DOES CREDIT SUPPLY DRIVE THE LBO MARKET?

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A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Kenan-Flagler Business School (Finance).

Chapel Hill
2009

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ABSTRACT

YIHUI WANG: Does Credit Supply Drive the LBO Market?
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I examine how supply of credit affects investment and capital structure decisions by studying the leveraged buyout (LBO) market. I employ the structural changes in credit markets that led to the explosion in collateralized debt obligations (CDOs) to identify shocks in credit supply. Using instruments that are not likely affected by credit demand in the LBO market, I show that the easy credit from the CDO market encouraged banks to arrange more loans to finance LBOs, leading to the recent LBO boom. This structured lending supported by CDOs led to cheaper credit, looser covenants, and more aggressive use of bank loans in financing LBOs. However, in sharp contrast to the LBO boom in the late 1980s, this easy credit did not lead to riskier LBO deals. My findings point to the effects of disintermediation of banks as they switched from an originate-and-hold to an originate-and-distribute model.

ACKNOWLEDGEMENTS

I am indebted to my advisor Anil Shivdasani for his encouragement and support throughout the work of this dissertation. I thank Gregory Brown, Paolo Fulghieri, Matthias Kahl, Wayne Landsman, and Ed Van Wesep for their suggestions and help on this dissertation. I would also like to thank Paige Ouimet, Adam Reed, Jay Ritter, Sergey Sanzhar, Merih Sevilir, and Gunter Strobl for their comments.

I thank Chris Flanagan and Kedran Panageas, of JP Morgan, and Marc Auerbach, of Standard and Poor for helpful discussions. I thank Asset-Backed Alert for sharing the ABS Database.

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I. Introduction

From 2004 to 2007, a total value of $535 billion of U.S. public-to-private leveraged buyout (LBO) transactions was completed. This was more than ten times the volume of $50 billion over the eight years from 1996 to 2003 (Fig. 1). This LBO boom eclipses an earlier boom (1986 to 1989), which had a volume of $137 billion,[1] but it came to an abrupt end in the last quarter of 2007, with a sharp drop of 94% from a year earlier.

What explains this enormous rise and sudden fall in the LBO market? The literature suggests that LBOs create value from interest tax shields and reducing agency costs. However, these benefits are not likely to vary much over time and, thereby, cannot explain the boom. In this paper, I turn to supply-side factors and propose a credit supply hypothesis, which argues that the increased credit supply, particularly from the expansion of the market of collateralized debt obligations (CDOs), drove the LBO boom. As CDOs attracted more investors, CDO issuers needed more collateral assets, including bank loans to support more issues, and, hence, boosted the supply of credit to bank borrowers. This easier access to credit led to the substitution of debt for equity and thus more highly levered transactions, such as LBOs. In addition to testing the credit supply hypothesis, I also examine two important questions: First, how did the credit from the CDO market affect banks' lending policies? Second, did this easy credit lead to riskier LBO deals?

More broadly, the goal of this paper is to examine the effect of credit supply on investment and capital structure decisions. The literature has focused primarily on the demand-side firm characteristics related to taxes, agency problems, information asymmetry, and bankruptcy costs,

[1] Total volume of LBOs in the 1980s is calculated based on a sample of U.S. public-to-private transactions from SDC Platinum selected using the same criteria as discussed in Section II.

to understand these decisions. However, relatively little is known about the role of supply-side factors in leverage and investment choices. The evidence is limited to a few recent important papers by Faulkender and Petersen (2006), Sufi (2007b), and Lemmon and Roberts (2008). In this paper, I expand the analysis by showing the effects of supply-side factors on merger and acquisition activities, the structure of transactions, and the quality of deals. The LBO market is a good venue to study the supply effect because the extensive use of debt makes it very sensitive to changes in credit supply.

The shocks in credit supply I explore are from the market of CDOs. CDOs are claims on cash flows of collateral assets, which can be a pool of bank loans, corporate bonds, or structured products. CDOs backed by bank loans, or collateralized loan obligations (CLOs), in particular, supply capital to LBOs by holding LBO loans in the collateral pools. Several reasons support that the CDO market creates additional supply of credit to LBOs. First, this technology creates a broader base of investors of bank loans, which include not only banks but also hedge funds, insurance companies, pension funds, and others, because it allows these investors to diversify by holding a pool of assets and to choose to invest in tranches with the seniority suitable for their risk preferences. Second, banks have an incentive to lend more because they are less constrained by their balance sheet when they can sell the loans in CLOs, and they may profit from underwriting CLOs backed by these loans. Third, since this technology makes it possible to issue investment-grade securities backed by a pool of assets with much lower ratings, it breaks market segmentation and brings investment-grade capital to leveraged loans. In fact, CDO issues exploded during the same period as the recent LBO boom. The total issuance amount was $1.3 trillion from 2004 to 2007, doubling the amount in the eight years before 2004 (Fig. 2), but dropped in the second half of 2007.

While the explosion in CDOs and LBOs at around the same time is consistent with the credit supply hypothesis, it does not show the causal direction proposed in this hypothesis. To disentangle the causality, I use two strategies. The first strategy is to employ instruments that are

correlated with the credit supply from the CDO market but unlikely to be affected by the demand for LBOs. My first set of instruments concerns the types of CDOs not likely to be affected by LBOs. For example, I separate CLOs and collateralized bond obligations (CBOs) from other types of CDOs, and use the other types of CDOs, referred to as non-CLO CDOs, as an instrument. Non-CLO CDOs include mainly structured product CDOs. Backed by securitized assets,[2] structured product CDOs are not likely to be affected by the demand for LBOs because LBOs do not generally produce more securitized assets to support these issues. My second set of instruments exploits the more traditional forms of securitization, e.g., mortgage-backed securities (MBS) and asset-backed securities (ABS). The collateral assets of MBS and ABS mainly include residential mortgages, home-equity loans, credit card loans, auto loans, and student loans. These assets are not likely to be driven by LBOs. Yet, as ancestors of CDOs, these two markets are highly correlated with the CDO market.

Provided that the instruments do not fluctuate with the demand for LBOs, positive correlations between them and the LBO volume would discriminate the credit supply hypothesis from the alternative based on reverse causality. This alternative argues that an increase in demand for LBOs led banks to lend more to LBOs, and banks then sold excessive holdings of these loans in CLOs, contributing to the CDO expansion. Consistent with the credit supply hypothesis but not the alternative, I find that the LBO volume is highly correlated with the instruments (correlation 0.57 to 0.95) during the sample period from 1996 to the first half of 2008. This correlation remains (partial correlation 0.36 and 0.62) controlling for prices of risks, and other variables related to the demand for LBOs or other sources of credit supply.

The second strategy of identification at the aggregate level is to examine the correlation between the changes in credit price and changes in the aggregate amount of LBO loans. In an equilibrium determined by supply and demand curves with usual shapes, a positive demand shock

[2] Such assets include residential mortgage-backed securities, commercial mortgage-backed securities, collateralized mortgage obligations, asset-backed securities, and other securitized assets, even other CDOs.

should drive up both price and quantity, leading to a positive correlation between the changes in price and quantity. However, a positive supply shock should depress price while driving up quantity, generating a negative correlation between the changes in price and quantity. Given the increase in the amount of LBO loans, a negative (positive) correlation between the changes in credit spreads and changes in the amount of loans would indicate a dominating shock in credit supply (demand). Supporting a shock in credit supply but not demand in the LBO loan market, I find a significant and negative correlation between the changes in the amount of loans and changes in the spreads of the tranches in which CLO vehicles invest.

After showing the evidence at the aggregate level, I then investigate the implications of the credit supply hypothesis on banks and their lending decisions. The hypothesis indicates that the credit from CDOs fueled the LBO market by encouraging banks to finance more deals. I examine three effects of the CDO capital on banks' LBO lending: the total amount of lending, the financing of loan commitments, and the contractual terms of these loans. Banks access the capital from CDO investors by underwriting CDOs. Large CDO underwriters are able to refinance the loans they originate by selling the loans in CLOs both for themselves and for other syndicate members. This better access to the CDO capital allows them to easily finance their loan commitments in the syndicated loan market. In addition, large CDO underwriters have more incentive to originate more loans to serve as collateral to support their current or future CDO underwriting. Hence, the credit supply hypothesis predicts a positive effect of a bank's CDO underwriting on its LBO lending. To test this prediction, I first show that the top ten lead banks of the LBO loans since 2004 were all top CDO underwriters. Then, in a bank fixed-effects model, I show a positive within-bank correlation between a bank's LBO lending and its access to the CDO capital measured with the instruments. Specifically, in the year when a bank underwrites more non-CLO CDOs, it also originates a larger amount of loans to finance LBOs. This result is robust to all instruments and controls including bank fixed effects, bank characteristics, and macro variables. As the instruments do not vary with the demand for LBOs, this result suggests that

banks' access to the credit from CDO investors through underwriting has a causal effect on their LBO lending, strongly supporting the credit supply hypothesis.

The second effect I examine is how these LBO loans were financed in the syndicated loan market. The credit supply hypothesis predicts that CLO vehicles financed a substantial part of these loans. Although my data on LBO loans does not identify the allocation to CLO vehicles, the tranche structure of the loans indicates the allocation to all institutional investors, among which CLO vehicles were the primary investor and have become more important over time. Thus, the hypothesis predicts a large fraction of institutional tranches in the loans driven by the CDO capital. Indeed, I find that institutional investors in post-2004 loans financed an additional 16% (median 30%) of the loan amounts, compared to the pre-2004 loans. Also, a lead bank's CDO underwriting has a positive effect on the fraction of institutional tranches. The result suggests that better access to CDO investors allowed banks to exploit more capital from this market to finance their loan commitments. It shows the direct link between the CDO credit and the LBO loans and helps to differentiate the hypothesis from alternatives based on omitted variables, which preclude any direct impacts between the CDO market and the LBO market.

The third effect is on loan contractual terms. I show that banks with relatively large CDO underwriting business offered cheaper credit at looser covenants to LBOs and supported more aggressive use of bank loans in financing these deals. Specifically, in response to a one standard deviation increase in the relative CDO underwriting size of the lead bank, the loan spread decreases by 15 to 23 basis points, the probability of having a covenant-lite tranche increases by 14% to 20%, and the total amount of non-contingent bank loans (e.g., non-revolvers) in the capital structure of the LBO deal increases by the amount equal to 70% of the EBIT of the target firm. In covenant-lite loans, which do not have the maintenance covenant that requires borrowers to maintain certain financial ratios at certain levels on a quarterly basis, lenders abandon the right to detect and act in response to financial deteriorations of borrowers. Hence, covenant-lite loans are much less restrictive on borrowers than traditional bank loans. The presence of this extremely

light covenant, in combination with the lower prices and the better access to credit for borrowers, suggests that banks are more than willing to provide credit when they have a relatively large CDO underwriting business. These results imply a buyers' market of LBO loans and lend more support for the direct impact of the CDO capital on banks' LBO lending.

In addition to supporting the credit supply hypothesis, the three effects on banks' lending decisions also illustrate a structured lending model in which banks fund their lending from structured credit, such as CDOs, instead of deposits. Specifically, after originating loans, instead of holding them on their balance sheet, banks refinance them from CDO investors. This lending model fundamentally changes banks' special role in information production, monitoring, and enforcing contracts (Diamond (1984, 1991), Rajan (1992)), because the key incentive for them to monitor is that they bear the costs of risk-shifting of borrowers (Jensen and Meckling (1976)). However, as the funding function is outsourced to the capital market in the structured lending, banks do not bear the costs, and hence, their incentives to monitor are largely reduced (Pennacchi (1988), Gorton and Pennacchi (1995)). Moreover, CDO investors also lack the incentive to monitor, because they are diversified by holding only one piece of each loan in the collateral pool. This view is consistent with the instance of covenant-lite loans.[3] In addition, the results suggest that this lending model support cheaper credit and better access to credit for borrowers. These findings point to the effects of disintermediation of banks as they switch from an originate-and-hold to an originate-and-distribute model.

Did the easy credit lead to bad LBO deals, those that were riskier or overpriced? I find that the target firms in the CDO-driven deals, deals financed by lead banks with relatively large CDO underwriting business, generate more free cash flows, pay more taxes, and are less risky. They are good LBO candidates by conventional measures, in sharp contrast to the deals in the late 1980s. These firms tend to be much larger. The average transaction value of the CDO-driven

[3] Covenants can be used to reduce risk-shifting and moral hazard problems in credit financing, according to Dewatripont and Tirole (1994), Chava and Roberts (2008), and Roberts and Sufi (2008).

deals is four times that of the non-CDO-driven deals. In fact, nine of the ten largest LBOs were announced during 2006 and 2007. It is possible that the new source of credit relaxed financing constraints on large LBOs and allowed the technology of LBOs on large firms.

Even if the target firms are not risky, deals can still be structured in a risky way by taking more debt and less equity. My analysis shows that while the CDO-driven deals borrowed more from banks, the equity contributions were not reduced. In fact, these deals seem to arrange more financing than they need to complete the deal. The extra financing may give more flexibility and reduce the probability of financial distress. In terms of pricing, there is no evidence suggesting overpayment in the CDO-driven deals. Overall, I do not find evidence that the easy credit from the CDO market led to riskier LBO deals. This result also seems to suggest that banks screened borrowers well when originating these loans even if they would sell the loans in CLOs.

This paper contributes to several areas of research. First, it adds to a growing body of research on the effect of credit supply on firms' financing and investment decisions, including Faulkender and Petersen (2006), Sufi (2007b), Leary (2005), and Lemmon and Roberts (2008).[4] Instead of looking at leverage and investment of publicly traded firms, this paper focuses on LBOs, the extreme use of leverage. My findings provide strong evidence that firms and private equity sponsors took advantage of the easy credit from the CDO market by borrowing debt to substitute for public equity. The resulting explosion in the LBO volume suggests that the effect of supply-side factors can be substantial.

Second, this paper expands the literature on LBOs. The findings highlight the importance of the supply-side factors in highly levered transactions. The most closely related paper is Kaplan and Stein (1993). They show that the LBO market in the late 1980s was overheated and argue that the capital from junk bond investors might have led to the overheating. In this paper, I identify the new source of credit from CDO investors. The CDO market allows me to directly test the causal effect. Another difference is that I focus on the recent LBO boom. The private equity

[4] Also related is Mian and Sufi (2008), which focuses on the subprime mortgage market.

industry of today differs greatly from that of the late 1980s (Kaplan and Stromberg 2008). My finding that the cheap credit did not lead to riskier deals in this boom highlights the difference between the two booms. The analysis also sheds some light on the pricing and structure of LBO loans. Both Demiroglu and James (2007) and Ivashina and Kovner (2008) look at LBO loans in the recent boom, but they focus on the reputation of private equity groups and their relationship with lenders. Other studies on the recent LBOs include Acharya and Johnson (2008), Axelson et al. (2008), Boone and Mulherin (2008), Guo et al. (2007), and Officer et al. (2008).

Third, my findings are related to the literature on loan sales. Recent papers include Drucker and Puri (2007), Parlour and Plantin (2008), Guner (2006), Gande and Saunders (2006).[5] However, the structured lending supported by CDOs is different from loan sales among banks and institutions. First, by pooling and tranching, the CDO technology reduces market friction and, hence, introduces a much broader base of non-bank investors to bank loans. Second, buyers in the loan sales market have the incentive and expertise to monitor borrowers since they bear the costs of risk-shifting. In contrast, CDO investors, well diversified by holding only one piece of each loan in collateral pools, lack the incentive or expertise to monitor. Thus, the structured lending leads to more fundamental changes in banks' role as the information producer, resulting in massive LBO lending and the light covenants.

The remainder of the paper proceeds as follows. Section I introduces the background information on CDOs and leveraged loans. Section II describes the sample and the data. Section III discusses the identification problem in testing the credit supply hypothesis and outlines the empirical strategies to deal with it. The results of the tests are presented in Section IV. Section V examines the efficiency implications of the new source of credit on the recent LBO market. Section VI concludes.

[5] Loutskina and Strahan (2008) show the effect of mortgage securitization on banks' loan supply.

II. Background: Collateralized Debt Obligations and Leveraged Loans

A. Collateralized Debt Obligations

Collateralized debt obligations (CDOs) refer to a series of notes issued by a special-purpose vehicle and collateralized on a portfolio of securities or claims that the vehicle acquires. The special-purpose vehicle is often referred to as the CDO vehicle. For a CDO vehicle, the CDOs, the issued notes, are its liability, while the securities it acquires to back the issue are its assets. Based on underlying assets, CDOs can be categorized into collateralized loan obligations (CLOs), collateralized bond obligations (CBOs), structured product CDOs, and others.[6] The liability of CDO vehicles is structured into tranches with differing levels of seniority. Equity tranches absorb the first loss, followed by mezzanine tranches, and then, senior tranches. The capital structure is roughly 10% equity, 20% mezzanine, and 70% senior tranches and can vary depending on the collateral assets.[7] Senior tranches are commonly rated at investment-grade with the majority at AAA, even if the collateral assets are rated much lower. Fitch Ratings (2007) shows that almost 60% of the structured finance they rate are at AAA. This is made possible with techniques such as over-collateral, credit enhancements, or liquidity enhancements.[8]

The CDO technology combines diversification in designing collateral pool and security tailoring in structuring tranches, attracting a broad base of investors, including banks, hedge funds, insurance companies, pension funds, and asset managers. Asset managers manage the

[6] In Cash CDO issues, the vehicle acquire the underlying assets, while in synthetic CDO issues, the CDO vehicle may not acquire the assets but only the risk associated with them in the form of credit default swaps.

[7] For example, CLOs have only 60% senior tranches while high-grade structured product CDOs have about 80% senior tranches, according to Citi (2007).

