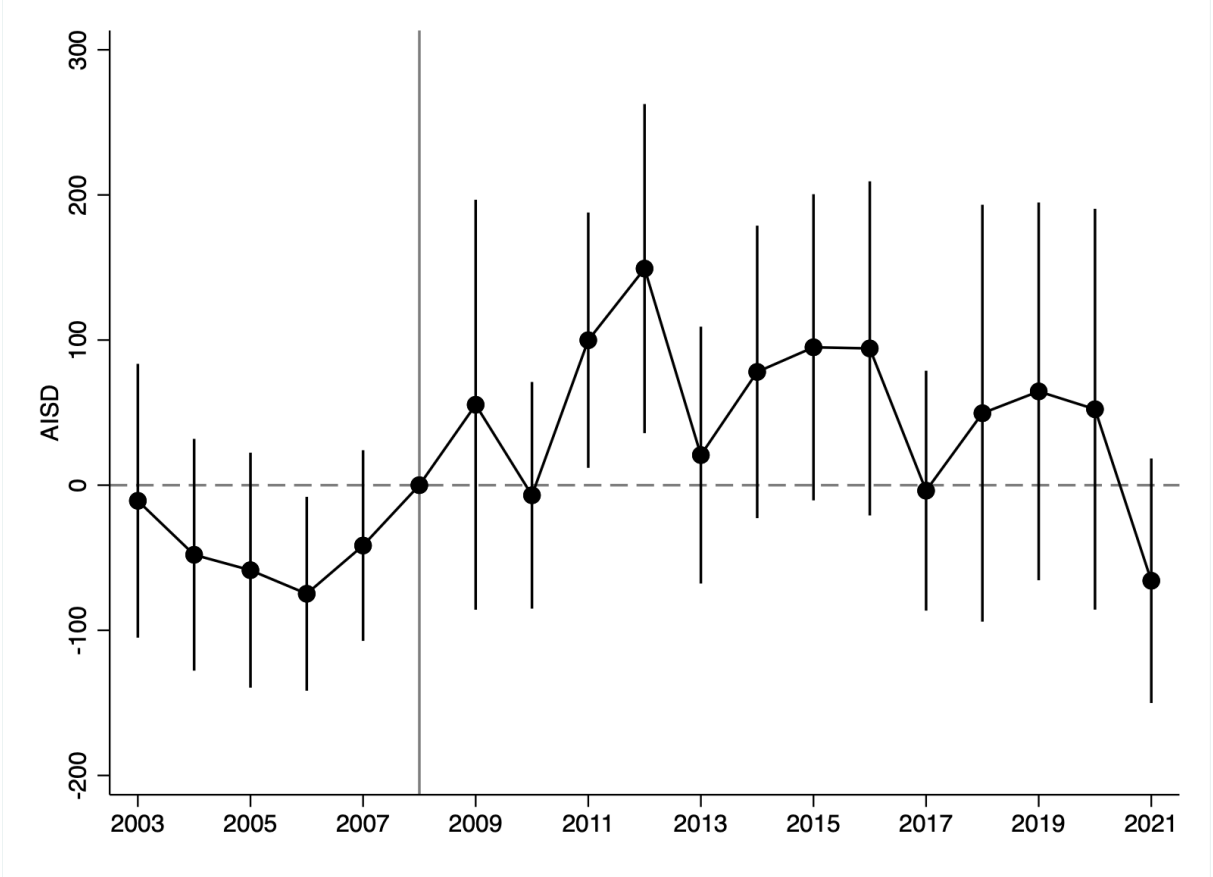
A. Figure 1: Target company ratings by period

The figure displays the density of target companies' S&P long-term issuer ratings by period. For target companies in the category "Until 2008", the deal agreement was until and including 2008. For target companies in the category "After 2008", the acquisition was agreed on after 2008. A rating of 15 equals a B rating. A rating of 14 equals a B+ rating.



A. Figure 2: Parallel trends of the AISD of LBO vs. non-LBO leveraged loans

The figure displays the difference in the AISD (in bps) of LBO and non-LBO leveraged loans. LBO loans are all loans from our sample, excluding bridge loans. Non-LBO leveraged loans are leveraged loans, as defined by their eligibility for the Morningstar LSTA US Leveraged Loan Index, available in Dealscan/Loan Connector for our sample period.



Appendix B. Tables

B. Table 1: Fitch table on LBO exposures

The table displays the total allocation to LBO deals and the LBO exposure of lenders active in the syndication of LBO credit facilities in 2007, as provided by a Fitch Special Report (Fitch, 2007). Column (2) displays the total allocation of LBO lenders to their top 20 pending deals in \$US million. Column (3) displays the total allocation of LBO lenders to their top 20 pending deals and their top 10 completed deals in \$US million. The exposure in column (4) is calculated as the percentage change in a lender's equity capital to asset ratio if 75% of the lender's top 20 pending deals and 50% of the lender's top 10 completed deals return to the lender's balance sheet.

