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Relationship Banking and Loan Syndicate Structure: The Role of Private Equity Sponsors

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Abstract

Using a sample of syndicated loans to private equity (PE)-backed IPO companies, we examine how a third-party bank relationship influences the syndicate structure of a loan. We find that a stronger relationship between the lead bank and the borrower's PE firm enables the lead bank to retain a smaller share of the loan and form a larger and less concentrated syndicate, especially when the borrower is less transparent. A stronger PE-bank relationship also attracts greater foreign bank participation. Our findings suggest that the lead bank's relationship with a large equity holder of the borrower facilitates information production in lending.

Key Words: Third-Party Banking Relationship, Information Asymmetry, Private Equity, Syndicated Loan, Syndicate Structure, IPO

***JEL* Classification:** G21, G23

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1. Introduction

We examine how the relationship between a bank and a borrower's equity blockholder, which we call a third-party bank relationship, affects information production in lending. Using a sample of syndicated loans made to U.S. initial public offering (IPO) companies backed by private equity (PE) firms, we study the effect of the relationship between a bank and a PE firm on information production in the syndicated loans market.[1] For loans made to PE-backed IPO companies, we find that a stronger PE-bank relationship is associated with a lower lead bank share, a larger and less concentrated syndicate, and a higher probability of foreign bank participation, suggesting that PE-bank relationships facilitate information production in lending. These results also suggest that PE-bank relationships allow a PE-backed borrower to have better access to capital and make it possible for the lead bank to free up its capital and lend more to other borrowers.

Theories predict that PE-bank relationships can influence the informational environment of a PE-backed IPO company in taking a loan. When the PE firm possesses private information about the IPO company, a stronger relationship between the PE firm and the bank could catalyze a more efficient acquisition and sharing of information about the borrower, thereby reducing the lead bank's costs of due diligence and monitoring. However, the lead bank's relationship with the PE firm could augment the bank's informational advantage over other potential lenders, imposing undesired costs on the borrower if it sidelines the other lenders and leads to adverse selection/hold-up problems (Rajan, 1992). Even if PE-bank relationships lower the lead bank's due diligence and monitoring costs, the bank could have an informational monopoly that prevents it from sharing the

[1] PE firms are active players in the syndicated loans market and build relationships with banks (Ivashina and Kovner, 2011). PE firms often retain influential equity stakes and/or serve on the boards of their portfolio companies in the first several years after the companies go public (Cao and Lerner, 2009; Huang, Ritter, and Zhang, 2016). PE-sponsored IPOs include both reversed leveraged buyouts (RLBOs) and IPOs of private companies that were bought by PE firms and did not go through a public-to-private transition. The PE sponsor of an IPO is not necessarily the sponsor of a post-IPO loan. Unless the context suggests otherwise, a PE sponsor in this paper refers to the fact that the PE firm is the sponsor of the borrower's recent IPO, not the loan.

benefits with the borrower. It is also possible that PE-bank relationships no longer matter once the borrower becomes public. Therefore, it is an empirical question as of which effect, if any, of the PE-bank relationship on post-IPO lending dominates.

We study the effect of PE-bank relationship on loan syndicate structure, an important aspect of lending. The literature suggests that information asymmetries between a borrower and its lender(s) and within a lending syndicate are a critical determinant of the syndicate structure (e.g., Holmstrom and Tirole, 1997; Sufi, 2007; Ivashina, 2009; Gopalan, Nanda, and Yerramilli, 2011; Lin, Ma, Malatesta, and Xuan, 2012). The lead bank of a syndicated loan package conducts due diligence on the borrower and markets the loan package to a group of potential participant lenders. The lead bank is also responsible for ex post monitoring of the borrower during the life of the loan. Because the lead bank owns only a fraction of the loan but bears virtually all of the due diligence and monitoring costs, it has an incentive to shirk due diligence/monitoring responsibilities when its efforts are imperfectly observable to the participant lenders. Furthermore, the lead bank has an incentive to allocate a larger share of a lower quality loan to the participant banks (Gorton and Pennacchi, 1995). The participant banks are more concerned about these moral hazard and adverse selection problems when information asymmetries among the borrower, the lead bank, and the participant banks are greater. In equilibrium, the lead bank holds a larger fraction of the loan to mitigate the participant banks' concerns when there is greater asymmetric information.

We test two competing hypotheses. The *efficient information production hypothesis* posits that a stronger relationship between the PE firm and the lead bank reduces the costs for the lead bank to investigate and monitor the underlying borrower, and thus alleviate potential participant banks' concerns about the lead bank's incentive to shirk due diligence/monitoring responsibilities.

This hypothesis predicts a negative association between the lead bank's share of the loan and the PE-lead bank relationship. The *exclusive informational advantage hypothesis*, on the contrary, suggests that a stronger relationship between the PE firm and the lead bank elevates the lead bank's informational advantage over the participant lenders, which become more concerned about getting more of a lower quality loan. This hypothesis predicts a positive association between the lead bank's share of the loan and the PE-lead bank relationship.

We analyze syndicate structures for a sample of 291 syndicated loans to PE-backed IPO companies between 1995 and 2011. Our primary measure of a PE-bank relationship is the ratio of the total dollar amount of loans from this particular bank and sponsored by this particular PE firm over the total dollar amount of all loans sponsored by the PE firm during the past five years. Our findings strongly support the *efficient information production hypothesis*. Lead banks retain significantly smaller factions of loans made to PE-backed IPO companies when these banks have stronger prior lending relationships with the PE firms. A stronger PE-bank relationship also relates to a less concentrated syndicate (measured by the Herfindahl index of loan shares of all lenders in the syndicate). Economically, one of our regressions shows that a one-standard-deviation increase in the PE-bank relationship allows the lead bank to hold 6.44% less of a loan. For our sample of loans to PE-backed IPO companies, the average loan amount is $216 million with the average lead bank share of 51%. If we assume that the lead bank can only provide $110 million for a loan due to regulatory capital constraints, a 6.44% decrease from 51% to 44.56% in the lead bank share would imply an increase of $31 million in the loan amount to $247 million. Such an increase in credit supply can be important for many IPO companies.

Our results also suggest that PE-bank relationships and their effects on syndicate structure are beneficial to a lead bank. If the lead bank of a loan can hold 6.44% or $14 million less of the

loan when the PE-bank relationship increases by one standard deviation, the bank could hold $96 million instead of $110 million. If the bank has $1.1 billion to lend, it can hold a portfolio of 11.5 loans instead of 10 loans. Practitioners emphasize that a loan's yield on a stand-alone basis is often not attractive to a bank in terms of its risk-return tradeoff. The bank often evaluates a loan as a component of a portfolio of all businesses with the borrower (S&P, 2016). Lending to more companies can be very beneficial to a bank as it can develop relationships with more borrowers and gain opportunities of cross-selling other banking products.

The negative effect of PE-bank relationship on lead bank share and syndicate concentration is robust when we control for loan characteristics, the lead bank and PE firm reputations, the borrower-lead bank relationship, the lead bank's underwriting relationships with the borrower, and the borrower-participant banks relationship. These results are also robust with controlling for the lead bank and PE firm fixed effects.

The effect of PE-bank relationship on lead bank share could reflect a selection bias. A PE firm could select a bank with which it has a stronger relationship as the lead bank for a loan to a better portfolio company. To alleviate this concern, we use the strongest bank relationship of the PE firm measured prior to the current loan as the instrumental variable (IV). This IV correlates with the PE firm's relationship with the lead bank of the current loan, but it does not correlate with the borrower's quality because it is measured prior to the selection of the lead bank. The effect of PE-bank relationships on the lead bank's loan share in our two-stage least square (2SLS) regressions is qualitatively similar to that in the OLS regressions, suggesting that our results are not driven by the selection of a stronger relationship bank for a higher quality borrower.

Consistent with its role in reducing the lead bank share, a strong PE-bank relationship also attracts more lenders to the syndicate, increases the probability of having a non-U.S. participant

lender, and associates with a shorter syndication process. In the cross-section, the effect of PE-bank relationships is more pronounced for more informationally opaque borrowers. These findings provide further support for the *efficient information production hypothesis* rather than the *exclusive informational advantage hypothesis*.[2]

Taken together, our results shed new light on the scope of information production by financial intermediaries. The literature on relationship banking focuses on how the bilateral relationship between the borrower and its bank incentivizes information production (e.g., Sharpe, 1990; Rajan, 1992; Petersen and Rajan, 1994; Berger and Udell, 1995; Boot, 2000; Ongena and Smith, 2000; Bharath, Dahiya, Saunders, and Srinivasan, 2011). We show that the relationship between a borrower's shareholder and bank also facilitates information production. This is a new layer of bank relationship that has not been closely examined in the literature.

Our paper also sheds light on the benefits of relationship lending for banks. Ivashina and Kovner (2011) shows that the yield spread on a leveraged buyout (LBO) loan is negatively related to the PE sponsor's previous relationships with the lead lender. A lower loan spread benefits the borrower. We focus on lead bank share, a non-pecuniary measure. A negative association between PE-bank relationship and lead bank share can benefit both the borrower and the lead bank. The borrower can gain greater credit supply as the participant banks contribute more of the loan. The lead bank can free up its capital to lend more to other borrowers (Chu, Zhang, and Zhao, 2017), which can provide significant benefits to the bank in developing broader relationship lending.

Finally, our focus on post-IPO financing broadens our understanding of the long-term

[2] We also show that differences in syndicate structure is unlikely to be reflected or compensated for in loan pricing. In unreported results, we regress lead bank share on loan spread along with other control variables and find no significant association between lead bank share and loan spread. That is, lead banks retain a lower share but not at the cost of a higher spread for the borrower.

influence of PE firms as a special (and sometimes controversial) group of investors.[3] PE firms have significant equity stakes in an increasing number of U.S. companies. The fraction of U.S. IPOs backed by PE firms has increased substantially from the 1990s to the 2000s (Huang, Ritter, and Zhang, 2016). PE-backed IPOs tend to have better stock and operating performance than other IPOs (e.g., Cao and Lerner, 2009; Guo, Hotchkiss, and Song, 2011). Although they face less information asymmetry than private companies, new public companies are still prone to information asymmetry problems and often have great needs for external financing (Helwege and Liang, 1996; Bates, Kahle, and Stulz, 2009; Bouwman and Lowry, 2012; Hertzel, Huson, and Parrino, 2012). It is important if a PE sponsor can help an IPO company gain access to extra credit by alleviating informational problems faced by the company. Our results provide an explanation for the superior performance of PE-backed IPO companies.