[8] See Coval et al. (2008b) for detailed discussion on how the high ratings could be achieved given the much riskier collateral assets in CDOs and what went wrong in the CDO market recently.

portfolio of CDO vehicles and receive fees. It is common for the asset manager of an issuing vehicle to hold the equity tranche to reduce agency problems between the manager and investors.[9] Hedge funds are also large buyers of equity, although they invest in other tranches as well. Insurance companies take mezzanine tranches more often. Banks are the major investors in senior tranches. With very high ratings, these tranches bear low required capital on banks' balance sheets under the risk-based capital standard. All these investors invest in CLOs. For example, about 50% of the CDOs insurance companies invested in were CLOs, according to Citi (2007). CLO vehicles hold primarily leveraged loans. According to the Securities Industry and Financial Markets Association (SIFMA), all the CLOs issued between 2005 and 2007 were backed by leveraged loans. These CLOs introduces a wide range of investors to the leveraged loan market.

Based on motivation of issues, CDOs can be classified into two types. Balance sheet CDOs are issued to remove assets (or the risk of assets) from the balance sheet of the seller, while arbitrage CDOs are issued in an attempt to capture any mismatch between the yield of CDO collateral and the financing cost of CDO tranches. Since issuers of balance sheet CDOs already hold the collateral assets at the issue, these issues do not create additional demand for underlying assets. In contrast, in arbitrage CDOs, issuers typically do not have the underlying assets and have to purchase them from the market place. Thus, arbitrage CDOs, particularly arbitrage CLOs, create additional demand for leveraged loans (i.e., additional credit supply to leveraged borrowers). According to SIFMA, 87% of CDO issues during 2004 and 2007 were for arbitrage purpose. The existence and popularity of arbitrage CDOs support the causal interpretation of the credit supply hypothesis that the CDO market creates additional credit supply. Moreover, CDO vehicles not only purchase collateral assets at the issues, but also before and after. According to Barclay (2002), the purchase of assets can be done in multiple stages, starting before the issue and

[9] Asset managers make important decisions that could hurt the interest of the CDO investors, introducing agency problems. Garrison (2005) shows that keeping the equity tranche is more efficient than other contracts based on debt and fees in solving the agency problem between CDO managers and CDO investors in a model. Franke and Herrmann (2007) show empirically that lower collateral quality induces a manager to keep more as equity tranches.

continuing up to six months after. In addition, in the following three to five years, cash flows from principal repayments resulting from amortization, maturity, prepayment or asset sales are usually reinvested, generating continual demand for collateral, including LBO loans.

The CDO market has a long history, but only became important in recent years. The first CDO was issued in 1987, but the market remained very small until 1996 (Kothari (2006)). From 1998 to 2003, the CDO issuance amount remained stable at about $80 billion per year. It started to grow substantially in 2004, when a total value of $127 billion CDOs was issued. This amount quadrupled in only two years (Fig. 2). The annual growth in 2004, 2005, and 2006 was 61%, 100%, and 90%, respectively.

Various reasons can be cited for the dramatic expansion of this market. Among these, a key driver was the change in incentives of banks in securitization resulting from the new regulation of the Basel II Accord, first published in June 2004.[10] This regulation was intended to reflect the risk of assets on banks' balance sheets and discourage regulatory arbitrage under Basel I (1988 Accord)[11] by assigning high-rated assets low weights and low-rated assets high weights in calculating required capital. However, this requirement may have inevitably encouraged banks to remove risky assets and transform them to high-rated assets, which require low capital. CDOs are the technology that allows them to do this. With the CDO market, banks, on one hand, sell risky assets with high capital requirement, such as leveraged loans, to CDO investors. On the other hand, they invest in senior CDO tranches, as the required capital is very low for this type of high-rated assets.[12] The incentive for banks to hold senior tranches is important for the expansion of

[10] The Basel II has not been widely implemented in U.S., but JP Morgan (2007) suggests that its implementation is clearly anticipated in market prices.

[11] The Basel I treats bank assets without regarding the risk in calculating capital requirements. This gives banks incentives to securitize their high quality assets while keeping risky assets on their balance sheet, since risky assets earn higher expected returns. Basel II was designed, to a large extent, to prevent the resulting increase in risk in the banking system produced by this regulatory arbitrage.

[12] According to JP Morgan (2007), the weight on AAA investment in securitized assets is only 7%. Given 8% capital requirement, the investment in this type of securities allows banks to put only 0.56% (7%*8%) of capital, an implicit leverage of 178 times (1/0.56%).

CDOs because other major CDO investors (e.g., hedge funds and insurance companies) are more interested in junior tranches. Banks' incentives to take senior tranches, the majority of most CDO issues, are crucial for the market to grow. The coincidence of the CDO market take-off and the publication of the Basel II is consistent with this view. Also, Giaccherini and Pepe (2008) argue that a rating-based approach in calculating capital requirement does not fully cover the economic risk of CDO tranches held on banks' balance sheets. The authors note that "it should be questioned whether the Basel II mapping from ratings to capital is the right choice or it is encouraging new forms of arbitrage" (p.20).

A collapse of the CDO market followed in the summer of 2007, triggered by problems in subprime mortgages. The overall CDO issuance has shrunk substantially since then. While the market for structured-product CDOs virtually disappeared in 2008, CLOs continued to exist, though they experienced a decline of 70% in the first half of 2008 from a year earlier. Fig. 4 plots the spreads of AAA-rated tranches of CDOs collateralized on high-yield loans, high-grade and mezzanine structured products, respectively. The spread on the highest-rated CDO tranches backed by mezzanine structured products experienced an astonishing surge, from about 30 basis points in early 2007 to about 1,450 basis points in April 2008. However, the spread on the same rated CDOs backed by high-yield loans only increased to 175 basis points. Both the changes in issuance amounts and spreads suggest that the current trouble in the CDO market is in structured product CDOs. CLOs are hit mainly due to the increased risk aversion and the loss of confidence in the CDO market.[13] Overall, both the rise and fall of the CDO market appear to be driven by exogenous factors with respect to the LBO market.

[13] Coval et al. (2008b) suggests that the reason for the dramatic rise and fall of the CDO market is that pooling and tranching amplifies mistakes in the assessment of underlying default risks. Structured product CDOs, as the second time pooling and tranching, are even more sensitive to the mistakes in estimating parameters, such as the delinquency rate of subprime mortgages.

B. Leveraged Loans

Leveraged loans, or high-yield loans, are bank loans issued to borrowers with speculative-grade ratings. Many of the large leveraged loans, particularly LBO loans, are syndicated.[14] The volume of syndicated leveraged loans has more than tripled from $217.9 billion in 2001 to $688.5 billion in 2007, for the first time exceeding the volume of syndicated investment-grade loans. In the syndicated loan market, investors can be classified into pro rata investors and institutional investors. According to S&P (2006), banks (commercial banks or savings and loan institutions) and finance companies are pro rata investors and typically invest in pro rata tranches, which include revolver and term loan A (or amortizing term loan). Institutional investors include CLO vehicles, prime funds, hedge funds, insurance companies, and others. They invest in institutional tranches, which include term loan B, C, and D. These term loans are bullet payments and lined up in order behind term loan A. Thus, institutional tranches should be priced with higher spreads than pro rata tranches.[15] In my analysis, since CLO vehicles are institutional investors, I focus on prices of institutional tranches, usually measured with spreads on term loan B, the most common institutional tranche.

Institutional investors have become increasingly important in the syndicated loan market. According to Loan Pricing Corporation (LPC), the share of institutional tranche (term loan B only) in syndicated loans has increased from 30% in 1996 to 43% in 2001, and 75% in 2007. This increasing share of institutional investors is squeezing out term loan A. Recent deals are more commonly structured as only revolver and term loan B. In the institutional market, CLO vehicles are one of the major investors, taking 60% of primary activities by institutional investors by 2006, according to S&P (2006). This increasing share of CLO vehicles among institutional investors, combined with the expansion of the institutional market and the fast growth of leveraged loans in

[14] For details in syndication process, refer to Sufi (2007a).

[15] After 2001, spreads on a growing percentage of institutional tranches are priced close to pro rata tranches, in some cases even lower, according to S&P (2006), which attributes this to higher demand from institutional investors.

the past few years, implies that a substantial part of the credit financing leveraged loans come from CLO vehicles, lending support for the special role of CLOs in driving the LBO boom.

A more recent phenomenon in the leveraged loan market is covenant-lite loans. According to S&P's Leveraged Commentary & Data (LCD) (2007), the outstanding covenant-lite loans accounted for less than 1% in leveraged loans before 2005, increased to almost 5% in 2006, and jumped to 18% in the first half of 2007. These loans do not have the traditional maintenance covenants, which require borrowers to keep financial ratios at certain levels in every quarter. As a key protection for lenders, maintenance covenant assigns creditors the rights to take actions when borrowers' financial conditions deteriorate. Without this covenant, lenders would rely solely on incurrence covenant, which is breeched only when an action (e.g., paying a dividend, issuing more debt, or making an acquisition) triggers the failure to meet certain financial requirements. Hence, covenant-lite loans are much less stringent on borrowers than traditional bank loans. S&P (2006) notes that covenant-lite loans "thrive only in the hottest markets when the supply/demand equation is tilted persuasively in favor of issuers". Its fast growth toward the end of my sample is consistent with a dominating supply shift in the leveraged loan market.

III. Data and Sample Description

A. The LBO Sample

The sample of LBO deals, taken from SDC Platinum, consists of 345 deals satisfying the following criteria: 1) The deal is a leveraged buyout announced during the period of 1996 to the second quarter of 2008, and completed by July 28, 2008; 2) the target is a U.S. company and publicly traded; 3) the transaction value is greater than $10 million; and 4) at least 50% of common shares are acquired, and the acquirers own 100% after the deal. Note that the minimum deal value of $10 million is smaller than that in some other studies, such as Kaplan (1989b) and Guo et al. (2007). This small cutoff value is chosen to avoid a selection bias against the periods in which small deals are more common, for example, the late 1990s. The exclusion of small deals may lead to an underestimate of the LBO volume during that period.

Fig. 1 shows the distribution of LBO deals in each quarter over the sample period, in terms of both the total deal value and number of deals. A deal is counted in the quarter when it is announced. Total value of LBO deals, i.e., LBO volume, is the aggregate transaction value of all sample deals announced in each quarter. The most striking pattern of the figure is the boom from 2004 to 2007. In fact, the quarterly volume never surpassed $5 billion until the second quarter of 2004, in which $5.6 billion of deals were announced. It then started to pick up, though not monotonically, and reached $20 billion in the last quarter of 2005. Only one year later, this number became $106 billion in the fourth quarter of 2006, contributing to the total annual volume of $255 billion in 2006, the biggest year ever. Interestingly, the market abruptly pulled back to $32 billion in the third quarter of 2007 and dropped back to below $5 billion in the first quarter of

2008. The number of deals also increased during the boom period but much less dramatically. The late 1990s saw quite a few deals, but these tended to be small.

Based on the 345 deals, I construct an LBO bank loan sample, combining LPC's DealScan and manually collected loan information from proxy filings. First, the LBO target firms are matched with LBO/MBO loans from DealScan to obtain information on tranche types and amounts, lead arrangers, spreads, maturity, and other terms. This information is recorded at the tranche level. Bridge loans are deleted as my analysis focuses on long-term financing. This constitutes the DealScan loan sample. I then manually check proxy filings, including schedule 14A, TO-T, S-4 and 13E3, for information on deal financing for all sample deals when these filings are available in Edgar. For deals not in the DealScan sample, I collect information on lead banks, tranches types, amounts, spreads, and maturity whenever available. For deals already in DealScan, I check with information in proxy filings and delete tranches that can be identified as asset-backed financing.[16] These loans are excluded to avoid any bias resulting from securitized financing other than CDOs, as the hypothesis focuses on CDOs as the source of credit. Other DealScan observations are supplemented with information from proxy filings whenever possible.[17]

The LBO loan sample consists of 275 loans financing 241 (70%) deals, for which lead arrangers or borrowing amounts are available. Among these loans, 210 (76%) are from DealScan, and the rest are identified from proxy filings. I lost 30% of the sample deals in the loan sample for several reasons. First, many small deals do not arrange bank loans to specifically finance the deals. These deals are typically financed with cash in hand, mezzanine finance, or equity. Second, some deals are not conditioned on the availability of financing, and thus little disclosure on the

[16] For example, the loans financing the buyout of UICI, La Quinta, and Station Casinos are commercial mortgage-backed financing according to their proxy filings, but are included in DealScan as "other loan" tranches.

[17] When DealScan and proxy filings give different information, I stick with that in DealScan, as terms specified in proxy filings can be adjusted after the filing and hence may not be final.

relevant terms in proxy. Third, as discussed earlier, a few loans classified as asset-backed are excluded. Finally, a few firms cannot be found in Edgar, or no filings are available around the time of the deal. After constructing the loan sample, I use the list of covenant-lite LBO loans provided by S&P's LCD to identify covenant-lite tranches for each loan.

Fig. 3 shows the total amounts of bank loans in each quarter. The loans are allocated to the quarter in which the LBO deal is announced, not when the loan is effective.[18] The amount of bank loans reflects the pattern of the total LBO transaction value, with heavy volume during the period from the second quarter of 2004 to the first half of 2007. But during the boom, loans are distributed slightly differently. Total bank borrowing reached its peak in the second quarter of 2007, while the LBO volume reached its high at the end of 2006. This is because the loan sample excludes the commercial mortgage financing for a few large deals announced in the fourth quarter of 2006, including the $40.7 billion deal of Equity Office Properties, and the $27.9 billion deal of Harrah's Entertainment. On average, the total amount of bank loans accounted for 53% of the LBO volume during the sample period.

In addition to bank loans, I also identify the complete structure of financing for 235 (68.1%) of the sample deals. I collect the financing information mainly by reading the section on the source of funds or deal financing in proxy filings, supplemented with SDC's junk bond issuance data. Specifically, I record the total fund needed to complete the deal,[19] and the amounts of total equity financing including from rollover investors, asset-backed financing, junk bonds/notes, and mezzanine finance when available. The amounts of bank financing are from the bank loan sample. When a deal cannot be matched with a bank loan in the loan sample, and the proxy filings indicate no bank financing, the amount of bank financing is zero. Bridge loans or other

[18] This makes it easier to compare to LBO volume which is calculated at the announcement date, and also often the loan contract is largely determined at the announcement, although the final terms may change later.

[19] It includes cash to pay off equity holders and option or warrant holders, retire existing debt, and pay fees and expenses related to the deal. Most of the firms state the amount in their proxy filings, or list the items separately.

bridge financing are recorded as junk bond/note and mezzanine finance. The amount of junk bond issues is then supplemented by bond issuance data in SDC for 40 deals, in which the hand collected amount is different from the proceeds recorded in SDC. Equity contributions and asset-backed financing are solely from proxy filings. Deals with incomplete financing structure are then deleted, yielding the complete financing structure sample of 235 deals.

B. Data for CDO and Other Securitized Issues

The data for CDO and other securitized issues are from the ABS Database kindly provided by Asset-Backed Alert.[20] The ABS Database presents the initial terms of all rated issues of ABS, MBS, and CDO placed worldwide.[21] For each issue, the database records the date, collateral, and dollar amounts. Since the main objective of the database is to identify the primary participants, it also records detailed information on participants, e.g., names of the issuer, underwriter, sponsor, servicer, and trustee. The database covers 25,072 issues of MBS, ABS, or CDO, since 1985, the start of the coverage, up to the second quarter of 2008. While it covers MBS and ABS since 1985, the coverage of CDO issues begins in the middle of 1995. Therefore, I begin my sample in 1996 to avoid incomplete data in 1995. From 1996 to the second quarter of 2008, 4,449 CDOs, at a total value of $1,928 billion, were issued.

Fig. 2 shows the total value of CDOs issued in each quarter during the sample period. The CDO market exploded during the same period as the LBO boom. The average quarterly CDO issuance amount from 1996 to 2003 was $19 billion, and was doubled in the third quarter of 2004, right after the Basel II Accord was published. The annual issuance amount then doubled in the two years after 2004. The market started to shrink significantly in the third quarter of 2007, when problems of subprime mortgages began to surface. Overall, Fig. 1 and Fig. 2 suggest a very

[20] I am very grateful to Asset-Backed Alert for sharing the data and updating my sample with recent deals. For more information about the database, refer to their website at www.abalert.com.

[21] To be included in the ABS database, an issue must be rated by at least one major rating agency, under control of a trustee, and collateralized on some assets. It excludes commercial mortgage-backed issues, agency sponsored MBS, issues by municipalities, tax-exempt issues, and asset-backed commercial paper issues.

close correlation between the LBO market and the CDO market. In fact, the correlation of the LBO volume and CDO issuance amounts is 0.94.

Table 1 describes the issues of CDOs and other securitized assets based on collateral for pre-2004 (1996 to 2003) and post-2004 (2004 to the first half of 2008), separately. Panel A describes the types of collateral for CDO issues. The ABS Database starts to record collateral for all CDO issues after 2001. Before that, only balance-sheet CLOs are flagged. Hence, I break the pre-2004 period into 1996 to 2000, and 2001 to 2003, to better describe the data. The majority of CDO issues are backed by three types of collateral: structured products, corporate loans, and corporate bonds. Different types of CDOs have grown at different paces. While the market of CBOs has shrunk, both structured products CDOs and CLOs have expanded substantially since 2004. Structured product CDOs increased nine times from $64 billion during 2001 and 2003 to $556 billion over the four and half years since 2004. During the same period, CLO issues also increased almost six times from $89 billion to $507 billion. In contrast, CBOs on high-yield bonds decreased from $24 billion to $13 billion. This indicates that the capital supply in the junk bond market was not affected much by the expansion of CDOs and, hence, cannot be the channel through which CDOs affect LBO financing. Second, the fast growth of CLOs was primarily driven by arbitrage CLOs. Balance-sheet CLOs seem to be common before 2000, but shrank after. In contrast, arbitrage CLOs became more important and exploded after 2004. Since arbitrage CLOs create additional supply of credit, the fact that the growth of CLOs was driven exclusively by arbitrage issues further suggests that the expansion of CLOs since 2004 created additional supply of credit to bank borrowers.