Lender	<i>Top 20 pending</i> (US\$mln)	<i>Total allocation</i> (US\$mln)	<i>Exposure</i> Δ equity ratio (%)
Citigroup	37,057	56,538	1,70%
JPMorgan Chase	28,771	37,318	1,70%
Bank of America	31,753	33,109	1,60%
Lehman Bros.	29,398	31,566	3,70%
Goldman Sachs	21,270	29,929	2,10%
Deutsche Bank	26,404	27,587	0,80%
Morgan Stanley	25,673	26,856	1,60%
Royal Bank of Scotland	19,028	21,318	0,80%
Credit Suisse	18,155	18,927	1,20%
Merrill Lynch	11,340	16,241	1,00%
Toronto-Dominion	12,752	12,752	2,70%
UniCredito	2,015	6,916	0,40%
Barclays	6,275	6,275	0,20%
Wachovia	4,447	5,803	0,60%
HSBC	3,667	3,667	0,10%
Bear Stearns	2,881	3,654	0,60%
Rabobank	0	1,183	0,10%
Royal Bank of Canada	0	1,107	0,10%
UBS	0	1,107	0,00%
Total	280,886	341,853	

B. Table 2: LBO sample composition

Panel A displays the total number of LBO deals retrieved from CapitalIQ, and how many deals we exclude due to missing information or missing data. Panel B shows the number of deals in the final sample and the number of deals with and without debt financing.

Panel A. Initial Sample

Total number of deals	563
OTC pink sheet transactions	29
Deals with undisclosed financing/missing financing information in their regulatory filings	91
Deals without information in Dealscan	114
Deals with various other data issues	13

Panel B. Final Sample

Total number of deals	316
Deals with equity and debt commitments	242
Deals with sufficiently large equity commitment to finance LBO (“equity-only”)	73
... of which received debt financing upon closing	20
... of which were entirely financed with equity	53

B. Table 3: Industry composition by period

The table displays the top 4 industries of the pre- (2003-2008) and post-GFC sample (2009-2021). The table ranks the industries by their importance (column (3)) and displays their percentage share in the respective sub-sample (column (4)). Column (5) shows the industry's rank in the universe of firms available in Compustat for the same period, and column (6) depicts the percentage share accordingly.

Period	Industry	<i>Sample</i>		<i>Universe</i>	
		Rank	%	Rank	%
2003 - 2008	Business Services	1	19.23	1	13.71
	Health Services	2	6.15	16	1.63
	Eating & Drinking Places	3	4.62	18	1.27
	Miscellaneous Retail	4	4.62	14	1.72
2009 - 2021	Business Services	1	30.81	2	14.41
	Chemical & Allied Products	2	7.03	1	15.75
	Electronic & Other Electric Equipment	3	5.41	5	5.91
	Industrial Machinery & Equipment	4	4.86	9	3.32

B. Table 4: LBO loan vs. non-LBO leveraged loan

The table reports the results of difference-in-difference estimations for different loan terms. The “treatment sample” consists of the LBO loans used in Tables 1 – 11, excluding bridge loans. The “control sample” consists of all other leveraged loans, as defined by their eligibility for the Morningstar LSTA US Leveraged Loan Index, available in Dealscan/Loan Connector for our sample period. Columns (1) and (4) display the results of a Poisson regression of the number of lead arrangers in a lending syndicate on a period and LBO indicator variable. Columns (2) and (5) show the results of an OLS regression of lenders’ individual loan shares as a fraction on a period and LBO indicator variable. Columns (3) and (6) display the results of an OLS regression of the AISD in bps on a period, LBO, and loan-type indicator variable. The indicator variable *Post 2008* is equal to one if a facility was originated after 2008 and zero otherwise. The indicator variable *LBO* is equal to one if a loan is an LBO loan from our sample and zero otherwise. The indicator variable *Term Loan A* is equal to one if the loan was a term loan A and zero otherwise. The same control variables are used as in Tables 6 and 7 except the indicator variable *Bridge Loan*. Industry FE denote Fama French 49 industry fixed effects. Rating FE denote rating category fixed effects. Standard errors are clustered at the deal level. *T*-statistics are reported in parenthesis. ***, **, * denote statistical significance at the 10%, 5%, and 1% level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	# Underwriters	Loan share (fraction)	AISD (bps)	# Underwriters	Loan share (fraction)	AISD (bps)
Post 2008	0.733*** (17.96)	-0.254*** (-18.09)	57.34*** (10.25)	0.712*** (17.64)	-0.247*** (-17.28)	53.65*** (9.74)
LBO	0.239*** (3.90)	-0.135*** (-5.47)	73.76*** (7.29)	0.259*** (3.92)	-0.142*** (-5.52)	46.33*** (4.44)
Post 2008 # LBO	0.0793 (0.91)	0.0427 (1.29)	92.12*** (5.58)	0.0810 (0.90)	0.0334 (0.99)	99.21*** (6.12)
Term loan A	-0.0483 (-1.35)	-0.00507 (-0.44)	37.39*** (2.97)	-0.0300 (-0.90)	-0.00567 (-0.53)	38.71*** (3.07)
Post 2008 # Term loan A			-18.60 (-1.17)			-20.09 (-1.34)
Term loan A # LBO			83.98*** (2.81)			86.49*** (2.87)
Post 2008 # Term loan A # LBO			166.0*** (3.67)			149.0*** (3.38)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes			
Industry # Rating FE				Yes	Yes	Yes
Observations	3550	3294	3383	3549	3294	3383
Adjusted R^2		0.387	0.309		0.420	0.384
Pseudo R^2	0.134			0.159		