2. Hypothesis development

In a syndicated loan, a group of lenders lend to a borrower and the lead bank originates the loan and performs due diligence and monitoring (Esty, 2001; Ivashina and Sun, 2011). Information asymmetries affect the syndication outcome (Holmstrom and Tirole, 1997). On one level, agency problems exist due to information asymmetries between the borrower and its lender(s). Costly due diligence and monitoring by the lender(s) is necessary to mitigate such problems (e.g., Harris and Raviv, 1979; Holmstrom, 1979; Smith and Warner, 1979). There are also incentive problems for the lead bank due to information asymmetry *within* the syndicate. Because the lead bank passes along a portion of the loan to the participant lenders, there is an adverse selection concern among the participant lenders that they receive more low quality loans. Because the lead bank is also the

[3] PE sponsors can bring in more effective monitoring to their portfolio companies and provide management with a stronger incentive to improve efficiency (Jensen, 1986; Kaplan, 1989). Alternatively, PE sponsors could gain via transferring wealth from other stakeholders (Shleifer and Summers, 1988; Warga and Welch, 1993).

"delegated monitor" of the syndicate, it has an incentive to shirk monitoring when its monitoring effort cannot be observed and thus fairly compensated by the participant banks (Diamond, 1984). Holmstrom and Tirole (1997) suggest that in equilibrium the lead bank has to hold a certain portion of a loan that it syndicates so the other lenders can be assured that the borrower is of acceptable quality and will be monitored properly. The lead bank has to take a larger fraction of a loan if the borrower requires more intense due diligence and greater monitoring effort. Consequently, if there exists a PE-bank relationship that can reduce due diligence and monitoring costs, more lenders will participate in the syndicate and provide more funding for the loan.

A prior relationship with a PE firm, who is often an informed equity blockholder, can help the bank to acquire valuable borrower-specific information. A PE firm is likely to possess some proprietary information, including "soft" information, on the IPO company that used to be part of its portfolio. PE firms engage in financial, governance, and operational engineering to enhance the valuations of their portfolio companies (Kaplan, Sensoy, and Strömberg, 2009; Gompers, Kaplan, and Mukharlyamov, 2015; Malenko and Malenko, 2015). Such efforts are likely to have a long-term effect on the companies (Cao and Lerner, 2009). Due to their considerable involvement in these companies before the IPO, PE firms could have a vision for the companies' investment plans, cash flow projections, etc. Such information can help a bank determine the borrower's future prospect. The PE firm could also hold private information about the characteristics of the borrower's management teams. Such knowledge can help a bank better assess the borrower's management competence.[4]

[4] A good example for a PE firm's "soft" information and influence is Blackstone's Hilton LBO. This is one of the most lucrative private equity deals in history: Blackstone made $9 billion profit at Hilton's IPO on December 13, 2013 on a $5.6 billion investment in the LBO deal. Blackstone bought Hilton in the fall of 2007, at the peak of the real estate boom. The deal's success is not due to its timing. Instead, the choice of Christopher Nassetta as CEO, Hilton's reconstructing for focusing on overseas markets and luxury brands, and Hilton's voluntary restructuring of its debt with its 26 creditors during the financial crisis are probably among the important reasons. Blackstone's expertise and bank relationships likely contributed to the success of the debt restructuring. See Willian D. Cohan's story on the

PE firms have the incentive to reveal information on borrowers to their relationship banks. PE firms generally still have large equity ownership in PE-backed IPO companies in the first few years after the IPO.[5] If reduced asymmetric information lowers financing costs of an IPO company, the PE firm would also benefit as a significant stakeholder. Even when the PE firm no longer has large ownership in a PE-backed IPO company at the time of the loan, its general partner(s) could still serve as a board member of the borrower. A PE firm's reputational concerns and ongoing interactions with its relationship lenders could also induce truthful revelation of borrower information (Huang, Ritter, and Zhang, 2016).

Taken together, the above arguments lead to our first hypothesis, which we call the *efficient information production hypothesis*:

> *H1: Efficient Information Production Hypothesis: All else being equal, a stronger PE-bank relationship facilitates the lead bank's information production about the borrower and thus allows a smaller lead bank share and a less concentrated lending syndicate.*

Nonetheless, it is possible that communication between the PE firm and the lead bank elevates the lead bank's informational advantage over potential participant lenders, who could become more concerned about potential adverse selection problems.[6] Information acquired by the lead bank via the PE firm-bank relationship channel could be "soft," thereby not easily transferrable. When the participant banks do not have the same access to such information as the lead bank does, they could peg a large loan allocation as a "lemon" regardless of its true credit

Hilton deal, "Blackstone's $26 Billion Hilton Deal: The Best Leveraged Buyout Ever", in *Bloomberg Businessweek* (September 11, 2014), for more details. Three Blackstone-affiliated directors remained on the board nearly one year after Hilton's IPO. So it is very plausible that, in any post-IPO lending to Hilton, the lenders would benefit from their relationships with Blackstone and from Blackstone's soft information and influence on Hilton.

[5] We hand-collected lead PE firms' equity ownership data from SEC filings at the time of loan inceptions. Among the 291 loans, we were able to identify PE sponsor's equity ownerships of 226 loans. The mean (median) equity holding of PE firm is 29.5% (22.2%).

[6] Relationships and communications with a third-party PE firm can help reduce the "distance" between the lead bank and the borrower (e.g., Hauswald and Marquez, 2006).

quality. If this adverse selection concern prevails, the lead bank must keep a large share of the loan to certify the loan quality. Therefore, a stronger PE-bank relationship would be associated with a larger lead bank holding of the loan. This leads to our alternative hypothesis, which we call the *exclusive informational advantage hypothesis*:

> *H2: Exclusive Informational Advantage Hypothesis: All else being equal, a stronger PE-bank relationship aggravates the potential participant banks' concern about getting greater allocations of a lower quality loan, so the lead bank has to retain a larger share of the loan and form a more concentrated lending syndicate.*

3. Data, variable definitions, and summary statistics

3.1 Data

To construct our sample, we start with 97,731 bank loans (a.k.a., facilities) to U.S. companies with an origination year between 1995 and 2011 in the DealScan database.[7] Among them, 34,687 facilities can be linked to the Compustat Annual database and the Center for Research in Security Prices (CRSP) database and have key Compustat and CRSP data available in the fiscal year prior to the facility start date.[8] We match these loan facilities to Thomson Reuters IPO data and find IPO information for 17,332 facilities. Information for the founding year of the IPO company is available for 17,224 facilities.[9] Key facility characteristics (facility amount, maturity, yield spread, performance pricing, and secured status) are available for 11,026 facilities. Among

[7] Multiple facilities can belong to the same loan package. All facilities in a package share the same contract terms such as covenants, but they differ in loan type (e.g., credit lines and term loans), maturity, yield spreads, and other features. Lender identities and their funding contributions are available at the facility level, so we focus on facilities.
[8] We downloaded the DealScan database from the Wharton Research Data Services (WRDS) in May 2013, together with the August 2012 version of the DealScan-Compustat link file. See Chava and Roberts (2008) for details about the link file. DealScan includes loans to private companies, which are excluded when CRSP data are required.
[9] The founding date of a RLBO company is the founding date of its predecessor company (Loughran and Ritter, 2004). We thank Jay Ritter for sharing the IPO founding year data.

them, we keep 4,223 facilities that are made within five years after the IPO.[10] We examine loans within five years after the IPO because PE firms have a reduced influence on their portfolio companies as the time goes on. We require the IPO date to fall between 1995-2011 because the SEC's Electronic Data Gathering, Analysis, and Retrieval system (EDGAR) filing information became available from 1995. As a result, we are able to collect and verify information on PE sponsors from the IPO prospectus. This requirement allows us to retain 2,973 of the 4,223 facilities.

For each of the 2,973 facilities, we follow Ivashina (2009) and Bharath, Dahiya, Saunders, and Srinivasan (2011) to identify its lead arranging bank(s). More specifically, if an administrative agent of a facility is identified, it is defined as the lead bank. If the syndicate does not have an administrative agent, lenders carrying the titles of agent, arranger, book-runner, lead arranger, lead bank, or lead manager are defined as the lead bank(s). We keep 2,920 facilities whose lead bank's role can be identified and whose market share information (as a proxy of reputation) can be computed. Of the 2,920 facilities, 824 facilities are made to PE-backed IPO companies.

Our analysis on the lead bank share requires a measure for the lead bank's contribution of funds as a fraction of the total facility amount. The DealScan database reports the number of lenders in a facility. For the facilities with only one lender, we set the lead bank share to 100%. The DealScan database provides information on the fraction, or share, of a facility amount contributed by each lender, but such information is unavailable for many facilities in the original database. Among the 2,920 facilities, 1,627 facilities have lender share information, including 291 facilities to 151 unique PE-backed IPO companies and 1,336 facilities to 759 non-PE-backed IPO

[10] Most loans during the first year after the IPO are also excluded because we require stock returns over the 200 trading days ending 11 days prior to the loan start date to compute the beta coefficient and the return volatility of each borrower's stock.

companies.[11] Our analysis focuses on the 291 facilities to PE-backed IPO companies.

Our focus on the post-IPO loan sample rather than LBO loans extends the literature on relationship banking and the role of private equity firms. First, PE firms on average have lower equity ownership in their portfolio companies in the first several years after the IPO than at the LBO. It is important to know whether PE firms continue to play an important role in alleviating information asymmetry problems facing their portfolio companies after the IPO when they have lower equity ownership. Second, the IPO of a company entails substantial changes in the company's informational environment, its bargaining power with regard to its lenders, the secondary trading market for its loans, and its ownership structure (e.g., Schenone, 2010; Saunders and Steffen, 2011). Whether a PE-bank relationship brings about benefits to public firms remains an open empirical question. Finally, the better availability of firm-level data in the post-IPO era enables us to control for a broader set of borrower characteristics as they have been shown to affect syndicate structures.