Panel B of Table 2 presents CDO issues together with other securitized issues. The total securitized issues increased from $4.76 trillion over an eight-year period before 2004 to $8.07 trillion over the four and half years after. CDOs become more common after 2004, accounting for 16% of the total market. Although the U.S. MBS expanded in market share over time, the U.S. ABS has grown at a much slower pace, leading to a loss of 13.3% in market share after 2004.

This indicates that ABS is less correlated with CDOs than is MBS, suggesting that it is a weaker instrument than MBS.

IV. Identification and Empirical Strategies

The credit supply hypothesis posits a causal effect of the expansion of CDOs on the recent LBO boom. Although the tight correlation between the two markets is consistent with this hypothesis, an alternative promoting reverse causality can also explain the correlation. The alternative suggests that the demand for LBOs increased for some reasons unrelated to the CDO market. To accommodate this increased demand, banks lend more to finance LBO deals, resulting in large exposure to leveraged loans. To reduce the exposure, banks pool the excess holdings of these loans and sell them to CDO investors. In other words, banks sell CDOs in order to remove excess holdings of leveraged loans *ex post*. The possibility of selling loans later in CDOs does not affect their decision in making loans to LBOs *ax ante*, i.e., they would lend the same amount to LBOs without the CDO market. Therefore, the exogenous shock to LBO demand in effect causes the explosion of CDOs, not the other way around. To disentangle the credit supply hypothesis from this alternative, I employ several strategies.

A. Relation of Changes in Prices and Quantities

The first strategy looks into the correlation of changes in prices and quantities to distinguish a supply shift from a demand shift in the market of LBO loans. In a market with a usual demand curve (downward slope) and supply curve (upward slope), a positive shift in the demand curve leads to a higher quantity and higher price in equilibrium, generating a positive correlation between the changes of prices and quantities. However, a positive shift in the supply curve leads to a higher quantity but lower price in equilibrium, resulting in a negative correlation between the changes of prices and quantities. Katz and Murphy (1992) formally develop this argument in the labor market and use it to identify demand shifts for educated labor in explaining changes in

relative wages during the 1970s and 1980s. Cohen et al. (2007) use price-quantity pairs to identify supply from demand shifts in the short-selling market. Dastidar (2008) examines the correlation of mortgage bond spreads and issuance volume to identify the effect of supply of assets.

In the market of LBO loans, the amount and average spread of the loans can be viewed as the equilibrium quantity and price determined by the supply and demand of LBO loans. Given the increase in the amount of LBO loans during the boom, the correlation of the changes in the amount of LBO loans and changes in credit spreads can be used to discriminate a supply shift, as implied in the credit supply hypothesis, from a demand shift, suggested in the reverse causality argument. The credit supply hypothesis predicts a negative correlation, while the alternative predicts a positive correlation. Although this analysis can be used to establish the relevance of supply shift, it does not identify the source of the supply shock. The instrumental variable approach next examines CDOs as an important incremental source of supply.

B. Instruments for the Credit Supply from the CDO Market

The alternative based on reverse causality suggests that the large exposure to LBO loans resulting from an increased demand for LBOs led banks to sell the loans in CLOs. This alternative predicts a positive correlation of the LBO volume to CLOs, but not to other types of CDOs. In contrast, the credit supply hypothesis predicts a positive correlation between LBOs and other types of CDOs, such as structured product CDOs. This is because a large market of structured product CDOs implies a large supply of credit from CDO investors. In other words, CLOs are correlated with other types of CDOs because they share the same investor base, or source of capital, but not the same source of demand. Hence, an increase in the other types of CDOs indicates a shift in supply of credit to LBOs but not in demand for it. As discussed in Angrist et al. (2000), the key to distinguish supply from demand shift is to construct instruments

that are correlated with supply but not demand. Therefore, I construct instrumental variables using various types of CDOs that are not likely to be affected by the demand for LBOs.

The first instrument excludes all CLOs and CBOs from CDO issues, which I refer to as *CDO Excluding CLO and CBO*. I exclude CBOs because the collateral in the issues (e.g., junk bonds) can potentially finance LBOs. But for issues before 2000, only balance-sheet CLOs are excluded, because the ABS Database does not identify other CLO issues (e.g., arbitrage CLOs) or CBO issues. Potential bias resulting from this should be minor, because the major fluctuation in LBO volume came after 2000, and because balance-sheet CLOs were a large part of the CDO market before 2000, accounting for 34.36% of all CDOs. This first instrument includes mainly structured product CDOs, CDOs backed on CMBS/Real Estate, and others.

The second instrument looks into the motivation behind CLO issues. Recall that CLOs issued for the purpose of removing collateral from the issuers' balance sheet are balance-sheet CLOs. This is the motivation for issuing CLOs indicated in the reverse causality. However, arbitrage CLOs are issued to take arbitrage profits but not to reduce sellers' exposures to loans. Thus, balance sheet CLOs are the type of CLOs directly driven by the demand for LBOs. Therefore, my second instrument excludes balance sheet CLOs from all CDO issues and is referred to as *CDO Excluding Balance-Sheet CLO*. It adds arbitrage CLOs and CBOs on top of the first instrument. Already small, the CBO market shrank during the LBO boom. This low correlation between CBOs and the LBO market suggests that including CBOs in the instrument should not introduce any effect of the demand for LBOs. But it allows me to construct a consistent measure, because the ABS database does not identify CBOs issues before 2000.

The last two instruments go beyond the CDO market and are based on the more traditional forms of securitization, i.e., MBS and ABS. The collateral assets in these issues mainly include residential mortgages, home-equity loans, auto loans, credit card loans, and student loans. Since LBOs do not create these types of consumer credit, it is unlikely that MBS or ABS are affected by demand for LBOs. Yet as ancestors of CDOs, the market of MBS and ABS are correlated with

the CDO market. Therefore, I construct the third instrument denoted as *MBS*, including all U.S. issued MBS, and the fourth instrument *ABS*, including all U.S. issued ABS.

C. Bank Fixed-Effects Regressions

The credit supply hypothesis suggests that the credit supply from CDOs encouraged banks to lend more aggressively to LBOs, leading to the LBO boom. Specifically, in a sizable CDO market, banks can finance a large part of their loan commitments from CLO vehicles. Moreover, they can remove or sell their own shares of the loans to CLO vehicles of their own or others. To refinance the loans, these vehicles then issue CLOs, of which the banks may serve as underwriters. In this lending model supported by the CDO market, banks profit not only from upfront fees in the syndicated loan market, but also from underwriting fees in the CDO market. Furthermore, they do not bear much of the risk or required capital after refinancing the loans. All these benefits from CDOs encourage banks to lend more to LBOs. This incentive model predicts a positive effect of banks' CDO underwriting on their LBO lending for two reasons. First, underwriting banks have better access to the capital from CDO investors and, hence, are more able to fund their loans. Second, large CDO underwriters have the incentive to create more loans as inputs for their CDO factories to generate more underwriting fees.

To test the positive effect of banks' CDO underwriting on their LBO lending, I construct a bank panel dataset to test the following bank fixed-effects model:

$$LBOLending_{it} = \sum_{i=1}^{K} \alpha_i + \beta * CDO_{it} + \gamma' * X_{it} + \delta' * Z_t + \varepsilon_{it} \quad (1)$$

where $LBOLending_{it}$ is the total amount of LBO loans bank *i* arranges in year *t*, α_i is the bank fixed effect, X_{it} and Z_t are proxies for bank characteristics and macroeconomic conditions, respectively, CDO_{it} is the underwriting amount of CDOs for bank *i* in year *t*. I also use the instrumental variables to proxy for CDO_{it}. The credit supply hypothesis predicts that $\beta > 0$. Given that the instruments do not vary with the LBO demand, a positive β distinguishes the credit supply hypothesis from the reverse causality.

Moreover, this model also controls to a large extent for omitted variables. Alternatives based on omitted variables assume no direct causal effects between the CDO market and the LBO market, as promoted in the credit supply hypothesis or the reverse causality, and argue that the tight correlation was driven by some third factors. The bank fixed-effects model controls for omitted variables related to bank fixed effects, observable time-varying bank characteristics and macro variables. The only omitted variables left uncontrolled are those related to unobservable time-varying factors. In addition, any such argument would need to explain the bank level correlation between LBO lending and CDO underwriting.

D. The Fraction of Institutional Tranches

One concern that remains with regard to omitted variables relates to time-decaying risk aversion of banks. It argues that banks become more risk-taking (hence, arranging more leveraged loans), and risk-taking banks are more innovative (thereby, underwriting more CDOs). To further discriminate the credit supply hypothesis from this argument, I look into how the LBO loans are financed in the syndicated loan market. If a loan is driven by the credit from the CDO market, one should expect CDO vehicles to be important investors in this loan. Because CDO vehicles are a primary type of investors in the institutional market, the credit supply hypothesis predicts, accordingly, a higher fraction of institutional tranches in this loan. In contrast, the omitted variable argument does not have any implications for how the loans are financed. Hence, this analysis, showing the direct link between the capital from CDOs and LBO loans, helps to discriminate the credit supply hypothesis from arguments based on risk aversion or other omitted variables, which all assume no such direct link between CDOs and LBOs.

E. The Direct Effect of the Capital from CDOs on Loan Contracts

To supply more evidence for the direct link between the CDO capital and LBO loans, I look into the effect on contractual terms of LBO loans. A key prediction of the credit supply hypothesis is that many of the LBO loans are originated in the anticipation that they can be

funded largely from CDO investors. The CDO capital may lead to different lending policies. In particular, if the CDO market provides a cheaper funding source, it may allow banks to offer loans at lower spreads. Moreover, since banks do not fund the loans from their balance sheet, their incentive to monitor is reduced. This may lead to less restrictive covenants, and potentially reduce the prices of credit as banks do not incur monitoring costs. It may also encourage banks to lend more aggressively because they do not bear much of the risk. Therefore, I analyze the effects of the credit from CDOs on loan pricing, covenants, and amounts of total bank borrowing. Any effect of the CDO capital on banks' lending policies would be additional support for the causal effect of the CDO capital on LBO lending.

V. Results

A. Aggregate Level

As discussed earlier, a supply shift drives up quantities and depresses prices. Hence, the credit supply hypothesis suggests lower loan spreads during the LBO boom. Because CLO vehicles invest in intuitional but not pro rata tranches, the hypothesis predicts a lower institutional spreads during the boom. Fig. 3 plots quarterly amounts of LBO loans along with institutional spreads of BB and B rated loans, obtained from LPC. Clearly, both spreads are at historical lows during the boom period, from the second half of 2004 to the first half of 2007. The spread on BB rated loans was below 200 basis points during that period, and increased to 600 basis points in 2008. This recent increase in spreads is accompanied by a sharp drop in the amount of loans. The opposite directions of changes in the loan amount and institutional spreads indicate a shift in the supply of credit during the boom.

To formally test the correlation of quantities and prices, I follow Katz and Murphy (1992) and calculate the correlation of quarterly changes in institutional spreads and changes in both the LBO loan amount and LBO volume. As a comparison, I also include spreads of pro rata tranches. Panel A of Table 2 shows that changes in spreads on institutional tranches are negatively correlated with changes in the loan amount and LBO volume. The correlation is -0.32 and -0.39 for loan amounts and -0.28 and -0.30 for the LBO volume, significant at least at the 10% level. In contrast, I do not find this correlation using changes in pro rata spreads, suggesting the supply shock is mainly in the institutional market but not in the pro rata market. This result supports the causal interpretation in the credit supply hypothesis. Note that this result does not rely on an instrumental variable that may require additional assumptions.

To indentify the supply shock in the institutional market, I construct instrumental variables to proxy for the credit supply from CDOs. The two instruments based on CDOs, *CDO Excluding CLO and CBO*, and *CDO Excluding Balance-Sheet CLO*, representing 59% and 82% of total CDOs, respectively, are almost perfectly correlated with total CDOs (0.99). These two instruments are highly correlated with LBO volume, with correlation of 0.94 and 0.95, respectively. This suggests that the tight correlation between LBOs and CDOs are not a result of reverse causality. *MBS* and *ABS* are larger markets than CDOs, with total issuance amounts roughly 2.3 times and 3.7 times as large as the CDO issuance amount. Their correlation with total CDOs is 0.84 and 0.72, respectively. These two instruments are also confirmed to be highly correlated with LBO volume, with correlation of 0.73 and 0.57, respectively. All these correlations are statistically significant at the 1% level.

I then test this correlation with the instruments controlling for macro variables related to the demand for LBOs or other sources of credit supply. The results are shown in Panel B of Table 1. The control variables include *Growth of GDP,* to proxy for economic growth; *Return on S&P 500*, to capture stock market returns; *Risk Premium*, to control for the overall price of risk; *Risk-Free Rate*, as a proxy for the cost of risk-free funds; *Credit Spread;* and *Term Structure*. Moreover, *Prime Rate over Fed Fund Rate* is included, as Harford (2005) finds that this measure is important in explaining merger waves. A dummy variable *SOX*, equal to 1 only after June 2002, when the Sarbanes-Oxley Act (SOX) was signed into law, is used to control for the effects of SOX on going-private decisions, as shown in Engel et al. (2006).

The first five specifications regress log LBO volume on log total CDO amount or the instruments. Regression (1) shows that the positive correlation between the LBO volume and total CDO issuance amount is robust to macro controls. This coefficient of 1.486 implies a partial correlation of 0.54 between the logged value of the LBO volume and CDO amount. In Regression (2) to (5), I substitute the CDO amount with the instruments. Both *CDO Excluding CLO and CBO* and *CDO Excluding Balance-Sheet CLO* are significantly positively correlated with LBO

volume, indicating that the close relation between the two markets is not driven by demand for LBOs. The partial correlation is 0.36 and 0.62 respectively. The positive coefficients on *ABS* and *MBS*, both significant at the 1% level, further support the credit supply hypothesis. I also run the same regression for the amount of LBO loans. The results are similar. To save space, only two specifications are reported in (6) and (7). Among the control variables, *Risk-Free Rate* has a significant and positive effect on the LBO volume and loan amount, suggesting it may not proxy for borrowing cost but for business cycles. *Growth of GDP* has some marginal effects on the LBO volume but a more significant effect on the loan amount. *SOX* is positive but generally not significant. The last two columns in Panel B of Table 2 directly relate institutional spreads on leveraged loans to the CDO amount. If the expansion of CDOs led to the supply shock in the LBO loan market, one would expect a negative correlation between the CDO issuance amount and institutional spreads. Regressions (8) and (9) confirm this negative correlation. A one standard deviation increase in the CDO issuance amount is associated with a 38 basis points decrease in the institutional spread of the BB-rated tranches.

Overall, these results at the aggregate level strongly support the credit supply hypothesis. The negative correlation between changes in the institutional spreads and loan amount suggests a shock in the supply from institutional investors. The regression using the instruments suggests that the tight correlation of the two markets was not driven by changes in LBO demand, supporting the credit supply hypothesis.

B. Bank Level

To construct a bank panel dataset containing banks annual LBO lending and CDO underwriting amounts, I identify all the lead banks in my LBO loan sample. For each bank, in the year when it originates loans to LBOs, I calculate the total amount of loans it originates and the total amount of CDOs it underwrites in that year. Notice that the amount of each loan is credited

exclusively to the lead banks.[22] When there is more than one lead bank, the loan amount is split equally among all the lead banks. Banks' CDO underwriting amounts are calculated in a similar way. The total amount of each issue is credited equally to the underwriters. Only 8.3% of the CDO issues have multiple underwriters. Following Sufi (2007a), the banks are consolidated with the parent company. In a bank merger, the credit of the acquired firm is aggregated into the acquirer at the effective date, and the merged bank inherits the acquirer.

Table 3 presents the top ten LBO lead banks, along with their CDO underwriting market share and rank for pre-2004 and post-2004 separately. The rank in both LBO lending and CDO underwriting is based on market share within each sub-period. During the post-2004 period shown in the lower part of the table, the top ten LBO lenders originated a total of $225 billion LBO loans, accounting for a massive share of 94% of all LBO loans. During the same period, these banks were all top 13 CDO underwriters, sharing 55% of the CDO underwriting market. Among the top 13 CDO underwriters, the three banks not listed as the top ten LBO lenders were also very active in LBO lending. Merrill Lynch was the 13th in terms of LBO lending, and the other two banks were ranked 15th and 22nd, respectively. However, this tight correlation between LBO lending and CDO underwriting did not show up pre-2004. The top part of the table shows that the top ten LBO lenders in aggregate only share 25% of the CDO underwriting market while originating 79% of the LBO loans. Four of these banks did not even underwrite CDOs at all. This contrast in the relation between LBO lending and CDO underwriting before and after 2004 suggests that this relation is not a consequence of large market shares of large banks in both lending and underwriting businesses.

To formally test the effect of a bank's CDO underwriting on its LBO lending, I run the bank fixed-effects regression as in Eq. (1). The bank panel dataset contains 61 banks and 165 bank-

[22] According to Sufi (2007a), the lead banks are responsible for collecting information and negotiating loan terms, and they typically hold a larger share of the loan and charge up-front fees. Other syndicate participants, however, maintain an "arm's-length" relationship with the borrower by only interacting with the lead banks. Since I concentrate on the lenders who negotiate and determine the loan contract, focusing on the lead banks is sufficient for this purpose.

years. For each bank-year, *total CDO* is the aggregate amount of CDOs underwritten by the bank in the year. If I do not find the bank underwrite any CDOs in the year in the ABS Database, a value of zero is assigned for that year. More important, the four instrumental variables are also calculated for each bank-year. Specifically, a bank's *CDO Excluding CLO and CBO* and *CDO Excluding Balance-Sheet CLO* are calculated as the underwriting amount of other CDOs except CLOs and CBOs, and other CDOs except balance-sheet CLOs, respectively, for each year. Similarly, *ABS* and *MBS* are the total U.S.-issued ABS and MBS underwritten by the bank in each year. I also include *one-year lagged total CDO*, the one-year lagged value of *total CDO* as an additional instrument for banks' access to credit supply in the CDO market, because high CDO underwriting of a bank in the year before indicates the bank's expertise in CDO underwriting, and yet it is not driven by any loans arranged by the bank in this year.