Table 4 displays the results of a difference-in-difference (DiD) approach, which we employ to discern whether the observed shifts in LBO lending are unique to the LBO market or reflective of broader trends in leveraged loans post-financial crisis. Specifically, we compare the lending syndicates and contract terms of LBO loans to those of leveraged non-LBO loans before and after 2008. Our reference sample for leveraged loans is drawn from those eligible for inclusion in the Morningstar LSTA US Leveraged Loan Index.¹⁸

The first column examines the post-2008 shift in the number of lead arrangers, while the second column focuses on the loan share. The data suggests that, compared to non-LBO leveraged loans, LBO loans typically involve larger lending syndicates, resulting in reduced individual loan shares. However, the post-2008 period does not seem to amplify this trend for LBO loans, as evidenced by the statistically and economically negligible coefficients when interacting our *Post 2008* and *LBO* indicator variables.

Turning to loan spreads, column (3) uses the AISD in bps as the dependent variable. Post-2008, LBO loans became pricier in terms of drawn funds. While the spread for all leveraged loans rose by approximately 57bps after 2008, LBO loans saw an additional increase of 92bps. This cumulative 166bps premium for post-crisis LBO loans relative to post-crisis non-LBO leveraged loans underscores a heightened risk perception banks associate with LBO financing.

For the robustness of our DiD approach, it is crucial that LBO and non-LBO leveraged loans followed parallel trends prior to the financial crisis. To validate this, we refine our AISD regression to incorporate year indicator variables, plotting the AISD difference between LBO and non-LBO loans in Figure 2 in Appendix A.

Figure 2 reveals a modest negative pre-crisis gap between LBO and non-LBO leveraged loans. However, most coefficients from this period do not attain statistical significance.

¹⁸ We exclude all bridge loans from our estimation as they are generally not eligible to be included in the Morningstar LSTA US Leveraged Loan Index.

Post-2008, the gap widens noticeably, with many coefficients achieving strong statistical significance. This pattern does not indicate any significant divergence in pre-2008 trends between LBO and non-LBO leveraged loans.

Data Appendix

Variable	Note	Calculation	Source
# Underwriters	# lead arrangers	Number of lead arrangers in a loan syndicate	Dealscan/Loan Connector
# Loans		Number of loans per deal	Dealscan/Loan Connector
Affiliated CLO	Indicator variable	1 if some share of a loan was held by a PE-affiliated CLO, 0 if no PE-affiliated CLO ever held any share of a loan	Leveraged Commentary & Data/ Capital IQ
Agg. loan spread	Aggregate loan spread		Saunders et al. (2020)
AISD (bps)	All-in-spread-drawn	In basis points (bps)	Dealscan/Loan Connector
AISU (bps)	All-in-spread-undrawn	In basis points (bps)	Dealscan/Loan Connector
Book leverage		Long-term debt / assets	Compustat
Bridge loan	Indicator variable	1 if loan is a bridge loan, 0 otherwise	Dealscan/Loan Connector
Bridge loan commitment	Indicator variable	1 if LBO had a bridge loan commitment, 0 otherwise	SEC
CLO issuance		Number of CLOs issued in a given month	Refinitiv
Commitment period (days)		Period (in days) between receipt of debt commitment letter and its expiration date	SEC
Committed bridge loan financing (fraction of total)		Committed bridge loan financing / total debt commitment [0,1]	SEC
CPI	Consumer price index		FRED
Credit line	Indicator variable	1 if loan is credit line, 0 otherwise	Dealscan/Loan Connector
Credit line volume (fraction of total debt)		Credit line financing / total debt [0,1]	Dealscan/Loan Connector
Credit line & Term loan A debt (fraction of total)		(Credit line financing + term loan A financing) / total debt [0,1]	Dealscan/Loan Connector
Current		Current assets / current liabilities	Compustat
Cov-lite	Indicator variable	1 if loan is covenant light, 0 otherwise	Dealscan/Loan Connector
Covenant	Indicator variable	1 if a loan had a covenant, 0 otherwise	Dealscan/Loan Connector
Earnings volatility		Standard deviation (operating income / assets) for the last 5 years before deal closing (standard deviation over the last 5 annual reports)	Compustat
Equity share (fraction of total)		Equity commitment of PE sponsors / total financing commitment [0,1]	SEC/Dealscan/Loan Connector
Exposed	Indicator variable	1 if loan had at least one exposed lender according to our measure (top quartile of exposure according to LBO lending in our sample), 0 otherwise	Dealscan
Exposed – Fitch	Indicator variable	1 if a loan had at least one exposed lender according to our Fitch measure (in top quartile of exposure to LBO loans), 0 otherwise	Fitch
Flexed	Indicator variable	1 if loan terms were flexed during the loan syndication process, 0 otherwise	Leveraged Commentary & Data