3.2 Variable definitions

Following the literature, we construct two measures of PE-bank relationship strength (e.g., Bharath, Dahiya, Saunders, and Srinivasan, 2007, 2011; Ivashina and Kovner, 2011). Our main measure, *PE-Bank Relationship ($),* is based on the dollar amount of previous loans. Suppose an IPO company takes a loan for which the lead bank is *m*. The company's IPO was sponsored by PE firm *k*. For this specific loan, PE firm *k*'s prior relationship with bank *m* is equal to the total dollar amount of loans sponsored by PE firm *k* from lead bank *m* of the current facility in the past five years scaled by the total dollar amount of loans sponsored by PE firm *k* in the past five years, using

[11] There are cases where shares of only some (but not all) lenders within a facility are reported. To ensure accuracy, we exclude such cases from our sample. We also drop those facilities with obviously incorrect lender share information (e.g. those facilities when lender shares add up to far more than 100%).

all sponsored loans in the DealScan database. The second measure, *PE-Bank Relationship (#)*, is based on the number of previous loans. It is equal to the total number of loans sponsored by PE firm *k* from lead bank *m* of the current facility in the past five years divided by the number of loan facilities sponsored by PE firm *k* in the past five years.[12]

An IPO company is sometimes backed by several PE firms (i.e., club deals). In these cases, the *PE-Bank Relationship* is the relationship between the primary PE sponsor and the lead bank. We define the primary PE sponsor as the one that has the largest equity stake in the company among all PE sponsors at the time of the IPO. If several PE sponsors have the same largest equity stake, we use the first one listed in the IPO prospectus. Our definition of a PE-bank relationship does not differentiate between individual funds under the same PE firm. For example, we would give "Castle Harlan Partners" 40% equity ownership if "Castle Harlan Partners II" fund has 10% and "Castle Harlan Partners IV" fund has 30% in an IPO company. Also, we follow Ivashina and Kovner (2011) to use the highest *PE-Bank Relationship* value when there are multiple lead banks in a facility.

The dependent variables in our regressions are the lead bank's share of the loan, syndicate concentration (measured by the Herfindahl index), syndicate size, foreign lender participation, and time-on-the-market (defined in Section 4.5). Their definitions, along with those of the explanatory variables, can be found in Appendix A1.

[12] PE sponsor names for each IPO company are hand-collected from the IPO prospectus and cross-checked with and matched to the DealScan loan sponsor names. We only include loans with PE firm *k* being listed as a loan sponsor when we calculate the relationship measure between PE firm *k* and bank *m*. That is, we do not include non-sponsored post-IPO loans to PE-backed IPO companies. We do so for two reasons. First, including these loans is unlikely to materially change our PE-bank relationship measures, because the number of sponsored loans in DealScan is much larger than the number of non-sponsored post-IPO loans to PE-backed IPO companies and because LBO loans are often larger than other loans. Second, the relationship measures based on sponsored loans are consistent with the literature (e.g., Ivashina and Kovner, 2011), and this makes our results more comparable.

3.3 Summary statistics

Table 1 reports the summary statistics for the full sample of 1,627 loans for which we have lender share information. We also report the summary statistics for the loans to PE-backed and non-PE-backed IPO companies separately. The *Lead Bank Share* is the fraction of a loan facility held by the lead bank. The mean value of this variable is 0.73 and the median value is 1 for the full sample.[13] Both the mean and the median values of the lead bank share are smaller for the loans to PE-backed companies than those for the loans to non-PE-backed companies. A similar pattern is observed for the *Herfindahl Index* of lender shares in a facility.

The mean value of *No. of All Lenders* per facility is 4.07 for the full sample. The loans to PE-backed companies tend to have a larger syndicate than the loans to non-PE-backed companies. A foreign lender is a participant lender for 20% of the loan facilities in the full sample. A foreign lender is more likely to be a participant lender for the loans to PE-backed IPO companies than for the loans to non-PE-backed IPO companies.

The average *All-In-Spread Drawn* for the full sample is 241.20 basis points. On average, PE-backed IPO companies carry a lower overall loan cost than other IPO companies.[14] On average, the loans to PE-backed companies are larger and have longer maturities than those to other IPO companies.

In summary, relative to the loans to other IPO companies, the loans to PE-backed IPO companies are larger, and have lower yield spreads, longer maturity, a lower lead bank share, a larger and more concentrated syndicate, and a higher probability of foreign bank participation.

[13] Our average lead bank share is larger than those reported in Sufi (2007) and Gopalan, Nanda, and Yerramilli (2011) for two reasons. First, we set the lead bank share to 100% if the lead bank share is missing and the number of lenders equals one, while they exclude all loans when the lead bank share is missing. Second, the size of loans in our sample is much smaller than that in theirs.

[14] In unreported regressions, we find that PE sponsorships and PE-bank relationships help lower the net loan yield spreads (the all-in-spreads after upfront fees), but there exists no significant relations between PE-bank relationships and the all-in-spreads.

These results suggest that banks share some of the benefits of PE-bank relationships with borrowers.

The average value of the continuous measure for the PE-bank relationship constructed using the dollar amount, *PE-Bank Relationship ($)*, is 0.13 for the subsample of 291 loans to PE-backed companies with non-missing lender share information. The continuous measure for the PE-bank relationship has similar mean values when it is constructed using the number of deals. The lenders to PE-backed IPO companies have a larger market share (*Lead Lender Reputation*) and are more likely to have a prior lending relationship with the borrowers (i.e., a smaller mean value for the *New Lender Dummy*).

Table 1 also reports the summary statistics of key borrower-specific characteristics at the time of loan origination. With an average age of 18.26 years, the companies in our full sample tend to be younger than the bond issuers in Huang, Ritter, and Zhang (2016). This is consistent with Diamond (1989), who reports that younger companies tend to use private bank debt. On average, PE-backed IPO companies have higher leverage than other IPO companies, consistent with the conjecture that PE-bank relationships allow PE-backed companies to borrow more.

4. Regression results

4.1 PE-bank relationship and syndicate structure: Baseline regressions

We first estimate our baseline ordinary least squares (OLS) regressions of the effect of PE-bank relationships on loan syndicate structures for the sample of the 291 loans to PE-sponsored IPO companies. The analysis using the PE-backed sample provides a cleaner test of the PE-bank relationship effect because we can largely ignore possible differences in loan syndicate structure caused by the general effect of a PE firm.

Table 2 reports the results. In all regressions in this table, as well as in the subsequent tables,

we take advantage of the financial data availability for these IPO companies in our sample and control for many company-level proxies for borrower risk. We also include year dummies to capture changes in the macroeconomic environment, and Fama-French 17 industry dummies to control for industry effects.[15] Loan type and deal package purpose fixed effects are also included to account for differences among loans that are used for diverse corporate aims. For brevity, the coefficients on these dummy variables are not reported.

Panel A of Table 2 presents the estimated effect of PE-bank relationships on the share held by the lead bank. In model (1), we use the continuous measure of prior lending relationship between the PE firm and the lead bank, *PE-Bank Relationship ($)*. The coefficient on this variable is -0.28 and is statistically significant at the one percent level. This result suggests that, after controlling for observable borrower characteristics, a stronger prior PE-bank relationship results in a significantly smaller share held by the lead bank in the loan. We find a similar effect if we use the *PE-Bank Relationship (#)* as an alternative measure of relationship strength in model (2). These results are consistent with the *efficient information production hypothesis*.

The coefficient on *PE-Bank Relationship ($)* in model (1) is also economically meaningful. A one-standard-deviation increase in the *PE-Bank Relationship ($)*, which is 0.23 as reported in Table 1, decreases the share of the lead bank by 0.28×0.23=6.44%. Given that the average amount for the sample of loans to PE-sponsored IPO companies is about $215.81 million, a 6.44% decrease in the lead bank share is roughly equivalent to a $13.9 million reduction of required capital contribution by the lead bank. In the syndicated loans market, a bank's capital level is shown to

[15] The lead bank that has a strong relationship with the borrower's PE firm could have too much exposure to the PE firm's portfolio companies. Consequently, the lead bank could have an incentive to reduce its share of the loan to the PE-backed borrower. Our controls for borrower risk, industry fixed effects, and year fixed effects should help alleviate such risk-management influences on our major results on the role of PE-bank relationships in alleviating information asymmetry problems in lending.

have a significant effect on the size of funding that the bank can contribute to a loan (Chu, Zhang, and Zhao, 2017). For our sample, a bank can use $1.1 billion in capital to fund ten loans on average for PE-backed IPO companies (the average contribution of funding is $110 million, or 51% of the average loan size of $215.8 million as reported in Table 1). If the bank can use $13.9 million less of its capital for a loan, $1.1 billion would fund 11.5 loans. Banks rely on relationships with borrowers and cross-selling, as the risk-return tradeoff for a loan on a stand-alone basis is often not attractive for the bank due to capital regulations (S&P, 2016). The 15% increase from 10 to 11.5 loans can benefit the bank as it can gain more opportunities to establish relationships with borrowers.

PE-bank relationships can also benefit the borrower by increasing its credit supply. If the lead bank can only contribute $110 million (51% of a $215.8 million loan), a reduction in lead bank share from 51% to 44.56% implies that the loan size will be increased from $215.8 million to $246.9 million. A $31 million increase in credit supply can be important for an IPO company.

Panel B of Table 2 reports similar effects of PE-bank relationships using the *Herfindahl Index*. This finding again supports the *efficient information production hypothesis*: When a strong PE-bank relationship facilitates information acquisition, the lead bank can form a less concentrated syndicate (i.e., have a broader loan investor base). In summary, the baseline results reported in Table 2 suggest that PE-bank relationships can facilitate information production in lending, and can benefit both the lead bank (more lending and cross-selling opportunities) and the borrowing company (greater credit supply).