To obtain bank characteristics, the lead banks are then matched with Compustat Global Financial Service, generating financial data for 42 of the 61 banks. The following bank characteristics are included: *Bank size* (total assets) to control for bank size; *Operating margin* and *Return on equity* (defined as income before tax and appropriations divided by total revenue, and total equity, respectively) to control for bank efficiency; *Capital ratio* (the ratio of total equity to total assets) for risk; and *Liquidity* (total short-term investment divided by assets) to control for liquidity. I also include *Deposit* (total customer deposit over assets) to proxy for the access to fund from depositors and also represent how much a bank operates as a commercial bank. *Growth of GDP* and *Fed fund rate* are included as controls for the macro economy and funding costs.

Table 4 presents the results on bank fixed-effects regression. Specification (1) shows a positive correlation between a bank's CDO underwriting and its LBO lending over time. This correlation is consistent with the credit supply hypothesis. But it can also be driven by the reverse causality, which argues that a bank sells more CDOs to reduce its increased exposure to LBO loans resulting from high demand for LBOs. To disentangle the causality, I use the instruments to

proxy for the access to the CDO credit in all the other specifications. Model (2) and (3) show a significant (at the 1% level) and positive correlation between bank's LBO lending and the two instruments based on the CDO market. Specifically, model (2) suggests that in a year when a bank underwrites more *CDO Excluding CLO and CBO*, the bank also lends more to LBOs. Because CLOs and CBOs, which can be driven by demand for LBOs, are excluded, the result is not due to the reverse causality. This suggests that a bank lends more to finance LBOs when it has better access to the CDO capital through underwriting. This result counters the reverse causality argument and strongly supports the credit supply hypothesis. Other instruments, *lagged total CDO* in (4), *ABS* in (5), and *MBS* in (6), are also positive and significant in the regressions of banks' LBO lending (marginal significant for ABS),[23] providing further support for the hypothesis.

This analysis also offers further refinement of arguments based on omitted variables by controlling for the bank fixed effects, time-varying bank characteristics, and macro variables. Among the control variables, more LBO lending is associated with larger bank size and lower liquidity. Deposits do not show any effect on the amounts of lending, suggesting these loans are not driven by an increase in bank deposits. Federal fund rate is positively correlated with LBO lending, the same as in the aggregate level regressions. As a robustness check for potential selection biases arising from data availability in Compustat Global Financial Service, I run the same bank fixed-effects regression without the bank characteristics and, consequently, for a larger sample. The results are stronger for all the six measures. To save space, only specifications (7) to (9) are reported.

Overall, the bank level analysis shows that large CDO underwriter banks are the major lenders to LBOs, and documents a strong positive contemporaneous correlation between LBO lending and CDO underwriting within banks. The results with the various instruments provide

[23] ABS is less correlated with the CDO market than MBS. As shown in Table 1, Panel B, the market of ABS shrank during the CDO expansion, suggesting it may not be the best instrument for CDOs.

strong evidence that the access to the CDO capital through underwriting has a causal effect on banks' LBO lending. They support the credit supply hypothesis and are against the reverse causality. Moreover, this analysis demonstrates a structured lending model in which banks fund their loans from the market of structured credit, such as CDOs, but not from deposits. Instead of holding loans on their balance sheets, banks refinance these loans from CDO investors for themselves and other syndicate members. This model allows investment banks to lend solely on the basis of their expertise in security underwriting but not in the collecting of deposits.

C. Loan Level

Two sets of analyses are conducted at the loan level. First, the credit supply hypothesis predicts that the LBOs loans driven by the CDO market should be financed more from institutional investors, particularly CLO vehicles, in the syndicated loan market. The second set of analyses concerns the effect of banks' access to the CDO capital on the contractual terms of the loans they originate, such as loan spreads and covenants.

To test the first prediction, I would want ideally to observe the allocation to CLO vehicles. Data limitations,[24] however, prevent the identification of CLO vehicles from other institutional investors. Nevertheless, more allocation to institutional investors is very suggestive of more allocation to CLO vehicles for two reasons. First, according to S&P (2006), CLO vehicles had become a dominant investor in the institutional market, taking 60% of primary activities in leveraged loans by 2006. Second, the number of CLOs was increasing over the sample period and, hence, the share of CLOs in the institutional market was increasing. The number of U.S. CLO managers increased from 27 in 2001 to 68 in 2004, and to 160 in 2007, according to JP Morgan (2007).

I start by looking into whether the loans in post-2004 were financed more from institutional investors. I categorize revolvers and term loan A as pro rata tranches and other term loans (term

[24] Dealscan does not identify whether a syndicate member is a CLO vehicle. Moreover, syndicate participants other than the lead banks are missing for many observations.

loan B, C, D) as institutional tranches. Other tranches include everything else (e.g., standby letters of credit, delayed draw term loans). The fraction of these tranches is the ratio of the total tranche amount to the total borrowing amount. Part A of Table 5 shows that the post-2004 loans were not only much larger ($1,823 million vs. $224 million), but also financed more from institutional investors, with a mean of 59.7% compared to 43.9% for the pre-2004 sample. The difference in median is even larger (74.2% vs. 44.1%). The financing from pro rata investors decreased from 44.3% before 2004 to 31.4% after. All these differences are statistically significant at the 1% level. As the deals after 2004 are more likely to be driven by the credit from CDOs, the difference supports the credit supply hypothesis.

To test the prediction in a multivariate setting, I use the total CDO underwriting amount of all lead banks in a loan as the proxy for the exposure to the CDO capital of the banks. CDO underwriting reflects the ability of the lead banks to approach CDO investors for their capital. Part C of Table 5 shows this measure along with other bank characteristics. On average, 1.8 lead banks presented in the post-2004 loans, and 1.2 in pre-2004. The average total bank asset has grown substantially, potentially driven by the many bank mergers in the late 1990s and early 2000s. In 89% of the post-2004 loans, at least one lead bank was a CDO underwriter, compared to only 59% in pre-2004. The mean CDO underwriting for all lead banks was $34.5 billion per year after 2004, compared to only $2.9 billion before.

Table 6 reports the multivariate results of the effect of the lead banks' CDO underwriting on the institutional fraction of a loan in a Tobit model, with the dependent variable as the percentage fraction of institutional tranches. The interested variables are *Log total CDO*, log total amount of CDOs underwritten by all the lead banks of the loan in a year. I also include some specifications using the instruments. The control variables include loan characteristics, such as *log loan amount* (log the total borrowed amount of the loan); *maturity* (weighted average maturity of all institutional tranches); *spread* (weighted average spread of all institutional tranches); and *loan multiple* (*loan amount* divided by the cash flow of the target in the year before the deal

announced). Controls of target firm characteristics include the total asset, cash flow, and volatility of cash flow, all measured before the announcement. The number of lead banks and the average size of these banks are included as controls for lenders. Dummies of having financial covenants, pricing grids, financial ratios, and no sponsor are included to control for loan contractual characteristics, and bank loan rating dummies for credit quality. Specifications (1) and (2) show a positive correlation between the institutional fraction and the lead banks' CDO underwriting. The coefficient is statistically significant at the 1% level in (1) and at 5% in (2). The results show an even stronger correlation when I use the instruments of CDOs. Both the underwriting amounts of *CDO Excluding CLO and CBO* and of *CDO Excluding Balance-Sheet CLO* are positively associated with the allocation to institutional investors. In terms of economic magnitude, a one standard deviation increase in the log CDO underwriting amounts or the instruments is associated with an 8% to 10% higher institutional fraction. The result suggests that banks' access to the CDO capital through underwriting allows them to finance a larger part of their loan commitments from institutional investors, such as CLO vehicles, consistent with the credit supply hypothesis.

The second set of analyses at the loan level concerns the pricing and covenant in loan contracts. In supporting the hypothesis, the results so far show that financing of the recent LBOs went through a structured lending model supported by the CDO market. In this lending model, banks originate loans to fund LBOs and finance a large part of the loan commitments from CLO vehicles. They then underwrite CDOs to refinance the loans from CDO investors for themselves and other syndicate members. CDO underwriting provides banks with both the capability and incentive to originate more loans. The capability comes from the access to CDO investors and the relationships with the vehicles for which they underwrite CDOs. The incentive comes from their desire to produce more loans to serve as collateral for their current or future CDO underwriting. The larger the underwriting business of a bank, the more it benefits from generating more loans in the collateral market. Since this lending model is different from the traditional bank lending

supported by deposits, it may lead to different lending policies of banks. Any such change would be additional support for the causal effect of CDOs on banks' LBO lending.

Part B of Table 5 compares the spreads of revolver, term loan A, and term loan B of post-2004 loans to that of pre-2004. All the tranches were priced with lower spreads after 2004 than before. Since CLO vehicles are institutional investors, the effect of the CDO capital should be reflected in institutional spreads. I, therefore, focus on the institutional spread, measured with the spread on term loan B.[25] The spread on term loan B dropped 25%, from 339.7 basis points pre-2004, to 271 basis points post-2004. Part B of Table 5 also shows that covenant-lite loans showed up after 2004, with 21% of the loans having covenant-lite term loans. This comparison suggests that recent LBO loans were priced with lower spreads and had lighter covenants.

To formally test the effect of CDO capital on borrowing costs, I use the ratio of CDO underwriting amount to bank size as a proxy for how important the capital from CDOs is for a bank. Scaling CDO underwriting amounts by banks' assets removes the effect of bank size and captures the importance of the CDO capital relative to other sources of funding. The larger the CDO underwriting business is within a bank, compared with other businesses, the more this new funding source can affact its lending policies. Formally, for each loan, I define the variable *lender CDO size* as the ratio of CDO underwriting amount of a lead bank during the year to the contemporaneous total assets of the bank, averaging across all lead banks of the loan. The last row in Table 5 shows that average *lender CDO size* was 1.95% (of bank assets) after 2004, compared to 1.08% before. Hereafter, I refer to banks with larger *lender CDO size* as active CDO banks.

Table 7 reports the results on the effect of *lender CDO size* on the institutional spread and instance of covenant-lite loans. Models (1) to (4) show that loans originated by active CDO banks have lower institutional spreads. This negative effect is statistically significant at the 5% level.

[25] I use term loan B because other institutional term loans may be junior to it or have different covenants, and term loan B is the most common institutional term loan, accounting for 78% of all institutional tranches after 2004. This is also consistent with the measure of institutional spreads used by LPC.

The results are robust to various controls, including those in Table 6, and *growth of GDP*, *fed fund rate*, and *prime rate* as controls for business cycle and monetary policies that could affect banks' lending costs. The firm characteristics and macro variables are chosen largely following Petersen and Rajan (1994). The economic magnitude of the effect is sizable. A one standard deviation increase in *lender CDO size* leads to a decrease of 15 basis points in (1) and 23 basis points in (4). This result suggests that banks' access to the CDO capital reduces financing costs for borrowers. It is related to the findings in Ivashina and Sun (2008) that the demand pressure from institutional investors in the syndicated loan market depresses the spreads on institutional tranches.

The lower borrowing costs resulting from the structured lending is consistent with the findings in the loan sales literature. Parlour and Plantin (2008) model loan sales for both information reasons and funding reasons, and predict that, in an active secondary loan market, firms borrow larger quantities and at lower prices. Although our results are consistent with the prediction, the sales of LBO loans in the CDO market are mainly for funding reasons but not information reasons because the loans are originated in anticipating the sales in the CDO market. Guner (2006) shows that loans originated by banks that engage in more loans sales are priced with lower spreads, and interprets the low price as compensation to the borrower for having to deal with multiple banks and for the negative announcement effect resulting from the loan sale. However, it is important to note that in a comparison with the loan sales market, the cheaper credit in the lending supported by CDOs can result from very different reasons. First, it is possible that the CDO technology overcomes market friction and, thereby, reduces funding costs. Second, the cheap credit can be a result of the pricing errors in the CDO market documented by Coval et al. (2008a) and Brennan et al. (2008). They argue that CDO investors underestimate the premium they should be paid, because they underestimate the state price when CDOs default. CDOs, having diversified away specific risk, only default with severe economic conditions, when state price should be very high. Third, the lower price may reflect the lower premium banks

charge for their service of information production, because banks may invest less in monitoring when they know the loan will be sold to CDO investors.

In addition to lower spreads, the new source of credit has also led to looser covenants. The last three columns in Table 7 report the marginal effects of probit regressions on the probability of being structured as covenant-lite. In all the specifications, larger *lender CDO size* is associated with a higher chance of being covenant-lite. A one standard deviation increase in *lender CDO size* from the mean is associated with an increase of 14% to 20% in the probability. This magnitude is large considering the unconditional probability of only 11%. Without the maintenance covenant that allows lenders to test the financial condition of borrowers on a quarterly basis, covenant-lite loans restrict the lenders from detecting and acting in accordance with any financial deterioration of borrowers.

This extremely loose covenant is consistent with the view that since banks move the funding to the capital market, their incentive to monitor is largely reduced. The loose covenant in the structured lending model is in sharp contrast to the more restrictive covenants Drucker and Puri (2008) find in loans sold in the secondary market. The difference highlights the distinction between the structured lending and the loan sales market. In loan sales, loans are traded among banks and institutions. Since the buyer bears the risks, she has the incentive to monitor the borrower and enforce contracts. Moreover, the seller (and originator) of a loan have the incentive to design tight covenants at origination to reduce information asymmetry in future sales. However, in the structured lending, loans are originated to sell to diverse investors in the CDO market rather than any individual buyer. These investors, well diversified by holding only one piece of each loan in collateral pools, do not have the incentive or the expertise to monitor or enforce contracts. This further reduces the originating banks' incentives to invoke restrictive covenants, because they do not carry these loans on their balance sheets, and the buyers do not require tight covenants either.

Overall, at the loan level, I first show that large CDO banks finance more of their loan commitments from institutional investors, which include primarily CLO vehicles. I then show that LBO loans originated by banks with relatively large CDO underwriting business tend to have lower institutional spreads and are more likely to be covenant-lite. The evidence further supports the credit supply hypothesis and particularly distinguishes it from effects of other omitted variables. It also illustrates the structured lending of banks supported by CDOs. As banks switch from the traditional originate-and-hold to the originate-and-distribute model, this type of lending is supported more by their expertise in financial engineering and security underwriting than in information production as in traditional banks, pointing to the disintermediation of banks. The results seem to suggest that this disintermediation leads to looser covenants and cheaper credit for borrowers.

D. Deal Level

The last effect of the CDO capital on banks' lending policies I analyze is the amount of borrowing.[26] To do this, I aggregate multiple loans supporting the same deal and measure the use of bank loans at the deal level. Three ratios are calculated: the total loan amount over fund needs; the total loan amount over EBIT; and EBIT over interest payments. Fund needs include the payment to stakeholders of the firms (transaction value) and fees and expenses to complete the deal. Following Kaplan and Stein (1993), interest payments are estimated using the sum of six-month LIBOR at the effective date of the LBO deal plus the spreads. As in Axelson et al. (2008), I distinguish contingent borrowing (revolvers) from non-contingent borrowing (all other tranches). Since revolvers are only partially drawn down, if at all, at the effective date, including them would overestimate the use of bank loans in financing the deals. Hence, the non-contingent borrowing amount is the focus of the analysis. I also calculate the measures using contingent

[26] Both Axelson et al. (2007) and Ljungqvist et al. (2007) argue that general partners have the incentive to borrow as much as possible. Given the lower prices and looser terms, they have greater incentive to borrow more from banks.

amount only and the total amount, which measures the upper bound of borrowing. All of the three ratios using the three different amounts are then winsorized at the 5% level to avoid any bias resulting from extreme values, particularly of the small deals.

Table 8 compares the use of bank loans in deals with large *lender CDO size* (referred to as the CDO-driven deals) to those with small *lender CDO size* (referred to as the non-CDO-driven deals). For all the measures, the CDO-driven deals use non-contingent loans more aggressively. The difference is particularly large and significant for loan cash flow multiples, with a mean of 4.63 vs. 2.76 and median of 4.34 vs. 2.11. As a fraction of total fund needs, the CDO-driven deals borrow 41.8% (median 38.8%), compared to 35.5% (median 29%) for their counterparts. The difference in mean is only marginally significant, but the difference in median is significant at the 1% level. Although the CDO-driven deals use less revolvers, in total they seem to arrange more bank loans relative to their cash flows.

Table 9 tests the effect of *lender CDO size* on the use of bank loans controlling for characteristics of targets. The positive effect of *lender CDO size* on the use of non-contingent loans remains for all the three measures, significant at least at the 10% level. The results are again the strongest using loan cash flow multiple. A one standard deviation increase in *lender CDO size* leads to additional non-contingent borrowing equal to 70% of the cash flow. The positive effect on total bank borrowing is stronger than in the univariate, indicating that active CDO banks support more aggressive use of the total bank loans.[27]

In sum, the deal-level analysis suggests that the more important the CDO capital is for a bank, the more aggressively the bank lends to LBOs. It further shows the direct effect of the credit from CDOs on LBO financing and distinguishes the credit supply hypothesis from alternatives based on omitted variables. The better access to credit of borrowers is consistent with the findings in the loan sales literature. Drucker and Puri (2008) show that loan sales increase the

[27] The negative correlation between *lender CDO size* and the use of revolvers is not significant at all in regression (4) to (6), suggesting that borrowing from an active CDO bank does not necessarily lead to a smaller revolver.

access to credit of borrowers. Overall, in addition to cheaper credit and looser covenant, the structured lending model supported by CDOs also led to better access to credit for the borrowers.