GZ spread			FRED
LBO	Indicator variable	1 if loan is LBO loan from sample, 0 otherwise	Dealscan/Loan Connector
LLG Period I	Indicator variable	1 if a deal was agreed on in 2013 or 2014, 0 otherwise	Dealscan/Loan Connector/ Capital IQ
LLG Period II	Indicator variable	1 if a deal was agreed on in 2015, 2016, or 2017, 0 otherwise	Dealscan/Loan Connector/ Capital IQ
LISCC	Indicator variable	1 if a lender is under supervision by the Large Institution Supervision Coordinating Committee (LISCC) Program, 0 otherwise	Board of Governors of the Federal Reserve System
Loan share (fraction)		1 / # of lead arrangers [0,1]	Dealscan/Loan Connector
Loan spread			Refinitiv
log(Amount)		log(Loan amount)	Dealscan/Loan Connector
log(Assets)		log(Assets)	Compustat
log(Committed debt/EBITDA)	Leverage	Logarithm of the total committed debt financing / EBITDA	SEC/Compustat
log(Coverage)		log(1 + EBITDA / interest expenses)	Compustat
log(Maturity)		log(Loan maturity) [loan maturity in months]	Dealscan/Loan Connector
No R&D	Indicator variable	1 if target company has no R&D expenditure, 0 otherwise	Compustat
Non-bank share (fraction)		Total number of non-bank lead arrangers / total number of lead arrangers [0,1]	Dealscan/Loan Connector
OID	Original issue discount	Realized OID at end of loan syndication process (break OID)	Leveraged Commentary & Data
OID flexed up	Indicator variable	1 if the OID was flexed up during the loan syndication process, 0 otherwise	Leveraged Commentary & Data
Operating income/assets		Operating income / assets	Compustat
Post 2008	Indicator variable	1 if a loan was originated/a deal was agreed on after 2008	
R&D/sales		R&D expenditure / sales	Compustat
Rated	Indicator variable	1 if target company has a S&P long-term issuer rating, 0 otherwise	S&P Ratings
Rating		Target rating at close transformed to an ordinal scale from 1 to 27 (1 being AAA, 27 being SD)	S&P Ratings
Sales/PPE		Sales / Property, plant, and equipment	Compustat
Spread		Realized loan spread at end of loan syndication process (break spread)	Leveraged Commentary & Data
Talk OID		Proposed OID at beginning of loan syndication process	Leveraged Commentary & Data
Talk spread		Proposed loan spread at beginning of loan syndication process	Leveraged Commentary & Data
Term spread		Median term spread (10-year vs. 3-month T-Bill) in a given month	FRED

Term loan A	Indicator variable	1 if loan is term loan A, 0 otherwise	Dealscan/Loan Connector
Term loan B	Indicator variable	1 if loan is term loan B, 0 otherwise	Dealscan/Loan Connector
Term loan B volume (fraction of total debt)		Term loan B financing / total debt [0,1]	Dealscan/Loan Connector
Underpricing		Loan underpricing in percentage points Break price – (100 – (100 – Break OID))	Leveraged Commentary & Data FRED
VIX	CBOE Volatility Index		FRED
YTM (bps)	Yield to maturity	Spread + (OID / 4)	Leveraged Commentary & Data
2009 – 2012	Indicator variable	1 if a deal was agreed on/a loan was originated in the years 2009 to 2012, 0 otherwise	Dealscan/Loan Connector/ Capital IQ
2013 – 2017	Indicator variable	1 if a deal was agreed on/a loan was originated in 2013, 2014, 2015, 2016, or 2017, 0 otherwise	Dealscan/Loan Connector/ Capital IQ
2018 – 2021	Indicator variable	1 if a deal was agreed on in the years 2018 to 2021, 0 otherwise	Dealscan/Loan Connector/ Capital IQ