4.2 PE-bank relationship and syndicate structure: Expanded regressions

In this subsection, we estimate expanded regressions to address some concerns about other confounding factors that could drive our baseline results. First, it is possible that both the borrower

and the PE firm have a relationship with the lead bank. We check to see whether the PE-bank relationship is important after controlling for the borrower-bank relationship.[16]

Second, the reputation concern of a lead bank could deter it from shirking monitoring (Diamond, 1989; Chemmanur and Fulghieri, 1994). A lender's good reputation can also certify its ability of information collection as well as the quality of a borrower. Thus, we control for a lender's market share in the syndicated loan market in dollar amount in the five years prior to the current loan as a proxy for the lender's reputation. Another reason to control for lender reputation is that this variable could be correlated with PE-bank relationships because a lender with a larger market share would naturally have a higher probability to be selected as the lead bank in a deal.

Third, a lead bank can use certain loan characteristics as alternative means to demonstrate its commitment to information collection and monitoring (e.g., Rajan and Winton, 1995; Cerqueiro, Ongena, and Roszbach, 2016). If PE-bank relationships affect the lead bank's incentive to acquire information, they could influence the usage of covenants and collateral. Thus, we control for loan covenants and collateral requirements to avoid the potential problem of omitted variables . A lead bank will probably hold a smaller share when the loan is larger (Sufi, 2007). If some banks lead larger loan deals more often, they could form stronger relationships with PE firms, resulting in a negative relation between PE-bank relationships and the lead bank share. Thus, we control for loan size to alleviate such effects.

Finally, we control for a PE firm's reputation in the syndicated loans market. A PE firm would become more recognized as they repeatedly access the loan market. A PE firm with good

[16] In our sample, PE-backed IPO companies include those that had been through leveraged buyouts and those that had never been public before the IPO. A borrower, especially a company that had never been public before the IPO, could have developed a relationship with a bank through the help of the borrower's PE sponsor. Therefore, borrower-bank relationships at least partially capture the effect of PE-bank relationships. Our controlling for the borrower-bank relationship thus biases against us finding an effect for the PE-bank relationship.

reputation could also mitigate information asymmetry problems of the borrowing company (Demiroglu and James, 2010; Huang, Ritter, and Zhang, 2016). We use the natural log of total dollar amount of borrowing by a PE firm in the past five years to represent its reputation in the loan market and control for it in our regressions.

We present the expanded regression results with the aforementioned additional control variables in Table 3. Before we discuss the results, note that our reduced-form baseline models in Table 2 have the advantage of avoiding potential endogeneity problems associated with the simultaneous determination of the aforementioned control variables and the dependent variable. In Table 3 we only report the results using the PE-bank relationship measures based on previous deal amounts. Our results using the relationship measures based on the number of previous deals are qualitatively similar.

Panel A of Table 3 reports the regression results using the lead bank share as the dependent variable. The dependent variable in Panel B of Table 3 is the *Herfindahl Index,* with results similar to those in Panel A of Table 3. Our discussion will focus on Panel A of Table 3. Model (1) in Panel A of Table 3 is the same as model (1) in Table 2 except that we include a number of loan characteristics as additional control variables. We control for the *Lead Lender Reputation, New Lender Dummy* (as a control for borrower-bank relationship), and *PE Firm Reputation* in model (2) in Table 3. After controlling for observable loan characteristics, borrower-bank relationship, and bank and PE reputation, a strong PE-bank relationship still significantly reduces the lead bank share. The coefficients on the *PE-Bank Relationship ($)* change little compared to those in Panel A of Table 2 and are still statistically significant at the one percent level.

In model (2) of Panel A of Table 3, the coefficient on the *New Lender Dummy* is 0.12 and is statistically significant at the one percent level. This result indicates that, all else being equal,

lending to a new borrower requires the lead bank to hold more of the loan to signal commitment for information production. The coefficient on the *PE-Bank Relationship ($)* is also statistically significant at the one percent level, suggesting that PE firm-bank relationship is at least as important as borrower-bank relationship in facilitating information production.

The coefficients on the *Lead Lender Reputation* and *PE Firm Reputation* are negative but not statistically significant, providing some weak evidence that reputations of the lead bank and the PE sponsor could mitigate information asymmetry problems.

4.3 Endogeneity of PE-bank relationships

In this subsection, we conduct more robustness tests to show that our main findings are likely to be causal. First, we re-estimate both the baseline and the expanded regression models using a lead bank fixed effects model. The lead bank fixed effects model removes any effects that time-invariant bank characteristics might have on the association between PE-bank relationships and the lead bank share. We present the regression results in models (1) and (2) in Panel A of Table 4. Our main finding is robust to the inclusion of lead bank fixed effects.[17]

In models (3) and (4) of Panel A of Table 4, we report the results using the PE firm fixed effects models. It is possible that some consistently good quality PE firms tend to have a stronger relationship with a particular bank (because the bank is willing to work closely with a good PE firm) and a good quality PE firm has a higher likelihood of being the backer of a sound IPO company. Hence, the association between PE-bank relationship and lead bank share we have discovered could merely reflect the unobservable PE firm quality. Using the PE sponsor fixed

[17] The sample used in the regressions with lead-bank fixed effects has 287 observations, four observations less than the 291 observations in the early regressions. We use the average share of lead banks as the dependent variable when there are multiple lead banks in a facility in previous analysis. This presents a problem in the lead bank fixed effect model since we cannot determine which lead bank's fixed effect to include. Thus, we only use the 287 loans with exactly one lead bank.

effects model, we are estimating the effect of within-PE variation in the relationship variable on the lead bank share, while controlling for time-invariant (both observable and unobservable) PE firm quality. The results after controlling for PE sponsor fixed effects, regardless of the model specifications, are in line with our previous results.[18]

An endogeneity problem could also arise from the selection process of an IPO company-bank pair. Although a PE firm is not necessarily in charge of choosing the lender for a portfolio company after the IPO, it could still propose its relationship bank(s) to its IPO companies. A PE firm could be inclined to recommend a relationship bank to an IPO company with publicly unobservable but better credit qualities that requires less efforts for due diligence and monitoring, resulting in a negative relation between our PE-bank relationship measure and the lead bank share. In this case, the strength of PE-bank relationships would relate to the unobservable qualities of the IPO company.[19] We use an instrumental variable (IV) approach to deal with this endogeneity problem. The IV that we use is the highest bank relationship that a PE firm has immediately prior to the loan inception. This highest bank relationship value captures a PE firm's propensity to use a relationship bank again in the current deal, but it is unrelated to the IPO company's characteristics because it is pre-determined.[20]

We present the two stage least square (2SLS) regression results in Panel B of Table 4. In

[18] In unreported tests, we also include both lead bank and PE sponsor fixed effects. We find that the coefficient on the PE-Bank Relationship ($) remains negative but becomes statistically insignificant. Since we only have 291 observations, the inclusion of both fixed effects substantially consumes the statistical power of these tests.

[19] In unreported results, we estimate IPO firm fixed effects models. Although the coefficient estimates on the *PE-Bank relationship ($)* are still negative, they are not statistically significant. This is likely due to the fact that few IPO companies have multiple loans in our sample. One could also argue that PE firms could bring more challenging deals to their relationship banks. Since more challenging deals would require the lead banks to retain a greater loan share, this argument suggests a positive effect of PE-bank relationships on the lead bank share. This positive effect biases against our findings, so this argument is not a concern for us. We also want to point out that the selection bias that we try to deal with using IVs can be weak, as a PE firm may not have a strong reason to bring a borrowing company with either a good quality or a more challenging deal to a certain relationship bank.

[20] In an unreported test, we obtain very similar results if we use the highest PE-bank relationship measured six months or one year prior to the loan inception.

models (1) and (3), we report the first stage regressions under the basic and expanded model specifications, respectively. In these first-stage regressions, the *Highest Bank Relationship ($)* is positively related to the dependent variable, *PE-Bank Relationship ($).* This is consistent with our conjecture that a PE firm that has traditionally relied on one or more relationship banks is more likely to choose a relationship bank in a subsequent deal. In models (2) and (4), we report the respective second stage regression results. The effect of the *PE-Bank Relationship ($)* on the lead bank's share remains negative and statistically significant at the one or five percent levels, suggesting that potential endogeneity related to the selection of banks is not responsible for our early regression results in Tables 2 and 3. The Cragg-Donald Wald *F*-test statistic rejects the null hypothesis of weak instrument.

4.4 Cross-sectional heterogeneity of PE-bank relationship effects

Our *efficient information production hypothesis* suggests that PE-bank relationships would be more useful for less transparent companies, which require greater due diligence and monitoring costs. We shed further light on how the effect of PE-bank relationships on syndicate structure varies depending upon the borrowing company's informational opaqueness.

In Table 5, we consider three widely used proxies for information opaqueness of a borrowing company. The first proxy is average total asset size in the previous two years. A larger company has a relatively lower degree of information asymmetry. We partition our sample using the sample median of the average total assets and re-estimate the regressions for the two subsamples separately. In Panel A, it is clear that the effect of the *PE-Bank Relationship ($)* on the lead bank share is much stronger among smaller IPO companies. For smaller IPO companies that require more costly information production, having their PE sponsors connected with the lead banks significantly reduces the loan shares that the lead banks need to hold.

The other two proxies for ex ante information asymmetry are constructed according to an IPO company's research analyst coverage. We obtain analyst coverage data from the Thomas Reuters I/B/E/S database and calculate the standard deviations of analyst recommendations and analyst earnings-per-share (EPS) fiscal year 1 (FY1) forecasts for the year prior to the loan inception. We use analyst recommendations and EPS forecasts that were issued before a loan inception date and are still valid by the time of the loan inception. A more opaque company should be associated with a greater dispersion in analyst recommendations or EPS forecasts. In Panel B and Panel C, we show that the effect of the *PE-Bank Relationship ($)* on the lead bank share is much more pronounced among companies for which the dispersion in analyst recommendations or the dispersion in EPS forecast is greater. These results again imply that the PE-bank relationship is a particularly important channel of information transmission among more informationally opaque companies.