VI. Implications of the New Source of Credit on the LBO Market

The evidence suggests that the structured credit from CDO investors encouraged banks not only to lend more to finance LBO deals, but also to offer cheaper prices at looser covenants and support more aggressive use of bank loans in financing these deals. An important question is: Did this easy credit lead to bad LBO deals, those that were riskier or overpriced? In the first LBO boom during the late 1980s, Kaplan and Stein (1993) document an "overheated" market in which deals were overpriced, riskier, and financed more from junk bond investors than from banks, and performed worse post-buyouts. To shed some light on whether the new source of capital from CDO investors led to a similar pattern of "overheating" in the recent LBO boom, I examine the effect of this easy credit on three aspects of the recent LBO deals: target firm characteristics; financing structure; and LBO pricing.

A. Target Characteristics

Part A in Table 10 compares ex ante target characteristics of the CDO-driven deals to the non-CDO-driven deals. All the characteristics are measured in the last fiscal year before the announcement of deals.[28] Clearly, the CDO-driven deals are much larger. The average (median) transaction value for these deals is $3,045 million ($923 million), compared to $763 million ($129 million) for the non-CDO-driven deals. The size of the targets (total assets) in the CDO-driven deals is three times as large as that of the counterpart. The CDO-driven deals perform much better, generating cash flows of 0.151 (median 0.143), compared to 0.095 (median 0.115). They are much less likely to have negative cash flows. The CDO-driven deals seem to also have

[28] The volatility measures use of up to five years of data before the announcement.

better growth opportunities as measured by market-to-book. They have slightly, but not significantly, less tangible assets, and similar leverage to the non-CDO-driven deals.

As conventional measures for potential value enhancement in LBOs, free cash flows and tax payments are significantly higher in the CDO-driven deals. These deals on average generate 78% (32% for the median) more free cash flows than the non-CDO-driven deals, and they pay twice as much tax (both at the mean and median). The differences are statistically significant at the 1% level for both the mean and median. The higher free cash flows in the CDO-driven deals suggest that agency problems between management and shareholders can be more costly in these firms (Jensen (1986), Kaplan (1989b), Smith (1990), Lichtenberg and Siegel (1990), Opler and Titman (1993)). Therefore, LBOs, by forcing management to use free cash flows more effectively, can create more value in these deals. Moreover, the higher tax payments in the CDO-driven deals indicate that these firms would enjoy more interest tax shield benefit by levering up (Kaplan 1989a). The higher level of free cash flows and tax payments in these deals suggest that the potential for efficiency improvement can be higher.

As for risks, using various measures, including volatility of cash flows, volatility of growth in cash flows, and volatility of growth in operating margin, I find that the CDO-driven deals are significantly less risky. All the measures of risks for non-CDO-driven deals are at least 50% higher than those for the CDO-driven deals at either the mean or median (the difference in volatility of growth in operating margin at the median is not significant). This result suggests that the targets in the CDO-driven deals are more stable and, hence, can be better candidates for highly levered transactions.

Taken together, the evidence based on ex ante characteristics of targets seem to suggest that the easy credit did not lead to risky firms in the recent boom. Instead, it seems that this new source of credit made large deals possible. These large firms seem to be much less risky and face more severe agency problems. However, without the credit from CDOs, banks are reluctant to finance the buyouts of these firms from their deposits because of the large and risky nature of

these LBO loans. This financing constraint is relaxed in the structured lending model, which introduces a broader base of investors to collectively finance one deal. Given this view, one may argue that the best candidates among the large firms are first taken private when this easy credit becomes available, and the quality of these large deals may deteriorate over time as the market gets overheated, even though they are, on average, better than small deals. To check this possibility, in un-tabulated analysis, I break the deals of 2004 through 2007 into three size spectrums[29] and track the trend of major characteristics for these size spectrums over time separately. In doing so, I do not find that deal quality deteriorated over time within size spectrums.[30]

B. Financing Structure

Even if the firms in the CDO-driven deals are good candidates for LBOs, these deals can be structured in a risky way by taking more debt and less equity. Recall that Section IV. D. shows that the CDO-driven deals tend to use more bank loans, particularly non-contingent loans. Does this mean that these deals are over-levered and more likely to enter financially distress? Or, alternatively, does this additional bank borrowing substitute for equity or other debt? If bank borrowing substitutes for equity, then the deals are more levered and more likely to be financially distressed. I, therefore, analyze other financing, particularly equity, in addition to bank loans to understand the risk of deal structures. Table 11 compares the complete financing structure of the CDO-driven deals to the non-CDO-driven deals. Not surprisingly, total fund needs are much higher for the CDO-driven deals.[31] The different sources of financing listed in Table 11 are all

[29] Deals with transaction value between $100 million and $1 billion are categorized as small deals; $1 billion to $5 billion, as medium-sized; and those larger than $5 billion, as large.

[30] Free cash flows have been decreasing for medium-sized deals but not for others. Risk measures have been stable over time for medium- and large-sized deals, and have decreased since 2005 for small deals.

[31] Notice that fund needs are greater than the transaction values reported in Table 10. This is attributable to two factors. First, fund needs include the fees and expenses of deals, while transaction values do not. Second, in this sample with manually collected data, I capture more large deals due to limited data availability for small deals.

scaled by fund needs. Consistent with the results in Section IV.D., the CDO-driven deals use more term loans, as well as more total bank loans (not significant at the mean and marginally significant at the median) [32].

In addition to bank loans, the CDO-driven deals also use more junk bonds/notes and mezzanine financing, suggesting that bank loans are not used to substitute for other debt. More important, equity contribution is not reduced in these deals. Equity investors, including rollover investors, contribute on average 34% of the total fund needs in both groups. The median is even slightly higher for the CDO-driven deals, though not significantly. Thus, it seems that the easy credit from CDO investors was not used to substitute for equity financing. When all the financing is summed up, the last two rows of the table show that the CDO-driven deals arrange more financing than they need to complete the deal. On average, they arrange 15.5% additional funding, including revolvers, while the non-CDO-driven deals have only 6.7% extra funding. The difference is marginally significant. If revolvers are excluded, the CDO-driven deals, on average, arrange about just enough funds to complete the deals without a drawdown on their revolvers or use of their cash holdings, while the non-CDO-driven deals have a shortfall of 8%, and they need to use their cash holdings or draw on revolvers to complete the deal. This difference is also marginally significant.

Overall, this analysis does not indicate that riskier financing structure results from the easy credit. The result seems to suggest that the credit from CDO investors was not used as a substitute for equity to increase leverage. Instead, it appears that private equity sponsors took advantage of the favorable credit condition to lock up more of the cheap financing. This extra financing may give them more flexibility in funding future investment or other needs and reduce probability of financial distress.

[32] The sample in Table 11 is slightly different from that in Table 8. The deals in Table 8 are conditional on using bank loans, and loan amounts are available. However, in Table 11, deals I can identify as having no bank borrowing are included, while those bank borrowers with no information on equity contribution are excluded. The similar results provide assurance that this sample, with hand-collected financing information, is not systematically biased.

C. LBO Pricing

Even if the CDO-driven deals were not riskier, the easy credit might lead to overpayment in these deals. I, therefore, compare LBO pricing in these deals to the non-CDO-driven deals. LBO pricing is measured with both *premium*, the offered price over the target stock price one month before the announcement, and the pricing multiple *price/EBIT*, the ratio of the transaction value (net of expenses and fees) to EBIT if EBIT is positive, and missing otherwise. Firms with negative EBIT are excluded because of non-monotonicity of the ratio at negative values of EBIT. To include negative EBIT, I also calculate the inverse of the pricing multiple, *EBIT/price*, which is monotonic in EBIT. All of the three measures are winsorized at a 5% level to avoid extreme values, particularly from small deals. Part B of Table 10 compares the pricing measures for the two groups. The CDO-driven deals, on average, pay a premium of 29.7% (median 28.29%), compared to 36.4% (median 31.22%) in the non-CDO-driven deals. This difference is significant at the 5% level for the mean and the 10% level for the median. This seems to suggest that shareholders were paid less in the deals financed by active CDO banks. However, Bayazitova et al. (2008) show that the merger premium has decreased since 2003. The lower premium in the CDO-driven deals, mostly in recent years, may reflect the overall decline. Nevertheless, this result does not suggest that shareholders are overpaid in the CDO-driven deals. When using the pricing multiple, these deals appear to pay more relative to EBIT (only significant for the median). But this difference seems to be driven by the firms with negative cash flows, mainly in the non-CDO-driven sample. Once I include them in the inversed multiple, the difference is gone. Overall, the univariate test does not suggest an overpayment in the CDO-driven deals.

Table 12 controls for other firm characteristics that could suggest different prices for these deals. Specifically, the three pricing measures are regressed on *lender CDO size*, controlling for target and industry characteristics. I also include return or P/E ratio on the S&P 500 index to control for market pricing. The first two specifications show that *lender CDO size* still has a negative effect on premium although not statistically significant. However, in the other four

regressions, large *lender CDO size* is associated with higher price relative to EBIT. This seems to suggest overpayment relative to EBIT in these deals. But the effect is not statistically significant at all. Among the characteristics, larger size, higher market-to-book, and lower leverage are associated with higher pricing multiples. In un-tabulated analysis, I break the post-2004 sample into three size spectrums and find that the payment relative to cash flow increased over time for all spectrums from 2004 to 2007. This is suggestive of overpayment toward the end of the boom. But the regression result seems to suggest that, controlling for other characteristics, lenders' funding from CDOs does not have a significant effect on pricing. Overall, the analysis on pricing in general does not indicate that the easy credit led to overpayment in the LBO deals.

D. Discussion

In this section, the results on target characteristics, financing structure, and deal pricing do not suggest an "overheated" market resulting from the credit from the CDO market. In fact, this new source of credit appears to be used to buyout good LBO candidates, based on ex ante characteristics. The financing structure does not seem to be more risky, and not much evidence suggests overpayment in these deals. These results are in sharp contrast to the findings in Kaplan and Stein (1993) on the first LBO boom in the late 1980s. My findings seem to be more consistent with the view that the new source of credit from the CDO market reduces financing constraints in large buyouts, and allows the technology of LBOs on large firms. This view is related to Jensen's (1989) insight that leveraged buyout is a superior technology that could be applied to more firms. Large firms may face more severe agency problems and, hence, can be squeezed to generate more values in highly levered transactions. But the large size makes it difficult to find financing to buyout these firms. The CDO market, introducing a broader and diversified group of investors, reduced this financing constraints and allowed large LBO deals to happen.

Since all of my analysis is based only on ex ante information, it does not suggest that these large deals are more efficient ex post. To understand whether they create (more) value, one may need to examine post-LBO performances or outcomes. Using a sample of LBOs announced between 1990 and 2006, Guo et al. (2007) find performance improvement post-buyout. But most of the deals with post-buyout data were announced before 2004; consequently, the efficiency gains of the new source of credit in the LBO market are not clear from their study. Andrade and Kaplan (1998) show that the technology of LBOs is successful even for deals done in the late 1980s. They find that even the deals that later become financially distressed increase value slightly, after incurring the costs of financial distress. To see whether the result can be applied to the recent boom, it is important to note the differences between the two booms. First, the deals in the first boom were much higher levered. Kaplan and Stein (1993) show that post-buyout total debt to capital was between 83% and 91% from 1986 to 1989, indicating 9% to 17% total equity. The equity in the recent deals was about 30%. The lower leverage used in the recent boom may suggest lower value created but may also indicate lower costs of financial distress. Second, recent deals obtained more favorable bank loan terms, arranging more financing than needed. The loose covenants in these loans give borrowers more control. Moreover, these bank loans are mostly institutional term loans, which have bullet payment schedules. Since debt repayment is pushed toward the end of the maturity in these types of loans, the pressure on debt payment is less severe. All these easy terms in bank financing may give the borrowers in this boom more flexibility and allow them to survive economic downturns. Thus, the cost of "financial" distress may be reduced. But it may increase the cost of "economic" distress by tolerating errors for too long. Overall, how efficient the recent LBO boom turns out to be is an empirical question that requires more information to answer.

VII. Conclusion

Using an instrumental variable approach, I offer strong evidence to support the credit supply hypothesis. The expansion of the CDO market since 2004 seems to provide banks with a new source of funding and encourage them to finance more LBO deals, contributing to the LBO boom from 2004 to 2007. The results highlight the large impact of supply-side factors on firms' leverage and investment choices. They also demonstrate a structured lending model in which banks originate loans and then underwrite CDOs to refinance them from investors in the capital market. This disintermediation of banks seems to lead to lower credit prices, looser covenants, and better access to bank credit for borrowers. In contrast to the first LBO boom in late 1980s, this easy credit did not lead to riskier LBO deals in the recent boom. Instead, the evidence seems to be more consistent with the view that the new source of capital relaxes financing constraint on large LBOs and allows the technology of LBOs on large firms.

Several important questions arise from the analysis. For example, is the structured lending a short-term phenomenon driven solely by pricing errors in the CDO market, or a sustainable source of credit that improves efficiency? On the one hand, the current credit crisis triggered by the problems in subprime mortgages seems to suggest that structured lending is not a stable funding model. The recent failure of major U.S. investment banks further illustrates that this model cannot survive a liquidity shock. On the other hand, it is possible that CLOs work differently from structured product CDOs, which are second-time repackaging and may be too complex for participants to value or control for risks. The simple pooling and tranching in CLOs may effectively improve credit access for borrowers by overcoming market frictions. Specifically, the eventual creditors in the lending supported by CLOs are diversified in terms of firm-specific risks by holding a pool of loans. This diversification may reduce the costs of

external financing for firms. While less monitoring is a possible outcome, it may not necessarily be inefficient. Monitoring is a costly device in private financing to reduce risk-shifting. Borrowers with less severe problems may be able to reduce the costs by financing from the structured credit market. Understanding the efficiency of this lending model has important policy implications given the overwhelming blame being placed on the CDO market for the current credit crisis.

Another question related to LBOs is why the recent LBO boom is different from the one in the late 1980s, at least based on ex ante measures. Perhaps it is because banks screen borrowers well when they originate the loans. Their expertise in information production helps to select better LBO candidates. However, junk bond investors of the late 1980s typically were more diversified investors and may not have the same expertise (or incentive) to screen borrowers. Alternatively, the difference may result from changes in the private equity industry. Kaplan and Stromberg (2008) suggest that this industry has changed substantially since the first LBO boom. Perhaps in the last two decades, private equity sponsors have developed a better mechanism to control for risk. This mechanism can be related to reputation (Demiroglu and James (2007)) or future fund raising (Kaplan and Schoar (2005), Metrick and Yasuda (2007)). I am looking forward to see more research to understand the recent LBO market and the private equity industry.

Table 1: Market Size of CDO and Other Securitized Assets

The ABS Database covers initial terms of all rated ABS, MBS, and CDO issues worldwide with an emphasis on participants in each issue. Commercial MBS, MBS issued by government agencies (such as Fannie Mae and Freddie Mac), and short-term issues (such as asset-backed commercial paper or medium-term notes) are not covered. While the coverage of ABS/MBS issues goes back to 1985, the database starts to record CDO issues from the middle of 1995. Hence, my sample starts from 1996 and ends in the second quarter of 2008. The statistics are shown separately for the period of 1996-2003 and 2004-2Q2008.

Panel A: CDO Issues and Collateral
This panel reports the value and number of CDO issues based on the types of collateral. The current collateral codes are used to flag CDO issues since 2001. Before that, only balance sheet CLOs are flagged. Therefore, the data is described separately for 1996 to 2000, and 2001 to 2003.

	2001–2003			2004–2Q2008		
	# of Issues	Value of Issues ($bn)	% of Total Value (%)	# of Issues	Value of Issues ($bn)	% of Total Value (%)
Structured Product Corporate Loans (CLOs)	252	63.90	25.07	1243	556.02	42.08
Arbitrage	153	46.87	18.39	891	431.07	32.62
Balance Sheet	90	41.64	16.34	76	75.57	5.72
Corporate Bonds (CBOs)						
High-Yield	72	23.98	9.41	37	12.60	0.95
Investment-Grade	128	24.76	9.71	213	30.32	2.29
CMBS/Real Estate	29	16.03	6.29	179	89.37	6.76
Others	54	19.84	7.79	197	126.47	9.57
Unknown	74	17.85	7.00	19	1.02	0.08
Total	852	254.87	100.00	2836	1321.41	100.00
	1996-2000					
Corporate Loans (balance sheet)	123	120.41	34.36			
Others	712	230.06	65.64			
Total	835	350.47	100.00			

Panel B: All Securitized Issues

This panel presents the total value and number of all types of securitized issues covered in the ABS Database during the two sub-periods.

	1996-2003			2004 -June 2008		
	Number of Issues	Issuance Amount ($bn)	% of Total	Number of Issues	Issuance Amount ($bn)	% of Total
CDOs	1,687	605.3	12.7	2,855	1,322.4	16.4
U.S. Mortgage-Backed Securities (MBS)						
Residential mortgages	2,461	999.1	21.0	2,660	1,891.1	23.4
Subprime mortgages	812	349.9	7.4	929	713.8	8.8
Total MBS	3,273	1,349.0	28.4	3,589	2,604.8	32.3
U.S. Asset-Backed Securities (ABS)						
Home-equity loans	1,103	476.7	10.0	1,261	1,038.0	12.9
Auto loans/leases	776	485.2	10.2	345	344.1	4.3
Credit cards	724	452.9	9.5	504	331.5	4.1
Student loans	196	137.9	2.9	193	253.8	3.1
Others	1,814	534.7	11.2	1,671	496.5	6.2
Total ABS	4,613	2,087.4	43.9	3,974	2,464.0	30.5
Non-U.S. Mortgage- and Asset-Backed Securities						
Non-U.S. residential	802	370.6	7.8	1021	1,229.9	15.2
Auto loans/leases	150	42.9	0.9	104	76.6	0.9
Credit cards	155	62.6	1.3	86	41.7	0.5
Others	638	238.7	5.0	409	330.6	4.1
Total Non-U.S. MBS/ABS	1,745	714.9	15.0	1,620	1,678.7	20.8
Total Securitization Issuance	11,318	4,756.7	100	12,038	8,070.0	100

Table 2: Aggregate Level Analysis

Quarterly LBO volume (amounts of LBO loans) is calculated by aggregating transaction value (long-term bank loan borrowing amounts) for the 345 deals in the sample for each quarter based on the date of the announcement of each deal. One is added to both LBO volume and LBO loans before taking logarithm to avoid zero values. Spreads of leveraged loans include quarterly spreads of institutional and pro rata tranches of leveraged loans for BB and B rated loans, provided by Loan Pricing Corporation (LPC). This series starts from 1Q1998 and is recorded in basis points.

Panel A: The Correlation of Quarterly Changes in Spreads of Leveraged Loans and Quarterly Changes in LBO Volume and Loan Amounts
Pearson correlation, p-value testing the null that the correlation is equal to zero, and the number of observations are shown in each row.

		Changes in Institutional Spread		Changes in Pro Rata Spread	
		BB Rated	B Rated	BB Rated	B Rated
Changes in LBO Loan Amount	Correlation	-0.318	-0.388	-0.114	0.043
	p-value	0.043	0.012	0.489	0.799
	No. of obs	41	41	39	37
Changes in LBO Volume	Correlation	-0.280	-0.303	-0.106	0.152
	p-value	0.076	0.054	0.522	0.369
	No. of obs	41	41	39	37

Panel B: Regressions of Quarterly LBO Volume, LBO Loan amounts, and Institutional Spreads of Leveraged Loans on Quarterly Total Amounts of CDOs and the Instruments

The first five independent variables are logarithm of quarterly aggregate issuance amounts of CDOs, ABS, or MBS, constructed from the ABS Database. *Log total CDO* includes all types of CDOs, while *Log CDO Excluding CLO and CBO* excludes CDOs backed on corporate loans (CLO) or bonds (CBO), and *Log CDO Excluding Balance-Sheet CLO* excludes balance-sheet CLOs. *Log ABS* and *Log MBS* are logarithm of quarterly issuance amounts of ABS and MBS in the U.S. *SOX* is a dummy valued at 1 after June 2002, and 0 otherwise. *Growth of GDP* is seasonally adjusted percentage changes of GDP over a year earlier. *Return on S&P 500* is measured in the year earlier. *Credit Spread* is the spread of 10-year Moody's Baa bonds over Aaa bonds. *Risk Premium* is calculated as value-weighted market return minus return on 90-day bills. *Risk-Free Rate* is the return on 30-day T-bills. *Term structure* is measured as the 10-year government bond return minus the return on 30-day T-bills. 2Q2008 drops out in the regression due to lack of recent data. Absolute values of t-statistics are in parentheses. ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels, respectively.

	Log LBO Volume					Log LBO Loan		Spread of Leveraged Loan	
								BB Rated	B Rated
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log total CDO	1.486							-108.137	-98.088
	(3.59)***							(5.81)***	(6.37)***
Log CDO Excluding CLO and CBO		1.077				1.016			
		(2.56)**				(2.24)**			
Log of CDO Excluding Balance-Sheet CLO			1.548						
			(3.58)***						
Log of ABS				2.392			2.234		
				(2.87)***			(2.47)**		
Log of MBS					1.044				
					(2.76)***				
Prime Rate Over Fed Fund Rate	2.062	1.276	-0.744	8.620	0.901	2.218	9.101	544.304	420.102
	(0.25)	(0.14)	(0.09)	(0.96)	(0.10)	(0.23)	(0.94)	(1.96)*	(1.83)*
Credit Spread	0.911	0.879	0.777	1.559	1.797	1.785	2.423	201.674	231.090
	(0.49)	(0.45)	(0.42)	(0.81)	(0.92)	(0.84)	(1.16)	(3.60)***	(4.99)***
SOX	1.011	1.683	0.455	1.414	1.530	1.589	1.354	97.499	72.114
	(1.13)	(1.82)*	(0.45)	(1.52)	(1.65)	(1.60)	(1.34)	(3.11)***	(2.78)***
Growth of GDP	0.504	0.314	0.532	0.411	0.542	0.685	0.776	-6.158	-8.599
	(1.74)*	(1.02)	(1.82)*	(1.36)	(1.75)*	(2.06)**	(2.37)**	(0.70)	(1.19)
Return on S&P 500	-0.045	-0.064	-0.051	-0.056	-0.051	-0.042	-0.035	0.345	-1.441
	(0.86)	(1.15)	(0.97)	(1.03)	(0.93)	(0.70)	(0.58)	(0.20)	(1.01)
Risk Premium	0.040	0.057	0.048	0.058	0.049	0.030	0.031	-0.232	1.409
	(0.82)	(1.10)	(0.98)	(1.13)	(0.96)	(0.54)	(0.55)	(0.14)	(1.06)
Risk Free Rate	0.615	0.721	0.615	1.024	1.075	0.758	1.044	27.546	26.033
	(2.45)**	(2.69)**	(2.44)**	(4.41)***	(4.60)***	(2.62)**	(4.15)***	(3.17)***	(3.62)***
Term Structure	0.017	0.023	0.026	0.026	0.025	0.028	0.031	-0.274	-0.106
	(0.83)	(1.04)	(1.29)	(1.22)	(1.18)	(1.20)	(1.34)	(0.38)	(0.18)
Constant	-19.899	-12.379	-11.548	-53.294	-15.548	-18.341	-56.552	-548.615	-206.725
	(0.78)	(0.45)	(0.45)	(1.75)*	(0.58)	(0.62)	(1.71)*	(0.63)	(0.29)
Observations	49	49	49	49	49	49	49	41	41
R-squared	0.61	0.56	0.61	0.57	0.57	0.55	0.56	0.72	0.81

Table 3: Top Lead Banks of LBO Loans

This table reports the top ten lead banks in the 247 LBO loans for which lead banks can be identified and their market share in CDO underwriting over the two sub-periods: 1996 to 2003, and 2004 to 2Q2008. Only long-term loans and tranches are included in the LBO loan sample. The amounts of the loan are distributed equally among all the lead banks when more than one bank serves as a lead arranger of a loan. The share of LBO loans a lead bank received in each loan is then aggregated into total amounts of LBO loans for the bank over each of the two sub-periods. In the case of bank mergers, all the credit to the target bank is aggregated into the acquiring bank at the effective date, and the emerging bank inherits the acquirer. This bank's share of amount of loans is then divided by total amounts of LBO loans in the sub-period to obtain market share in LBO lending. The top ten banks in terms of market share of LBO lending are listed in order. For CDO underwriting, the total issued amount is equally credited to all underwriters. The share of underwriting amounts is aggregated in each sub-period for all the underwriters and then divided by the total CDO amounts in that sub-period, yielding CDO underwriting market share for each underwriter and the rank. When a bank never underwrites any CDOs in a sub-period, the ranking is denoted as "NR" (i.e., no rank available).

	LBO Lending				CDO Underwriting		
Bank Name	Rank	No. of Loans	Amount of Loans ($bn)	Market Share (%)	Amount ($bn)	Market Share (%)	Rank
			1996-2003				
JP Morgan	1	25	10.63	36.55	27.33	4.52	8
Bank of America	2	19	2.86	9.84	7.79	1.29	19
Deutsche Bank	3	10	2.30	7.91	46.65	7.72	4
Credit Suisse	4	9	1.95	6.71	51.91	8.59	2
Bank of Nova Scotia	5	2	1.29	4.43	0	0	NR
Wachovia Bank	6	6	0.99	3.42	14.49	2.40	12
FleetBoston	7	8	0.98	3.37	0	0	NR
Bankers Trust	8	5	0.71	2.42	5.69	0.94	23
BankBoston	9	4	0.62	2.12	0	0	NR
Wells Fargo	10	5	0.61	2.11	0	0	NR
Total			22.94	78.87	153.86	25.47	
			2004-2Q2008				
Citigroup	1	24	44.93	18.65	121.45	9.22	2
JP Morgan	2	34	34.02	14.12	60.56	4.60	9
Bank of America	3	22	30.90	12.83	54.22	4.12	12
Credit Suisse	4	32	30.37	12.61	58.58	4.45	10
Deutsche Bank	5	20	23.16	9.62	98.83	7.50	3
Goldman Sachs	6	22	22.92	9.51	80.82	6.13	4
Lehman Brothers	7	10	18.68	7.75	65.59	4.98	6
Morgan Stanley	8	13	10.34	4.29	45.50	3.45	13
Barclays Bank	9	4	5.14	2.13	64.92	4.93	7
Wachovia Bank	10	11	4.92	2.04	77.05	5.85	5
Total			225.38	93.56	727.51	55.22	

Table 4: Bank Fixed-Effects Panel Regression of LBO Lending

This table presents results of fixed-effects regression of the following model in a bank-year panel:

$$LBOLending_{it} = \sum_{i=1}^{K} \alpha_i + \beta * CDO_{it}(CDO\ Instruments_{it}) + \gamma' * X_{it} + \delta' * Z_t + \varepsilon_{it}.$$

The dependent variable $LBOLending_{it}$ is logarithm of the total amounts of LBO loans bank *i* arrange in year *t*. α_i is the fixed effect for bank *i*. CDO_{it} is logarithm of total amount of CDOs bank *i* underwriting in year *t* (*Log total CDO*). $CDO\ Instruments_{it}$ is constructed with logarithm of underwriting amount of some parts of CDOs: *Log CDO Excluding CLO and CBO* includes those CDO backed by assets other than corporate loans or bonds; *Log CDO Excluding Balance-Sheet CLO* covers CDO excluding those backed on corporate loans and for balance-sheet purpose; or *Log one year lagged total CDO* includes the total CDO underwritten in the year before. Additional instruments include underwriting amount of other asset-backed securities in the U.S.: *Log ABS* or *Log MBS*. X_{it} denotes time-varying bank characteristics. Financial data for banks are obtained from Compustat. Before taking log, 1 is added to each of the above CDO measures and its instruments to avoid taking log on zero values. *Bank size* is logarithm of total assets (data129) of the bank. *Operating margin* and *Return on equity* are calculated as income before tax and appropriations (data387) divided by total revenue (data343) and total equity (data215), respectively. *Capital ratio* is total equity (data215) divided by total assets (data129). *Liquidity* and *Deposit* are defined as short-term investment (data128) and total customer deposit (data142) divided by total asset (data129), respectively. Z_t refers to time-varying macro variables, including annual *Growth of GDP* and *Federal fund rate*. Absolute values of t-statistics are in parentheses. ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log total CDO	0.190								
	(2.36)**								
Log CDO Excluding CLO and CBO		0.257					0.354		
		(3.14)***					(4.67)***		
Log CDO Excluding Balance-Sheet CLO			0.236						
			(3.17)***						
Log one year lagged total CDO				0.196					
				(3.38)***					
Log ABS					0.120			0.169	
					(1.65)*			(2.35)**	
Log MBS						0.115			0.165
						(2.11)**			(2.95)***

Bank size	0.369	0.350	0.336	0.406	0.426	0.399			
	(2.70)**	(2.63)**	(2.50)**	(3.16)***	(3.15)***	(2.95)***			
Operating margin	3.861	2.767	3.235	5.623	6.530	6.787			
	(0.67)	(0.50)	(0.58)	(1.05)	(1.16)	(1.23)			
Return on equity	-1.199	-0.807	-0.946	-1.736	-3.253	-2.846			
	(0.36)	(0.25)	(0.29)	(0.55)	(0.99)	(0.87)			
Capital ratio	28.244	32.417	30.353	24.685	29.033	26.622			
	(1.60)	(1.87)*	(1.76)*	(1.44)	(1.61)	(1.50)			
Liquidity	-6.082	-6.693	-6.155	-5.362	-6.836	-6.752			
	(1.83)*	(2.07)**	(1.90)*	(1.66)*	(2.03)**	(2.02)**			
Deposit	0.016	0.004	0.140	-0.002	-1.054	-0.923			
	(0.01)	(0.00)	(0.04)	(0.00)	(0.32)	(0.29)			
Growth of GDP	0.052	0.088	0.101	0.087	0.008	0.021	0.217	0.112	0.147
	(0.33)	(0.57)	(0.65)	(0.57)	(0.05)	(0.13)	(1.50)	(0.73)	(0.97)
Federal fund rate	0.241	0.242	0.260	0.309	0.288	0.286	0.224	0.199	0.209
	(2.10)**	(2.16)**	(2.33)**	(2.76)***	(2.44)**	(2.46)**	(2.42)**	(1.96)*	(2.11)**
Constant	-2.680	-2.995	-2.946	-3.584	-2.561	-2.177	1.856	3.254	3.184
	(0.92)	(1.05)	(1.04)	(1.26)	(0.85)	(0.75)	(1.56)	(2.56)**	(2.65)***
Observations	133	133	133	133	133	133	161	161	161
Number of banks	40	40	40	40	40	40	59	59	59
R-squared	0.32	0.35	0.35	0.36	0.29	0.31	0.20	0.07	0.10

Table 5: Tranche Structure, Pricing, and Lead Bank Characteristics

The loan sample includes 265 loans backing LBO deals with borrowing amount available. The date of the announcement of the LBO is recorded as the date of the LBO loan. Term loan D (2nd-lien loans) and covenant-lite loans are identified using a list obtained from S&P's LDC. To calculate variables related to CDO underwriting amounts for lead banks, each lead bank in the loan sample is matched with the CDO underwriting sample to find total amount of CDO underwriting of the bank to identify whether and how much CDOs the bank underwrites in the year when the LBO deal is announced. The dummy for at least one bank underwriting CDOs takes the value of 1 if at least one lead bank underwrites CDOs in the year, and 0 otherwise. Total CDO underwriting is the aggregate CDO underwriting amount for all lead banks. Lender CDO size is measured as CDO underwriting amount divided by bank total asset in the year, averaged across all lead banks of the loan. When the mean/median during the post-2004 differs from that during pre-2004, the significance of the difference is denoted with asterisks. ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels, respectively.

	1996-2003			2004-2Q2008		
	N	Mean	Median	N	Mean	Median
Part A. Loan Tranche Structure						
Loan amount ($ml)	131	223.89	125	134	1822.73***	587.5***
Fraction of Revolver	131	30.18%	23.36%	134	26.62%	15.38%**
Fraction of Term Loan A	131	14.09%	0	134	4.77%***	0
Fraction of Pro Rata	131	44.27%	45.83%	134	31.39%***	17.44%***
Fraction of Term Loan B	131	24.31%	19.51%	134	46.68%***	56.42%***
Fraction of Term Loan C	131	18.95%	0	134	7.06%***	0
Fraction of Term Loan D	131	0.61%	0	134	5.97%***	0
Fraction of Institutional	131	43.87%	44.12%	134	59.70%***	74.17%***
Fraction of Other Tranches	131	11.86%	0	134	8.91%	0
Part B. Loan Spread and Covenant						
Revolver	93	284.4	300	100	242.4***	225***
Term Loan A	56	295.3	300	12	279.4	288
Term Loan B	68	339.7	350	87	271***	250***
Covenant-Lite Dummy	131	0	0	134	0.21***	0
Part C. Lead Bank Characteristics and CDO Underwriting						
Number of lead banks	129	1.17	1	133	1.80***	2***
Average bank total asset ($bn)	106	424.29	357.39	128	1145.88***	1199.84***
Dummy for at least one bank underwriting CDOs	129	0.59	1	133	0.89***	1***
Total CDO underwriting ($bn)	129	2.93	1.45	133	34.51***	31.09***
Lender CDO size (%)	73	1.08	0.71	119	1.95***	1.79***

Table 6: Tobit Regression of Fraction of Institutional Tranches

This table reports loan level Tobit regression of fraction of institutional tranches in LBO loans on the total underwriting amounts of CDOs for all the lead banks. The dependent variable is the percentage fraction of institutional tranches, calculated as all institutional term loans over the total long-term borrowing amount of the loan. The value varies between 0 and 100. *Log total CDO* is logarithm of total CDO underwriting amounts of all lead banks in the year when the LBO deal is announced. *Log CDO Excluding CLO and CBO* excludes CDOs backed on corporate loans (CLO) or bonds (CBO), and *Log CDO Excluding Balance-Sheet CLO* excludes CDOs backed on corporate loans and for balance-sheet purpose. *Maturity* is value-weighted average maturity of all institutional tranches. *Log loan amount* is logarithm of total long-term borrowing of the loan. This total borrowing amount is divided by target operating income (Compustat data13) to obtain *loan multiple*. *Log target total asset* is logarithm of target total assets (Compustat data6), and *Target cash flow* is calculated as operating income divided by total assets. All of the above target financial variables are measured in the last year before the LBO deal is announced. *Volatility of target cash flow* is standard deviation of target cash flows in the five years before the deal is announced. *Number of lead banks* is the number of lead arrangers for the loan, and *Bank size* is logarithm of average total assets of lead banks in the year of the LBO. *Financial Covenant, Pricing grid, financial ratio,* and *No sponsor* are dummies for loans with financial covenant, pricing grid and financial ratio, and no sponsors, respectively. *Rating_BB*, *Rating_B*, and *Rating_CCC* are dummies for the loans rated at BB, B, and CCC, respectively. Year dummies are generated based on the year of the announcement date of the LBO deal. Absolute values of t-statistics are in parentheses. ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels, respectively.