4.5 Syndicate size, foreign bank participation, and syndication speed

So far, our results on the effect of PE-bank relationships on the lead bank share support our *efficient information production hypothesis*. We then examine the effect of PE-bank relationships on some related syndicate characteristics, controlling for the effects of other variables. Table 6 reports the results. Our discussions below focus on the effect of PE-bank relationships.

First, we examine syndicate size as an alternative measure of syndicate concentration. Panel A in Table 6 reports the estimation results. The dependent variable is the total number of lenders of a loan facility. Because this variable is a count number, we estimate Poisson regressions.[21] In column (1) of Panel A, we estimate the baseline model. The coefficient on the

[21] We retain loans which have only one lead bank. We also winsorize the total number of lenders at 10 (i.e., for loans with more than 10 lenders, we set the total number of lenders to 10).

PE-Bank Relationship ($) is positive and statistically significant at the ten percent level. Economically, a one-standard-deviation increase in this variable (0.23) increases the total number of lenders by 0.38 (0.23×0.32×5.14 = 0.38). In column (2) of Panel A, where an expanded model with additional control variables is estimated, the coefficient on the *PE-Bank Relationship ($)* remains positive and statistically significant at the ten percent level. These results suggest that a stronger PE-bank relationship is associated with a greater number of participant lenders, providing further support for the *efficient information production hypothesis*.

Next, we explore the effect of PE-bank relationships on loan syndicate composition to offer additional insight into how PE-bank relationships mitigate information asymmetry-related issues. We focus on one feature of syndicate composition – the participation of foreign lenders in a syndicate. Because foreign banks are geographically farther away, they are presumably more sensitive to asymmetric information issues when they participate in syndicated lending to U.S. borrowers (Stein, 2002; Esty, 2004; Sufi, 2007; Lin, Ma, Malatesta, and Xuan, 2012). Thus, we conjecture that a strong PE-bank relationship is associated with a greater chance of having one or more foreign lenders in the syndicate as it helps alleviate information asymmetries between the borrower and its lenders. We estimate a Logit model to assess the effect of PE-lead bank relationships on the probability of having a foreign participant lender.[22]

We present the regression results in Panel B of Table 6. For the baseline model in column (3), the coefficient on the variable *PE-Bank Relationship ($)* is positive and statistically significant at the ten percent level. Economically, if we change the actual value of this variable for each observation from one standard deviation below to one standard deviation above its actual value,

[22] Among the 291 facilities to PE-backed IPO companies, about 37.1% of them have one or more foreign lender presence. A foreign lender is present for approximately 19.6% of the full sample of the 1,627 facilities to both PE-backed and non-PE backed IPO companies.

without changing the actual values of other independent variables, the predicted average likelihood of foreign lender participation increases by about 30.3% (e.g., from 10% to 40.3%). In column (4) with additional controls, the coefficient on the *PE-Bank Relationship ($)* remains positive and becomes statistically significant at the one percent level. These findings indicate that a stronger PE-bank relationship significantly increases the odds of having a foreign lender in the syndicate, again consistent with the notion that PE-bank relationships mitigate information asymmetry-related issues in lending.[23]

Finally, we study the speed of the loan syndication process to provide additional evidence on the effect of a PE-bank relationship. Ivashina and Sun (2011) suggest that time-on-the-market (TOM), which is defined as the number of days from the start of syndication to the completion of a loan, captures the demand for the loan. We conjecture that, if other potential lenders acknowledge that the lead bank's relationship with the PE firm lowers the cost of information production and monitoring and, as a result, the lead bank's moral hazard issue is of less concerns, they will bid more aggressively for the loan and the overall loan demand would be greater. Thus, all else being equal, a stronger PE-bank relationship will be related to a shorter TOM for the loan.

In Panel C of Table 6, we regress TOM on *PE-Bank Relationship ($)* along with the control variables. Because the number of days is an integer count number greater than zero, we again estimate Poisson regressions. Also, due to the fact that a large portion of time-on-the-market information is missing in DealScan, we do not require a loan to have non-missing lead bank share to include it in this sample. We also include the loans to non-PE backed IPO companies to ensure that we have a reasonable sample size. To control for the difference between the PE-backed and

[23] In untabulated analysis of the sample of 824 loans to PE-backed IPO companies without requiring lead lender share information, we also find evidence that a stronger PE-bank relationship is associated with a larger syndicate size and a higher likelihood of foreign bank participation in the syndicate.

non-PE backed loans, we add a dummy control variable, *PE Sponsor Dummy*, to indicate whether a loan is to a PE-backed IPO company (=1) or not (=0). For the loans to non-PE backed IPO companies, their PE-bank relationships are set to zero. From the regression results in Panel C of Table 6, we can see that a stronger PE-bank relationship does lead to a shorter syndication process. The coefficient on the *PE-Bank Relationship ($)* is negative and statistically significant at the ten and five percent levels in column (5) and column (6), respectively. Economically, a one-standard-deviation increase in this variable decreases loan syndication time by over 10% or 3.21 days (0.23×(-0.45)×31.05=-3.21) in column (5). The fact that a stronger PE-bank relationship results in a shorter loan syndication time adds further support to our *efficient information production hypothesis*.

4.6 PE-bank relationship and lead bank share: More robustness checks

We present an array of additional robustness checks in Table 7. To save space, we only report the results using the expanded OLS specification. Using the baseline model specification yields very similar results.

We first investigate whether the negative effect of PE-bank relationships on the lead bank share is caused by the joint lending and underwriting relationships between the borrower and the lead bank. A company can use the same bank for both borrowing and underwriting (see, e.g., Drucker and Puri, 2005; Bharath, Dahiya, Saunders, and Srinivasan, 2007). To rule out the possibility that this underwriting channel is the main driver for our early results, we check whether the lead bank was also a lead underwriter of the borrowing company's IPO for each of the 291 loans to PE-backed companies. There are 38 loans that have overlapping lead banks/underwriters.

We include a dummy variable, *Lead Bank-IPO Underwriter Overlapping Dummy*, in our expanded regression for the sample of loans to PE-backed IPO companies as a control variable.

The *Lead Bank-IPO Underwriter Overlapping Dummy* variable equals one if the lead bank of the current loan was the lead or one of the lead underwriters of the borrowing company's IPO, and it is set to zero otherwise. We report the regression results in Panel A of Table 7. The coefficient on the *Lead Bank-IPO Underwriter Overlapping Dummy* variable is not statistically significant. The coefficient on the *PE-Bank Relationship ($)* is virtually the same as in Table 3. These results suggest that the underwriting channel cannot explain our earlier results.

It is possible that PE firms also have relationships with participant lenders. These relationships could also alleviate information asymmetry problems in lending (Sufi, 2007). In Panel B of Table 7, we check to see whether these relationships drive our earlier results on the PE sponsor's relationships with the lead bank. For each participant lender in a loan, we compute a similar measure for its relationships with the PE sponsor as the ratio of the dollar amount of loans from this particular bank to this PE firm's portfolio companies over the dollar amount of all loans to the PE firm's portfolio companies during the past five years. We set the *PE-Participant Relationship ($)* to the maximum relationship measure for all participant lenders in the loan, and set it to zero for sole lender loans. The effect of the PE firm's relationships on the lead bank share is qualitatively similar whether we control for the PE firm's relationships with the participant banks or not.[24]

In Panel C of Table 7, we show that the effect of PE-bank relationships on the lead bank share is robust to the usage of a Tobit model that deals with a censored dependent variable.[25] In Panel D of Table 7, we present the package level results. We regress the package level bank share

[24] A large PE firm can have relationships with many banks and such relationships make the participation of these banks in the syndicate more likely. We control for the reputation of the PE firm in our expanded regressions, although it has little effect on syndicate structure measures. More importantly, such network of relationships does not explain why the relationships between the lead bank and the PE sponsor reduce the lead bank share.

[25] The original dependent variable, *Lead Bank Share*, has a lower limit of 0 and an upper limit of 1. Although it is unlikely that any artificial censoring is involved, we still make sure that our results are robust.

on a PE-bank relationship measure and the control variables. The 291 facilities made to PE-backed IPO companies correspond to 187 packages. From Panel D of Table 7, we can see that the package level estimation results are, qualitatively and quantitatively, similar to the facility level results.[26] In Panels E and F of Table 7, we that our finding remains intact if we focus on revolving credit lines and term loans separately.

Additionally, we examine the effect of PE-bank relationships on the lead bank share for a subsample of leveraged facilities.[27] If a strong PE-bank relationship lessens the participant banks' concern about the lead bank's moral hazard problem, we expect this effect to be more pronounced among leveraged facilities since riskier borrowers require more intensive screening and monitoring. Compared with the previous estimation results using all loan facilities, the estimated coefficients on the *PE-Bank Relationship ($)* for the leveraged subsample remain negative and increase in their economic and statistical significance. Also, our initial measure for a PE firm's reputation is the total dollar amount of loans sponsored by the PE firm in the past five years. This measure could be subject to fluctuations in the volume of the LBO market across time. To remove the time-series effect, we scale the initial measure by the total amount of sponsored loans by all PE firms in the past five years. Our major results remain essentially the same. The results using the *Herfindahl Index* as the dependent variable are also robust. Some PE firms have direct affiliations with banks (Fang, Ivashina, and Lerner, 2013). Our major results are essentially the same whether or not we control for PE-lead bank affiliations. For brevity, these results are not tabulated but are available upon request.

[26] Our facility level regressions correct the standard errors for clustering at the borrower level. Our major facility level results are essentially the same if we correct the standard errors for clustering at the package level instead.
[27] We consider a loan facility to be leveraged if, in the DealScan database, its market segment is marked as either "Leveraged", "Highly Leveraged", or "Non-investment Grade".

4.7 PE-bank relationship and lead bank share: Larger sample results

In Table 8, we examine whether our main results on the lead lender share still hold in a broader sample that includes non-PE backed IPO companies. We include the same control variables as in Table 2 (for the baseline model in the first two columns) or Table 3 (for the expanded model in the last two columns). For brevity, the coefficients on the control variables are not reported.