	Percentage Fraction of Institutional Tranches					
	(1)	(2)	(3)	(4)	(5)	(6)
Log total CDOs	1.845	1.555				
	(2.64)***	(2.22)**				
Log CDO Excluding CLO and CBO			1.983	1.598		
			(2.75)***	(2.18)**		
Log CDO Excluding Balance-Sheet CLO					2.249	1.670
					(3.25)***	(2.31)**
Log loan amount	-1.005	-10.020	-1.478	-10.138	-1.753	-10.098
	(0.24)	(2.28)**	(0.35)	(2.30)**	(0.42)	(2.30)**
Maturity	-0.092	-0.266	-0.083	-0.262	-0.076	-0.259
	(0.82)	(2.07)**	(0.74)	(2.02)**	(0.69)	(2.01)**
Spread	-0.032	-0.034	-0.032	-0.034	-0.032	-0.034
	(1.90)*	(1.80)*	(1.95)*	(1.78)*	(1.97)*	(1.80)*
Loan multiple	0.583	-0.127	0.585	-0.132	0.617	-0.115
	(2.13)**	(0.48)	(2.14)**	(0.50)	(2.28)**	(0.43)

Log target total asset	3.607	9.946	3.876	10.087	3.763	9.978
	(0.88)	(2.37)**	(0.95)	(2.40)**	(0.93)	(2.38)**
Target cash flow	-5.756	70.409	-6.307	70.784	-4.822	70.876
	(0.16)	(2.19)**	(0.18)	(2.20)**	(0.14)	(2.21)**
Volatility of target cash flow	113.301	53.825	115.717	58.760	113.600	55.662
	(1.70)*	(0.89)	(1.74)*	(0.97)	(1.73)*	(0.92)
Number of lead banks	1.302	-1.772	1.380	-1.744	0.996	-1.865
	(0.41)	(0.62)	(0.43)	(0.61)	(0.31)	(0.65)
Bank size	2.160	-1.097	2.267	-1.015	1.717	-1.082
	(1.13)	(0.64)	(1.21)	(0.59)	(0.91)	(0.63)
Financial covenant		9.178		9.334		9.224
		(2.24)**		(2.26)**		(2.25)**
Pricing grid		1.787		1.640		1.765
		(0.47)		(0.43)		(0.46)
Financial ratio		6.663		6.610		6.616
		(1.87)*		(1.85)*		(1.86)*
No sponsor		6.026		5.521		5.864
		(0.88)		(0.81)		(0.86)
Rating_B		-1.673		-1.544		-1.912
		(0.33)		(0.31)		(0.38)
Rating_BB		-12.185		-12.208		-12.242
		(2.09)**		(2.09)**		(2.11)**
Rating_CCC		-5.363		-4.986		-5.466
		(0.69)		(0.64)		(0.70)
Year dummy	No	Yes	No	Yes	No	Yes
Constant	13.525	65.113	12.489	63.659	19.102	63.799
	(0.51)	(2.00)**	(0.48)	(1.96)*	(0.73)	(1.97)*
Observations	158	129	158	129	158	129

Table 7: The Effects of Lenders' CDO Size on Pricing and Covenant

This table reports coefficients for loan level OLS regression of spreads on term loan B tranches and marginal effects of probit regressions on the likelihood of covenant-lite loans. The dependent variable for the first four regressions is value-weighted average spreads, in basis points, of all term loan B tranches. The dependent variable for the last three probit regressions is 1 if at least one term loan B tranche is covenante-lite, and 0 otherwise. *Lender CDO size* is bank's CDO underwriting amounts as a percentage of bank asset, averaged across all lead banks. *Maturity* is value-weighted average maturity of all term loan B tranches. *Log loan amount* is logarithm of total borrowing of the loan, including all long-term tranches. This total borrowing amount divided by operating income (Compustat data13) yields *loan multiple*. *Target cash flow* is calculated as operating income divided by total assets (Compustat data6). Target financial ratios are measured in the last year before the LBO deal is announced. *Growth of target sales* is the average annual change in sales (Compustat data12) over the five years before the deal is announced, and *Volatility of target cash flow* is standard deviation of target cash flows over the five years before the deal. *Target industry cash flow* and *Target industry cash flow volatility* are the median cash flows (scaled by asset) for firms within the same Fama-French 48 industry in the year before the announcement and the median of standard deviation of cash flows (scaled by asset) within the five years before, respectively. *Number of lead banks* is the number of lead arrangers of the loan, and *Bank size* is logarithm of average total assets of lead banks in the year of the announcement. *Financial Covenant, Pricing grid, financial ratio,* and *No sponsor* are dummies for loans with financial covenant, pricing grid and financial ratio, and no sponsors, respectively. *Growth of GDP* is annual seasonally adjusted percentage change of GDP in the year. *Federal fund rate* and *Prime rate* are annual rates computed from average monthly federal fund rate and bank prime rate, obtained from Federal Reserve Bank. Rating dummies indicate if the loan is rated at BB, B, or CCC, respectively. Absolute values of t-statistics are in parentheses. ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels, respectively.

	Regression on Spread on Term Loan B				Probit on Covenant-Lite Loans		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lender CDO size	-13.539	-16.603	-20.759	-20.695	0.105	0.082	0.060
	(2.06)**	(2.53)**	(2.61)**	(2.52)**	(3.46)***	(3.48)***	(2.40)**
Log loan amount	28.803	35.304	12.854	25.837	0.121	0.030	0.072
	(0.97)	(1.19)	(0.33)	(0.64)	(1.86)*	(0.99)	(0.84)
Maturity	-0.191	-0.229	-0.936	-1.091	0.003	0.002	0.005
	(0.44)	(0.55)	(1.39)	(1.52)	(1.89)*	(2.45)**	(1.58)
Loan multiple	-11.234	-11.278	-7.079	-9.254	-0.002	0.001	0.001
	(2.04)**	(2.10)**	(1.08)	(1.34)	(0.55)	(0.44)	(0.11)
Log target total asset	-45.100	-42.937	-22.402	-33.898	-0.079	-0.032	-0.063
	(1.56)	(1.52)	(0.60)	(0.89)	(1.29)	(1.16)	(0.79)
Target cash flow	-172.341	-247.047	-101.417	-191.036	-0.637	-0.068	-0.155
	(0.82)	(1.20)	(0.40)	(0.72)	(1.16)	(0.28)	(0.27)
Growth of target sales	-0.055	-0.067	-0.053	-0.059	-0.001	-0.000	-0.000

	(0.76)	(0.95)	(0.66)	(0.73)	(0.37)	(0.21)	(0.08)
Volatility of target cash flow	-109.694	-95.325	-179.478	-102.641	-0.742	-0.184	-0.082
	(0.39)	(0.35)	(0.57)	(0.32)	(0.46)	(0.25)	(0.11)
Target industry cash flow	-170.436	-148.620	-125.837	-182.144	1.039	0.571	0.661
	(0.98)	(0.87)	(0.46)	(0.64)	(0.87)	(0.95)	(1.20)
Target industry cash flow volatility	37.882	107.542	180.244	222.825	1.364	0.625	0.512
	(0.13)	(0.37)	(0.52)	(0.64)	(0.91)	(0.91)	(0.77)
Number of lead banks		2.271	2.313	-1.192		-0.013	-0.039
		(0.19)	(0.17)	(0.09)		(0.59)	(1.35)
Bank size		-37.335	-50.481	-52.288		0.155	0.123
		(2.74)***	(2.68)***	(2.77)***		(2.67)***	(2.21)**
Financial covenant			-5.523	-1.922			-0.000
			(0.26)	(0.09)			(0.02)
Pricing grid			-32.397	-32.490			0.019
			(1.74)*	(1.73)*			(0.50)
Financial ratio			26.836	26.046			-0.002
			(1.51)	(1.40)			(0.07)
No sponsor			7.859	7.302			
			(0.23)	(0.21)			
Growth of GDP				4.048			-0.020
				(0.31)			(0.52)
Federal fund rate				-571.034			-0.046
				(1.42)			(0.08)
Prime rate				575.791			0.037
				(1.43)			(0.06)
Rating dummy	No	No	Yes	Yes	No	No	Yes
Constant	558.648	1,020.874	1,198.790	-510.327			
	(6.34)***	(5.39)***	(4.45)***	(0.42)			
Observations	113	113	99	99	118	118	95
R-squared	0.21	0.26	0.33	0.36			

Table 8: The Use of Bank Loans in Financing LBO Deals

This table shows the total use of long-term bank loans in financing the deal consideration. All loans sponsoring one deal are aggregated into one borrowing amount in this analysis. The sample consists of all the deals for which the amounts of bank loan borrowing are available, and is split into two subsamples at the median value of *lender CDO size*. *Lender CDO size* is defined as lead banks' CDO underwriting amounts in the year as a percentage of bank assets, averaged across all lead banks financing the deal. Contingent loans refer to revolvers. Non-contingent loans include all other long-term tranches. Total bank loans are the aggregate of the two. Fund needs are the total consideration paid by the acquirer, including fees and expenses, and are collected from proxy filings. In 39 deals when fund needs are not available, transaction values, which exclude fees and expenses, are used instead. EBIT is the target operating income (Compustat data13) in the year before the deal is announced. Interest is the total interest payment expected for the first year, and is estimated as the multiple of tranche amounts and expected interest rate, calculated as 6-month LIBOR at the effective date plus spreads. All the variables are winsorized at a 5% level in the whole sample. When the mean/median is different for the two subsamples, the significance of the difference is denoted with asterisks. ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels, respectively.

	Deals with SMALL *lender CDO size*			Deals with LARGE *lender CDO size*		
	N	Mean	Median	N	Mean	Median
Non-Contingent Loans						
Loan / fund needs	120	35.5%	29.0%	121	41.8%*	38.8%***
Loan / EBIT	114	2.76	2.11	109	4.63***	4.34***
EBIT / interest	86	4.69	3.79	98	3.64**	2.81*
Contingent Loans						
Loan / fund needs	120	27.2%	23.7%	121	18.3%***	10.9%***
Loan / EBIT	114	2.22	1.69	109	1.65**	1.30*
EBIT / interest	86	8.09	5.54	98	12.44***	10.08***
Total Bank Loans						
Loan / fund needs	120	64.8%	57.1%	121	60.7%	54.6%
Loan / EBIT	114	5.07	4.56	109	6.33***	6.00***
EBIT / interest	86	3.25	2.45	98	2.76*	2.15

Table 9: Regression of the Use of Bank Loans on Lender CDO Size

The dependent variables and the first independent variable are defined in Table 8. *Market equity* is data199*data25, and *market-to-book* is the sum of *market equity* and total debt (data9+data34) divided by total asset (data6). *Cash flow,* and *tangible asset,* are calculated as data13, and data1 over data6, respectively. *Book leverage* is total debt (data9+data34) over data6. *Growth of sales* is the average annual change in sales (Compustat data12) over the five years before the deal is announced, and *Volatility of ash flow* is standard deviation of target cash flows over the five years before the deal. *Industry cash flow* and *Industry volatility of cash flow* are the median cash flows (scaled by asset) for firms within the same Fama-French 48 industry in the year before the announcement and the median of standard deviation of cash flows (scaled by asset) within the five years before, respectively.

	Non-Contingent Bank Loan			Contingent Bank Loan			Total bank Loan		
	Loan /Fund Need (1)	Loan /EBIT (2)	EBIT /Interest (3)	Loan /Fund Need (4)	Loan /EBIT (5)	EBIT /Interest (6)	Loan /Fund Need (7)	Loan /EBIT (8)	EBIT /Interest (9)
Lender CDO size	0.032	0.590	-0.445	-0.015	-0.077	0.570	0.010	0.494	-0.348
	(1.94)*	(3.35)***	(1.86)*	(1.12)	(0.68)	(0.86)	(0.57)	(2.59)**	(2.47)**
Log total asset	-0.016	-0.001	0.005	-0.028	-0.287	1.558	-0.042	-0.261	0.284
	(1.21)	(0.01)	(0.03)	(2.65)***	(3.09)***	(2.84)***	(2.84)***	(1.67)*	(2.44)**
Cash flow	0.640	-8.240	13.701	0.685	-0.032	12.721	1.429	-10.407	8.355
	(2.38)**	(2.83)***	(3.30)***	(3.19)***	(0.02)	(1.10)	(4.84)***	(3.30)***	(3.41)***
Market-to-book	-0.046	1.404	-1.338	-0.104	-0.017	-0.571	-0.162	1.547	-0.885
	(1.35)	(3.82)***	(2.67)***	(3.83)***	(0.07)	(0.41)	(4.34)***	(3.88)***	(3.00)***
Book Leverage	0.091	-0.239	-0.220	0.066	0.627	1.710	0.175	0.179	-0.829
	(1.43)	(0.35)	(0.23)	(1.30)	(1.41)	(0.66)	(2.49)**	(0.24)	(1.50)
Volatility of cash flow	-0.307	-6.747	-11.220	-0.285	-5.944	-17.498	-0.591	-10.395	-2.170
	(0.57)	(1.16)	(1.38)	(0.66)	(1.58)	(0.77)	(1.00)	(1.64)*	(0.45)
Growth of sales	0.000	0.001	-0.002	-0.000	0.000	-0.005	-0.000	0.001	-0.002
	(0.01)	(0.25)	(0.69)	(0.43)	(0.03)	(0.59)	(0.37)	(0.25)	(0.94)
Tangible asset	0.110	0.514	-0.717	-0.039	-0.767	0.003	0.078	-0.098	-0.228
	(2.53)**	(1.09)	(1.13)	(1.13)	(2.53)**	(0.00)	(1.64)*	(0.19)	(0.61)
Industry cash flow	-0.073	1.154	-11.265	0.216	1.664	-1.785	0.084	2.316	-0.811

	(0.16)	(0.23)	(1.71)*	(0.58)	(0.51)	(0.10)	(0.16)	(0.42)	(0.21)
Industry volatility of cash flow	0.051	7.019	-16.300	-0.079	-1.753	2.900	-0.191	4.480	-4.362
	(0.07)	(0.93)	(1.64)*	(0.14)	(0.36)	(0.10)	(0.25)	(0.54)	(0.74)
Constant	0.325	2.148	7.090	0.432	4.185	-1.026	0.766	6.374	2.322
	(2.73)***	(1.67)*	(4.08)***	(4.55)***	(5.07)***	(0.21)	(5.88)***	(4.58)***	(2.27)**
Observations	222	222	184	222	222	184	222	222	184
R-squared	0.11	0.16	0.13	0.17	0.09	0.11	0.25	0.12	0.13

Table 10: LBO Pricing and Target Firm Characteristics

The sample consists of all the 345 LBOs and is split into two subsamples at the median value of *lender CDO size,* defined as lead banks' CDO underwriting amounts as a percentage of bank assets, averaged across all lead banks financing the deal. It is assigned to zero if no bank loan is identified to finance the deal. Transaction values are total consideration paid by the acquirer, including payment to holders of common stock, preferred stock, option, warrants and debt retired, but excluding fees and expenses. All the target financial ratios are measures in the last year before the deal is announced, and over the five years before, for volatility or growth measures. *Market equity* is data199*data25, and *market-to-book* is the sum of *market equity* and total debt (data9+data34) divided by total asset (data6). *Cash flow, CAPEX, tangible asset, tax payment,* and *cash* are calculated as data13, data128, data7, data16 and data1 over data6, respectively. *Book leverage* and *Free cash flow* are total debt (data9+data34) over data6 and (data12-data41-data189-data180-data16-data19-data21) over data12, respectively. *Operating margin* is data13/data12. *Premium* is percentage price premium of the offered price over the stock price one month before the deal. *Price/EBIT* is calculated as the transaction value divided by EBIT (data13) of the target in the year before the announcement, missing if EBIT is negative. *EBIT/price* is the reverse of *price/EBIT* but includes observations with negative EBIT. All of the three pricing measures are winsorized at a 5% level. When the mean/median differs for the two subsamples, the significance of the difference is denoted with asterisks. ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels, respectively.

	Deals with SMALL *lender CDO size*			Deals with LARGE *lender CDO size*		
	N	Mean	Median	N	Mean	Median
	Part A. Target Firm Characteristics					
Transaction value ($ml)	151	762.83	129.39	154	3044.77***	922.53***
Total asset($ml)	148	824.93	155.66	150	2513.99***	743.74***
Market equity($ml)	144	585.50	86.70	148	2144.19***	574.02***
Negative cash flow	154	0.149	0	154	0.006***	0
Cash flow	140	0.095	0.115	146	0.151***	0.143***
Market-to-book	148	1.061	0.911	150	1.231**	1.074***
Growth of asset	153	0.256	0.074	154	0.218	0.127*
CAPEX	144	0.057	0.036	149	0.056	0.040
Book Leverage	148	0.373	0.404	150	0.401	0.411
Tangible asset	137	0.598	0.497	146	0.535	0.437
Free cash flow	147	0.073	0.080	150	0.130***	0.106***
Tax payment	147	0.014	0.010	150	0.030***	0.024***
Volatility of cash flow	147	0.062	0.042	150	0.037***	0.028***
Volatility of growth in cash flow	143	1.853	0.426	147	0.721**	0.244***
Volatility of growth in operating margin	143	1.766	0.280	147	0.484**	0.168
	Part B. LBO Pricing					
Premium (%)	138	36.42	31.22	151	29.70**	28.29*
Price/EBIT	115	8.54	7.35	145	9.54	8.47**
EBIT/Price	137	0.137	0.118	146	0.136	0.116

Table 11: The Complete Financing Structure of LBO Deals

This table reports financing structure of the 235 deals for which the complete financing structure can be identified. The information is collected from proxy filings and supplemented with DealScan for bank loans and SDC for junk bonds. Fund needs, equity contribution, and asset-back finance are collected solely from proxy filings. The sample is split into two at the median value of lender CDO size, defined as the lead banks' CDO underwriting amounts as a percentage of bank assets, averaged across all lead banks financing the deal. It is assigned zero if no bank loan is used. Fund needs are the total consideration the acquirer needs to pay, including fees and expenses. Equity contribution includes investment from private equity sponsors and roll-over investors. When the mean/median differs for the two subsamples, the significance of the difference is denoted with asterisks. ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels, respectively.