In column (1) of Table 8, we examine the effect of the PE firm's IPO sponsorship on the lead bank share, regardless of the strength of PE-bank relationships. The *PE Sponsor Dummy* is set to one if the borrowing company's IPO is backed by a PE firm, and zero otherwise. The coefficient on the *PE Sponsor Dummy* is -0.10 and is statistically significant at the one percent level, suggesting that having PE sponsorship at the IPO on average reduces the lead bank's share of a post-IPO loan facility by 10% (e.g., from 61% to 51%). In column (2) of Table 8, we create two dummy variables to represent strong and weak PE-bank relationships. The *Strong Relationship Dummy ($)* equals one if the *PE-Bank Relationship ($)* is greater than or equal to 21%, and zero otherwise. The *Weak Relationship Dummy ($)* equals one if the *PE-Bank Relationship ($)* is less than 21% for loans to PE-backed companies, and is set to zero if the loan is to a non-PE-backed company or the *PE-Bank Relationship ($)* is greater than or equal to 21%. The regression uses the loans to non-PE-backed IPOs as the reference group. We choose as the cutoff point the mean value (21%) of the *PE-Bank Relationship ($)* for all of the 824 loans by the PE-sponsored companies in the sample of 2,920 loan facilities for which lead banks can be identified (some of these loans do not have lead bank share information). We use these dummy variables to alleviate the effect of

potential nonlinearity associated with the continuous PE-bank relationship measure that is more of a concern when both PE-backed and non-PE-backed IPO companies are included in the sample.[28]

As reported in column (2) of Table 8, the coefficient on the *Strong Relationship Dummy ($)* is -0.21 and is statistically significant at the one percent level. This result suggests that, compared with those to other IPO companies, the lead banks of the loans to PE-backed IPO companies hold 21% less (e.g., from 72% to 51%) when the lead banks have a strong relationship with the PE sponsors. On the other hand, the *Weak Relationship Dummy ($)* has a coefficient of -0.08, which is statistically significant at the five percent level. It means that a moderate relationship between the PE sponsor and the lead bank can still reduce the lead bank share, yet by a much smaller amount.

In columns (3) and (4) of Table 8, we include additional control variables such as the *Lead Lender Reputation*, *New Lender Dummy*, *PE Firm Reputation*, and loan characteristics. In model (3), the coefficient on the *PE Sponsor Dummy* is still negative but becomes statistically insignificant. Nevertheless, in model (4), the coefficient on the *Strong Relationship Dummy ($)* is negative and statistically significant at the ten percent level.[29]

5. Conclusions

Private equity (PE) firms are an important player in the economy. They have significant equity stakes in many companies, and interact frequently and develop relationships with banks. Using a sample of bank loans to IPO companies, we find that a stronger PE-lead bank relationship

[28] We also use the continuous measure *PE-Bank Relationship ($)*, together with the PE dummy, for the larger sample of both PE- and non-PE-sponsored IPOs. The coefficient on the *PE-Bank Relationship ($)* is negative but only statistically significant at the ten percent level. We set the *PE-Bank Relationship ($)* to zero for all non-PE-sponsored IPOs. The decrease in statistical significance suggests that the PE-bank relationship has a nonlinear effect on the lead bank share.

[29] In the un-tabulated analysis of syndicate size and foreign lender participation using the sample of 2,920 loans without requiring leader lender share information, we also find that a stronger PE-bank relationship is associated with a larger syndicate size and a higher likelihood of foreign bank participation in the syndicate.

allows the lead bank to hold a significantly smaller fraction of a loan to a PE-sponsored company and form a significantly larger and less concentrated syndicate. The likelihood of foreign bank participation in a syndicate also increases with the strength of a PE-bank relationship. These findings are robust to different measures of PE-bank relationship and to the control of the lead bank reputation, the PE sponsor reputation, the lead bank- and PE- fixed effects, the lead bank's underwriting relationships with the borrower, and the PE sponsor's relationships with the participant lenders. PE-bank relationships are also more important for more informationally opaque borrowers. These findings provide strong support for our *efficient information production hypothesis* that PE-bank relationships facilitate efficient information production and mitigate information asymmetry-related problems in lending.

The literature on relationship banking focuses on the direct bilateral relationship between the borrower and the lender (e.g., Boot, 2000; Bharath, Dahiya, Saunders, and Srinivasan, 2007, 2011). We contribute to the literature by showing that a close past lending relationship between a borrower's lead bank and a third-party financial sponsor also facilitates the lead bank's information acquisition about the borrower. The enhanced efficiency in information production helps banks to expand lending in the syndicated loans market as they can provide less capital for loans that they arrange. Borrowing companies also benefit from such bank-third party relationships as they gain better access to credit.

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Appendix A1

Variable definitions

This appendix contains the detailed variable definitions. For some of the variables in this appendix, their natural logarithms are used in the regressions. Ln(X) denotes the natural logarithm of variable X.

Variable Name	Detailed Definition
No. of All (Participant) Lenders	The total number of all lenders (participant lenders, excluding lead) in the syndicate of the loan facility.
Lead Bank Share	The lead lender's share of the dollar amount of the loan facility. If the syndicate has more than one lead lender, this is the average share of the lead lenders. To increase the number of usable observations, we set the *Lead Bank Share* to 100% if *No. of All Lenders* equals one.
Herfindahl Index	The Herfindahl index of lenders' shares in the loan facility, computed as the sum of the squares of each lender's share in the loan.
Foreign Bank Dummy	A dummy variable that equals one if the loan facility has a non-U.S. bank as a participant bank according to DealScan, and equals zero otherwise.
Time-on-the-Market (TOM)	Number of days from the start of the syndication to the completion of the loan
PE-Bank Relationship ($)	For a loan to a PE-backed company, the dollar-based relationship measure is defined as the ratio of the total dollar amount of loans sponsored by the PE firm and from the lead bank of the current loan facility in the past five years scaled by the total dollar amount of loans sponsored by the same PE firm in the past five years (regardless of lead banks). This measure is set zero for all loans to non-PE-backed companies.
Strong Relationship Dummy ($)	This dummy variable equals one if *PE-Bank Relationship ($)* is greater than or equal to 21%, and zero otherwise.
Weak Relationship Dummy ($)	For a loan to a PE-backed company, this dummy variable equals one if *PE-Bank Relationship ($)* is less than 21%, and zero otherwise. The dummy variable is set zero for loans to non-PE-backed companies.
PE-Bank Relationship (#)	This continuous relationship measure is defined in the same way as *PE-Bank Relationship ($)* except that the number of loans instead of the loan amount is used in calculating the ratio.
PE-Participant Relationship ($)	For a participant bank in a loan, we first compute a measure for the participant bank's relationship with the PE firm as the ratio of the total dollar amount of loans with this participant bank as the lead bank and with the PE firm as a sponsor in the past five years scaled by the total dollar amount of loans with the same PE firm as a sponsor in the past five years (regardless of lead banks). *PE-Participant Relationship ($)* equals the maximum relationship measure for all participant lenders in the loan, and equals zero for sole lender loans.
Highest Bank Relationship ($)	The highest value of the *PE-Bank Relationship ($)* for the PE sponsor of the borrowing IPO company with any banks prior to the current loan
All-In-Spread Drawn (bps)	The spread the borrower pays in basis points over LIBOR for each dollar drawn down. It adds the yield spread of the loan with any annual (or facility) fee paid to the bank group.
Loan Amount ($m)	The actual amount of the loan facility committed by the facility's lender pool, in millions of dollars of the 2011 purchasing power.
Maturity	The number of months the facility will be active from the start date to the expiration date.

Appendix A1: Continued.

Variable Name	Detailed Definition
Secured Loan Dummy	A dummy variable that equals one if the loan facility is secured, and equals zero otherwise.
Performance Pricing Dummy	A dummy variable that equals one if there is a grid displaying different pricing levels based on a predefined trigger such as a company's ratings and ratios, and equals zero otherwise.
No. of Fin. Covenants	The total number of covenants based on financial ratios (see Appendix A2). We first create a dummy variable that equals one if a financial ratio covenant exists, and equals zero otherwise. To avoid losing too many observations, we set the dummy variable to zero if there is no covenant based on a financial ratio or information about it is missing. We add up the dummy variables to obtain the number of financial covenants.
No. of Non-Fin. Covenants	The total number of non-financial covenants (see Appendix A2). This variable is constructed in the same way as *No. of Fin. Covenants* based on non-financial ratio covenants.
Loan Type Dummies	Including (1) 364-Day Dummy, (2) Revolver (<1 Year) Dummy, (3) Revolver (⩾1 Year) Dummy, (4) Term Loan Dummy, (5) Term Loan A Dummy, and (6) Term Loan B-G Dummy. The omitted group includes all other much less common loan types (e.g. "Bridge Loan", "Delay Draw Term Loan", "Note", "Other Loan", "Revolver/Term Loan", and "Standby Letter of Credit", among others). The group definition follows Drucker and Puri (2009).
Deal Purpose Dummies	Including (1) Acquire Dummy, (2) General Dummy, (3) LBO Dummy, and (4) Recap Dummy. The omitted group includes "Miscellaneous" and "Other" purposes. The group definition follows Drucker and Puri (2009).
PE Sponsor Dummy	A dummy variable that equals one if the borrower was a PE-backed company at the IPO, and equals zero otherwise.
Lead Lender Reputation	Measured by the lead lender market share, which is the total amount of all loans for which the lead lender of the current loan was also a lead lender divided by the total amount of loans in the DealScan universe during the five years prior to the current loan's start date. If there are multiple lead lenders for the current loan, the maximum lender market share is used.
New Lender Dummy	A dummy variable that equals one if none of the lead lenders is a lead lender in the loans by the same borrower during the five years prior to the current loan's start date, and equals zero otherwise.
PE Firm Reputation	Ln(1+ the total amount of borrowing sponsored by the PE firm over the past five years, in millions of dollars of the 2011 purchasing power).
Market Cap. ($m)	Market capitalization (Compustat items CSHO × TEM PRCC_F) of the borrower at the fiscal year end immediately prior to the loan start date, in millions of dollars of the 2011 purchasing power.
Market-to-Book	The sum of the market value of equity (items CSHO × PRCC_F) and the book value of debt (items LT + PSTKL – TXDITC) divided by the book value of total assets (item AT) at the fiscal year end immediately prior to the loan start date. If item PSTKL is missing, it is replaced with item PSTKRV. If PSTKRV is also missing, it is replaced with PSTK. If it is still missing, it is set to zero.
Dividend Payer Dummy	A dummy variable that equals one if the company paid a dividend (item DVC>0) during the fiscal year immediately prior to the loan start date, and equals zero otherwise.
Borrower Age	The number of years from the borrower's founding date to the loan start date. The founding date of a RLBO firm is the founding date of its predecessor company and is taken from the Field-Ritter data set available on Jay Ritter's website (Loughran and Ritter, 2004).