	Deals with SMALL *lender CDO size*		Deals with LARGE *lender CDO size*	
	Mean	Median	Mean	Median
Number of Deals	117		118	
Fund needs ($ml)	854.37	186	4035.7***	1260***
Bank loan financing				
Revolver	14.5%	8.5%	13.9%	8.5%
Term loan	30.9%	27.3%	38.2%**	36.8%***
Other bank loan	4.9%	0	5.3%	0
Total bank loan	50.3%	50.0%	57.3%	52.2%*
Asset-backed finance	6.6%	0	3.3%	0
Junk bond/note & mezzanine	16.1%	8.3%	20.9%*	22.2%***
Equity contribution	33.8%	27.7%	34.0%	30.5%
Total financing arranged	106.7%	105.5%	115.5%*	108.0%
Total non-contingent financing arranged	92.2%	94.7%	101.6%*	97.5%*

Table 12: The Effect of Lender CDO Size on LBO Pricing

This table reports the OLS regression of the measures of LBO pricing (defined in Table 10) on lender CDO size. *Lender CDO size* is defined as lead banks' CDO underwriting amounts as a percentage of bank assets, averaged across all lead banks financing the deal. It is assigned zero if no bank loan is identified. *Industry cash flow* is the median cash flow (data13/data6) for firms in the same Fama-French 48 industry as the target firm in the year before the LBO deal is announced. *Industry volatility of cash flow* is the median value of within-firm standard deviation of cash flows over the five years before the announcement date across firms in the same Fama-French 48 industry. *S&P 500 return* and *S&P 500 P/E ratio* are the return and P/E ratio of S&P 500 index in the year when the LBO is announced. All other variables are defined in Table 10. Absolute values of t-statistics are in parentheses. ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels, respectively.

	Premium		Price/EBIT		EBIT/Price	
	(1)	(2)	(3)	(4)	(5)	(6)
Lender CDO size	-0.978	-1.538	0.156	0.069	-0.008	-0.008
	(0.74)	(1.14)	(0.56)	(0.26)	(1.52)	(1.43)
Log total asset	-2.571	-2.949	0.760	0.329	-0.014	-0.007
	(2.54)**	(2.96)***	(3.49)***	(1.56)	(3.36)***	(1.69)*
Market-to-book	-0.190	1.213	2.293	2.190	-0.028	-0.032
	(0.09)	(0.59)	(4.29)***	(4.08)***	(3.37)***	(3.93)***
Book leverage	10.081	9.314	-4.519	-4.505	0.122	0.120
	(2.01)**	(1.83)*	(4.36)***	(4.52)***	(6.29)***	(6.11)***
Free cash flow	-19.834	-22.909	-5.753	-3.559	0.148	0.138
	(1.83)*	(2.00)**	(2.11)**	(1.36)	(4.81)***	(4.36)***
Tax	15.385	0.697	6.705	10.868	0.088	0.127
	(0.44)	(0.02)	(0.86)	(1.43)	(0.63)	(0.90)
Industry cash flow	-43.640	-36.826	-14.264	-8.275	0.145	-0.026
	(1.87)*	(1.05)	(2.80)***	(1.12)	(1.63)	(0.20)
Volatility. of cash flow	45.335		8.652		-0.384	
	(1.29)		(1.00)		(2.80)***	
Volatility of growth of operating margin		-0.458		0.305		-0.003
		(1.67)*		(2.00)**		(2.53)**
Industry volatility of cash flow		8.005		9.546		-0.436
		(0.14)		(0.81)		(1.92)*
S&P500 return		-25.487				
		(2.57)**				
S&P500 P/E ratio				-0.266		0.003
				(4.88)**		(2.43)*
Constant	49.872	55.897	4.990	12.261	0.202	0.137
	(6.88)***	(6.31)***	(3.30)***	(5.27)***	(7.06)***	(2.94)***
Observations	269	259	260	252	281	272
R-squared	0.11	0.14	0.26	0.35	0.32	0.34

Figure 1: Size of the LBO Market

The sample of LBOs includes 345 deals, obtained from SDC, with the following criteria: 1) the deal is announced over the period of 1996 to the second quarter of 2008, and completed by 7/28/2008; 2) the target is in U.S. and publicly traded; 3) transaction value is greater than $10 million; 4) at least 50% of common shares are required in the deal, and the acquirers own 100% after the deal. The number of LBO deals counts the number of deals announced in each quarter, and the total value of deals aggregates transaction values of these deals. Transaction values are the total values of consideration paid by the acquirer, excluding fees and expenses.

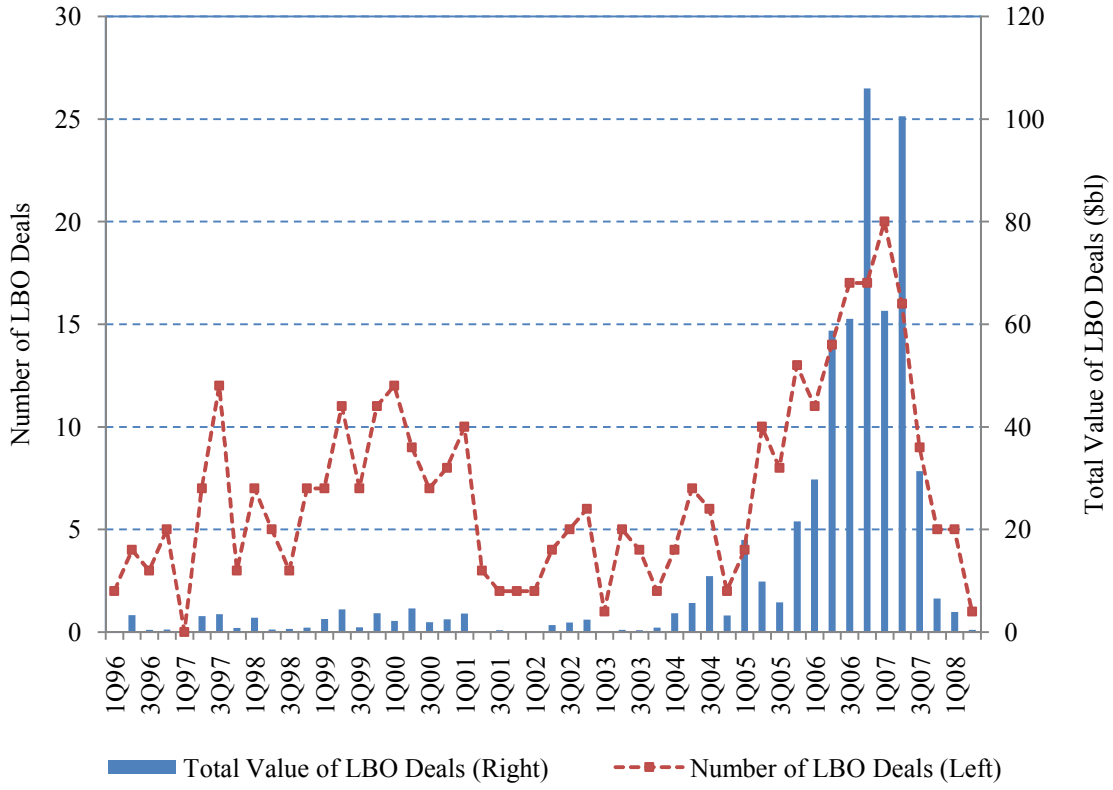


Figure 2: Size of the CDO Market

This figure aggregates the amounts of CDO issues in the ABS Database in each quarter.

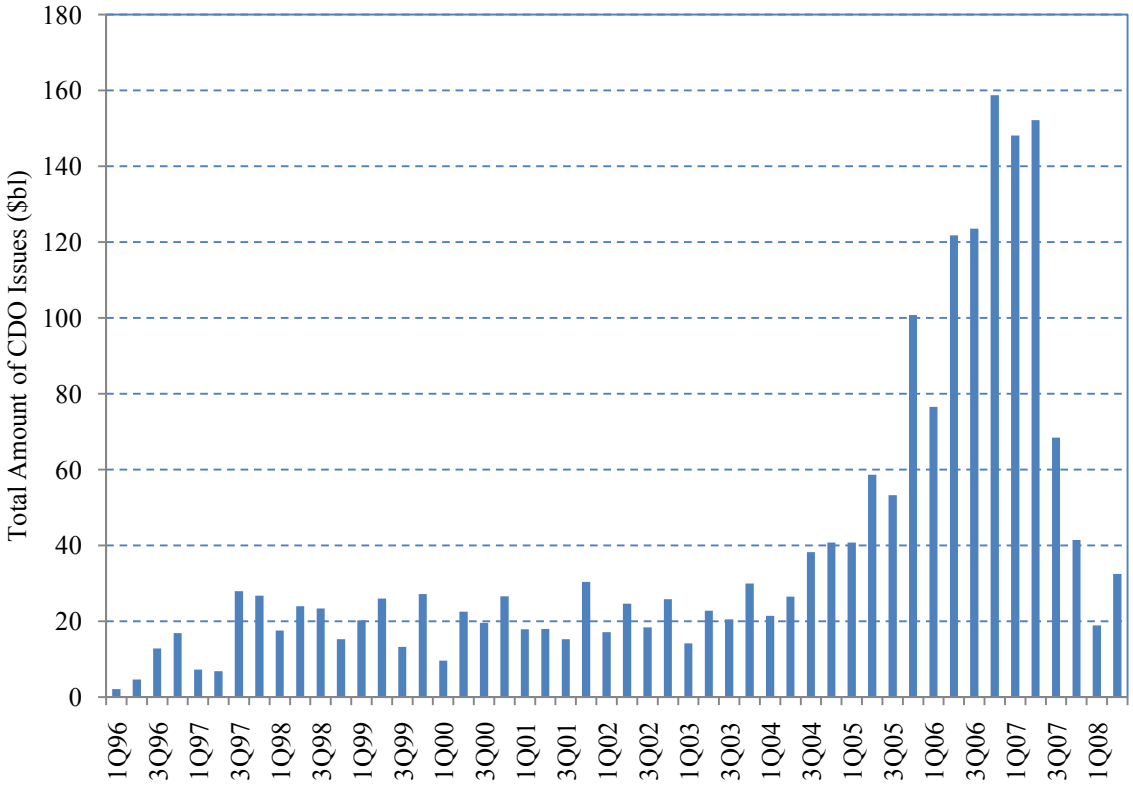


Figure 3: LBO Loans and Institutional Spreads for Leveraged Loans

This figure shows the aggregate amounts of bank loans financing the LBO deals in the sample, along with spreads of leveraged loans. The LBO loan sample includes 275 loans backing 241 of the 345 deals. Short-term borrowing, such as bridge loans, is excluded. The amount of a loan is credit to the quarter when the LBO deal is announced. The institutional spreads are obtained from LPC and shown for BB rated and B rated loans, respectively.

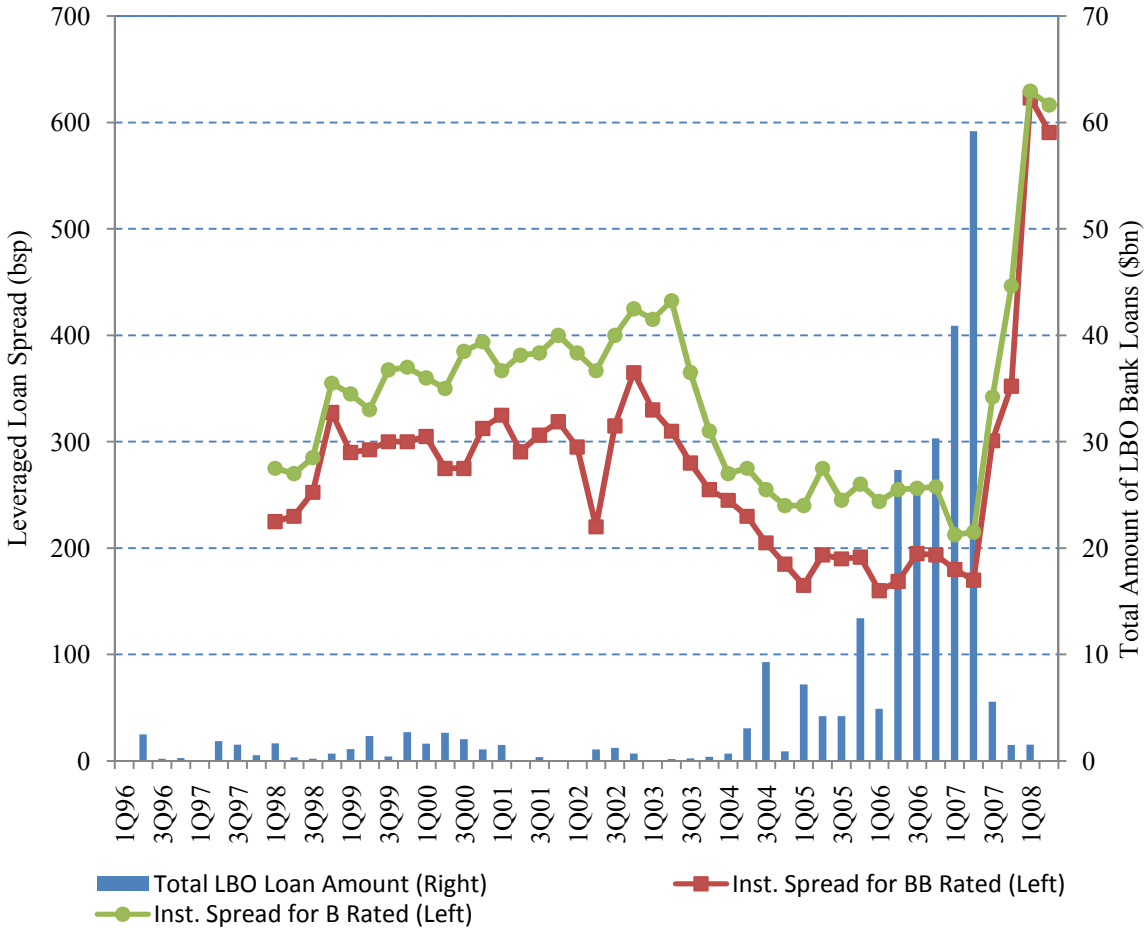
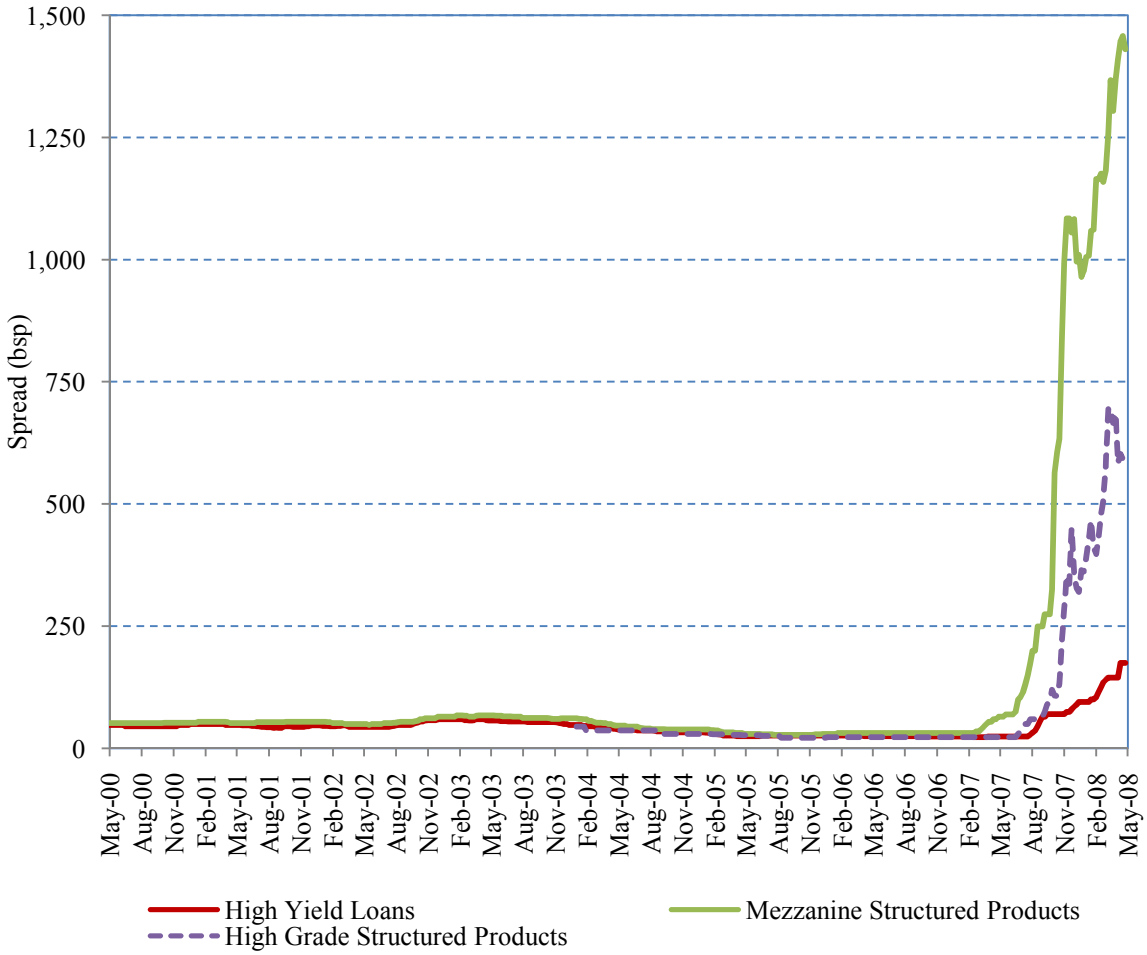


Figure 4: Weekly Spreads on AAA-Rated CDO Tranches

This figure plots weekly spreads on AAA-rated CDO tranches collateralized on high-yield loans, mezzanine structured products, and high-grade structured products, respectively. The data is obtained from JP Morgan.



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