Appendix A1: Continued.

Variable Name	Detailed Definition
Leverage	The book value of debt (total liabilities + minority interest – deferred taxes and investment tax credit + liquidating value of preferred stock – convertible debt, or Compustat items LT+MTB-TXDITC+PSTKL-DCVT) divided by total assets (item AT) at the fiscal year end immediately prior to the loan start date. Convertible debt (DCVT) is set to zero if it is missing in Compustat.
Tangibility	The fraction of net property, plant, and equipment in the total assets (items PPENT/AT) at the fiscal year end immediately prior to the loan start date.
Profitability	The net income (Compustat item NI) of the borrower during the fiscal year immediately prior to the loan start date divided by its book value of total assets (AT) at the fiscal year end immediately prior to the loan start date.
Operating Loss Dummy	A dummy variable that equals one if item NI is negative during the fiscal year immediately prior to the loan start date, and equals zero otherwise.
Beta	The beta coefficient from the market model using the equal-weighted CRSP market index and daily close-to-close percentage returns over the 200 trading days ending 11 days prior to the loan start date.
Stock Return Volatility	The standard error of residuals from the market model using the equal-weighted CRSP market index and daily close-to-close percentage returns over the 200 trading days ending 11 days prior to the loan start date.
Industry Dummies	Dummy variables using Ken French's 17 industry classification at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/.
Term Spread (%)	The daily percentage yield difference between ten- and one-year constant fixed maturity treasuries at http://woodrow.mpls.frb.fed.us/research/data/us/.
Default Spread (%)	The daily percentage yield difference between Moody's Baa and Aaa rated corporate bonds at http://woodrow.mpls.frb.fed.us/research/data/us/.
Year Dummies	Dummy variables for the years from 1995-2011.

Appendix A2

List of bank loan covenants

Financial covenants:
Max. Capex, Max. Debt to EBITDA, Max. Debt to Equity, Max. Debt to Tangible Net Worth, Max. Leverage Ratio, Max. Loan to Value, Max. Long-Term Investment to Net Worth, Max. Net Debt to Assets, Max. Senior Debt to EBITDA, Max. Senior Leverage, Max. Total Debt (including Contingent Liabilities) to Tangible Net Worth, Min. Cash Interest Coverage, Min. Current Ratio, Min. Debt Service Coverage, Min. EBITDA, Min. Equity to Asset Ratio, Min. Fixed Charge Coverage, Min. Interest Coverage, Min. Net Worth to Total Asset, Min. Quick Ratio, Other Ratio, Net Worth, Tangible Net Worth.

Non-financial covenants:
Insurance Proceeds Sweep, Dividend Restriction, Equity Issuance Sweep, Debt Issuance Sweep, Asset Sales Sweep, Excess Cash Flow Sweep, Percentage of Net Income, Percentage of Excess Cash Flow.

Table 1

Summary statistics

This table reports the mean, median, and standard deviation (std.) of the variables for the sample of 1,627 loan facilities. We also report the summary statistics separately for the 291 facilities to PE-backed IPO companies and the 1,336 facilities to non-PE-backed IPO companies. The sample period is 1995-2011. See Appendix A1 for variable definitions. Ln(X) denotes the natural logarithm of variable X.

	Full sample (1,627)			**Loans to PE-backed IPO companies (291)**			**Loans to non-PE-backed IPO companies (1,336)**		
	Mean	Median	Std.	Mean	Median	Std.	Mean	Median	Std.
Loan characteristics									
Lead Bank Share	0.73	1.00	0.36	0.51	0.33	0.39	0.78	1.00	0.34
Herfindahl Index	0.71	1.00	0.38	0.48	0.26	0.41	0.76	1.00	0.36
All-In Spread Drawn (bps)	241.20	225.00	127.39	229.85	200.00	147.2	243.67	250.00	122.57
No. of All Lenders	4.07	1.00	6.74	7.54	5.00	8.46	3.31	1.00	6.05
No. of Participant Lenders	3.04	0.00	6.73	6.52	4.00	8.46	2.29	0.00	6.03
Foreign Bank Dummy	0.20	0.00	0.40	0.37	0.00	0.48	0.16	0.00	0.36
Loan Amount ($m)	126.09	31.75	298.51	215.81	99.28	334.78	106.55	27.00	286.44
Ln (Loan Amount ($m))	3.55	3.46	1.65	4.53	4.60	1.40	3.33	3.30	1.63
Maturity (months)	37.89	36.00	23.18	48.88	59.00	22.03	35.49	36.00	22.73
Ln (Maturity)	3.40	3.58	0.76	3.74	4.08	0.63	3.33	3.58	0.76
No. of Fin. Covenants	2.43	3.00	1.50	2.55	3.00	1.33	2.41	2.50	1.53
No. of Non-Fin. Covenants	2.46	1.00	2.40	3.23	3.00	2.31	2.29	1.00	2.39
Performance Pricing Dummy	0.47	0.00	0.50	0.66	1.00	0.47	0.43	0.00	0.49
Secured Loan Dummy	0.86	1.00	0.34	0.89	1.00	0.31	0.86	1.00	0.35
PE-Bank Relationship ($)	0.02	0.00	0.11	0.13	0.00	0.23	0.00	0.00	0.00
PE-Bank Relationship (#)	0.03	0.00	0.11	0.15	0.03	0.24	0.00	0.00	0.00
Lead Lender Reputation	0.09	0.03	0.11	0.12	0.08	0.12	0.08	0.03	0.11
New Lender Dummy	0.56	1.00	0.50	0.40	0.00	0.49	0.60	1.00	0.49
PE Firm Reputation	1.25	0.00	3.12	7.00	8.43	3.76	0.00	0.00	0.00
Borrower characteristics									
Market Cap. ($m)	1,319.97	231.90	6,333.75	1,052.62	485.37	1,866.02	1,378.20	203.05	6,934.37
Ln (Market Cap. ($m))	5.52	5.45	1.63	6.07	6.18	1.48	5.40	5.31	1.64
Borrower Age (years)	18.26	11.00	20.94	22.14	15.00	21.56	17.41	10.00	20.71
Ln (1+Borrower Age)	2.57	2.48	0.83	2.78	2.77	0.86	2.53	2.40	0.82
Leverage	0.47	0.43	0.30	0.60	0.57	0.39	0.44	0.40	0.27
Tangibility	0.25	0.16	0.23	0.34	0.29	0.26	0.23	0.14	0.22
Dividend Payer Dummy	0.14	0.00	0.35	0.15	0.00	0.36	0.14	0.00	0.34
Market-to-Book	2.44	1.83	2.56	1.91	1.51	1.15	2.56	1.94	2.76
Profitability	-0.09	0.02	0.41	-0.02	0.04	0.32	-0.10	0.02	0.42
Operating Loss Dummy	0.40	0.00	0.49	0.30	0.00	0.46	0.42	0.00	0.49
Beta	1.35	1.24	0.91	1.18	1.18	0.68	1.38	1.26	0.95
Stock Return Volatility	0.05	0.04	0.03	0.04	0.03	0.02	0.05	0.04	0.03
Term Spread (%)	1.00	0.70	1.02	1.32	0.91	1.15	0.93	0.65	0.98
Default Spread (%)	0.86	0.78	0.34	0.95	0.86	0.38	0.84	0.76	0.33

Table 2

PE-bank relationship and syndicate structure: Baseline regressions

This table reports the baseline OLS regression results using the lead bank share per facility (Panel A) and facility Herfindahl Index (Panel B) as dependent variables. The regressions in this table use the sample of only the 291 loans to PE-backed IPO companies. All models control for year, industry, loan type, and deal package purpose dummy variables, but their coefficients and *t*-statistics are omitted below. See Appendix A1 for variable definitions. Ln(X) denotes the natural logarithm of variable X. The *t*-statistics in the parentheses below the coefficient estimates are calculated using robust standard errors corrected for heteroskedasticity and clustering at the borrowing company level.

	Panel A: Lead bank share		**Panel B: Herfindahl index**	
Name of variable	(1)	(2)	(3)	(4)
PE-Bank Relationship ($)	-0.28***		-0.28***	
	(-3.36)		(-3.18)	
PE-Bank Relationship (#)		-0.29***		-0.29***
		(-3.28)		(-3.14)
Market-to-Book	0.03	0.03	0.03	0.03
	(1.47)	(1.51)	(1.54)	(1.59)
Ln (Market Cap. ($m))	-0.12***	-0.13***	-0.12***	-0.12***
	(-5.40)	(-5.57)	(-4.84)	(-5.00)
Dividend Payer Dummy	0.08	0.07	0.09	0.08
	(1.24)	(1.08)	(1.20)	(1.05)
Leverage	-0.20**	-0.19**	-0.22**	-0.21**
	(-2.39)	(-2.23)	(-2.51)	(-2.36)
Tangibility	0.06	0.06	0.06	0.06
	(0.51)	(0.52)	(0.50)	(0.51)
Ln (1+Borrower Age)	0.05*	0.06**	0.06**	0.06**
	(1.96)	(2.13)	(1.98)	(2.13)
Profitability	-0.05	-0.04	-0.06	-0.05
	(-0.42)	(-0.33)	(-0.49)	(-0.40)
Operating Loss Dummy	0.08	0.08	0.11*	0.11*
	(1.29)	(1.35)	(1.67)	(1.72)
Beta÷10	0.05	0.10	-0.04	0.01
	(0.15)	(0.33)	(-0.13)	(0.04)
Stock Return Volatility	0.15	0.13	0.18	0.16
	(0.97)	(0.82)	(1.08)	(0.94)
Term Spread (%)	-0.08	-0.09*	-0.07	-0.08
	(-1.63)	(-1.72)	(-1.43)	(-1.50)
Default Spread (%)	-0.08	-0.09	-0.09	-0.09
	(-0.99)	(-1.05)	(-1.00)	(-1.06)
Constant	2.34***	2.38***	2.27***	2.31***
	(9.99)	(9.97)	(8.91)	(8.95)
Observations	291	291	291	291
Adj. R-squared	0.59	0.59	0.58	0.58

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in a two-tailed test.

Table 3

PE-bank relationship and syndicate structure: Expanded regressions

This table reports the OLS regression results on the effect of PE-bank relationships on the lead bank share per facility (Panel A) and on the facility Herfindahl Index (Panel B) with additional control variables. The sample for all regressions in this table uses only the 291 loans to PE-backed IPO companies. All models also control for year, industry, loan type, and deal package purpose dummy variables, but their coefficients and *t*-statistics are omitted below. See Appendix A1 for variable definitions. Ln(X) denotes the natural logarithm of variable X. The *t*-statistics in the parentheses below the coefficient estimates are calculated using robust standard errors corrected for heteroskedasticity and clustering at the borrowing company level.

	Panel A: Lead bank share		Panel B: Herfindahl index	
Name of variable	(1)	(2)	(3)	(4)
PE-Bank Relationship ($)	-0.27***	-0.26***	-0.27***	-0.26***
	(-3.96)	(-3.69)	(-3.73)	(-3.63)
Lead Lender Reputation		-0.07		-0.02
		(-0.48)		(-0.11)
New Lender Dummy		0.12***		0.13***
		(3.20)		(3.45)
PE Firm Reputation		-0.00		-0.00
		(-0.48)		(-0.51)
No. of Fin. Covenants	-0.03*	-0.03	-0.04**	-0.03**
	(-1.88)	(-1.60)	(-2.27)	(-2.01)
No. of Non-Fin. Covenants	-0.02**	-0.02**	-0.02*	-0.02*
	(-2.00)	(-2.04)	(-1.89)	(-1.91)
Performance Pricing Dummy	-0.11**	-0.10**	-0.09*	-0.08*
	(-2.51)	(-2.47)	(-1.85)	(-1.80)
Secured Loan Dummy	0.07	0.10*	0.10	0.12**
	(1.33)	(1.72)	(1.62)	(2.08)
Ln (Loan Amount ($m))	-0.07***	-0.07***	-0.08***	-0.07***
	(-3.56)	(-3.39)	(-3.52)	(-3.31)
Ln (Maturity)	-0.06*	-0.06	-0.07*	-0.06*
	(-1.66)	(-1.57)	(-1.73)	(-1.66)
Market-to-Book	0.01	0.00	0.01	0.00
	(0.37)	(0.04)	(0.52)	(0.20)
Ln (Market Cap. ($m))	-0.06***	-0.05**	-0.06**	-0.05**
	(-2.62)	(-2.37)	(-2.35)	(-2.08)
Dividend Payer Dummy	0.08	0.07	0.08	0.07
	(1.21)	(1.07)	(1.11)	(0.96)
Leverage	-0.13**	-0.11*	-0.16**	-0.13**
	(-2.20)	(-1.77)	(-2.44)	(-2.06)
Tangibility	0.10	0.11	0.10	0.11
	(1.02)	(1.15)	(0.94)	(1.08)
Ln (1+Borrower Age)	0.04*	0.04*	0.05*	0.04*
	(1.88)	(1.82)	(1.89)	(1.86)
Profitability	0.01	0.05	0.01	0.05
	(0.13)	(0.72)	(0.10)	(0.64)
Operating Loss Dummy	0.05	0.04	0.09	0.07
	(1.14)	(0.85)	(1.62)	(1.35)
Beta÷10	0.03	0.08	-0.06	0.01
	(0.10)	(0.32)	(-0.23)	(0.03)
Stock Return Volatility	0.06	0.12	0.08	0.16
	(0.47)	(1.14)	(0.63)	(1.37)
Term Spread (%)	-0.06	-0.07	-0.06	-0.07
	(-1.37)	(-1.64)	(-1.19)	(-1.42)
Default Spread (%)	-0.07	-0.08	-0.06	-0.08
	(-0.90)	(-1.19)	(-0.80)	(-1.10)
Constant	2.51***	2.39***	2.44***	2.28***
	(9.88)	(10.12)	(8.66)	(8.73)
Observations	291	291	291	291
Adj. R-squared	0.70	0.72	0.69	0.70

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in a two-tailed test.

Table 4

Endogeneity of PE-bank relationship

This table reports the lead bank fixed effects (columns (1) and (2) in Panel A), PE firm fixed effects (columns (3) and (4) in Panel A), and instrumental variable (IV) (Panel B) regression results on the effect of PE-bank relationships on the lead bank share. The regressions in this table use the sample of only the 291 loans to PE-backed IPO companies. For brevity, only coefficient estimates of key independent variables are reported. All models also control for year, industry, loan type, and deal package purpose dummy variables. The instrument variable (IV) in Panel B, the *Highest Bank Relationship ($)*, is the highest value of the *PE-Bank Relationship ($)* for the PE sponsor of the borrowing IPO company with any banks prior to the current loan. See Appendix A1 for detailed definitions for all other variables. The *t*-statistics (*z*-statistics for the IV regressions) in the parentheses below the coefficient estimates are calculated using robust standard errors corrected for heteroskedasticity and clustering at the borrowing company level.

Name of variable	**Lead bank fixed effects**		**PE fixed effects**	
Panel A: Fixed effects models	(1)	(2)	(3)	(4)
PE-Bank Relationship ($)	-0.34***	-0.26**	-0.57***	-0.46**
	(-2.65)	(-2.26)	(-3.51)	(-2.41)
Lead Lender and PE Firm Controls	No	Yes	No	Yes
Loan Characteristics Controls	No	Yes	No	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Observations	287	287	291	291
Adj. R-squared	0.75	0.82	0.76	0.81

	1st Stage	2nd Stage	1st Stage	2nd Stage
Panel B: Instrumental Variable (IV) methods	(1)	(2)	(3)	(4)
Highest Bank Relationship ($)	0.24***		0.23***	
	(4.17)		(3.02)	
Predicted PE-Bank Relationship ($)		-0.51**		-0.77***
		(-2.06)		(-2.62)
Lead Lender and PE Firm Controls	No	No	Yes	Yes
Loan Characteristics Controls	No	No	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Cragg-Donald Wald F Statistic		33.53		22.86
Observations	291	291	291	291

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in a two-tailed test.

Table 5

Cross-sectional heterogeneity of PE-bank relationship effects

This table reports the regression results on the differential effects of PE-bank relationships on the lead bank share per facility. The regressions in this table use subsamples of the 291 loans to PE-backed IPO companies. In Panel A, the less information asymmetry subsample includes loans to IPO companies with above the sample median average total assets of borrowing companies. In Panel B, the less information asymmetry subsample includes loans to IPO companies with below the sample median analyst recommendation standard deviation. In Panel C, the less information asymmetry subsample includes loans to IPO companies with below the sample median analyst EPS forecast dispersion. For brevity, only the coefficient estimates of the key independent variables are reported. All models also control for year, industry, loan type, and deal package purpose dummy variables. See Appendix A1 for detailed variable definitions. The *t*-statistics in the parentheses below the coefficient estimates are calculated using robust standard errors corrected for heteroskedasticity and clustering at the borrowing company level.

Name of variable	**Less information asymmetry**		**Greater information asymmetry**	
Panel A: Split sample by size	(1)	(2)	(3)	(4)
PE-Bank Relationship ($)	-0.19	-0.09	-0.28**	-0.31**
	(-0.91)	(-0.60)	(-2.24)	(-2.62)
Lead Lender and PE Firm Controls	No	Yes	No	Yes
Loan Characteristics Controls	No	Yes	No	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Observations	111	111	180	180
Adj. R-squared	0.73	0.78	0.60	0.74
Panel B: Split sample by analyst recommendation std.				
PE-Bank Relationship ($)	-0.19	-0.01	-0.42***	-0.38***
	(-1.63)	(-0.11)	(-2.76)	(-2.63)
Lead Lender and PE Firm Controls	No	Yes	No	Yes
Loan Characteristics Controls	No	Yes	No	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Observations	148	148	143	143
Adj. R-squared	0.62	0.77	0.63	0.75
Panel C: Split sample by analyst EPS forecast std.				
PE-Bank Relationship ($)	-0.08	-0.17	-0.35***	-0.26***
	(-0.55)	(-1.18)	(-3.02)	(-3.45)
Lead Lender and PE Firm Controls	No	Yes	No	Yes
Loan Characteristics Controls	No	Yes	No	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Observations	128	128	163	163
Adj. R-squared	0.58	0.67	0.72	0.80

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in a two-tailed test.

Table 6

PE-bank relationship and additional syndicate characteristics

This table reports the regression results on additional measures of loan syndicate structure. Panel A reports the Poisson regression results on syndicate size. The dependent variable is the total number of lenders per facility. Four loans with multiple lead banks are excluded for the regressions in Panel A and the number of lenders is winsorized at ten. The mean value of the winsorized dependent variable is also reported in Panel A. The mean number of lenders reported in Panel A is smaller than that in Table 1 due to the winsorization and the exclusion of the four loans with multiple lead banks. The economic effect of an independent variable in the Poisson regressions can be calculated as the coefficient multiplied by the mean value of the dependent variable. Panel B reports the logit regression results on the likelihood of having a foreign participant lender. The dependent variable in Panel B is a dummy variable that is set to one if at least one of the lenders in the loan syndicate is a foreign bank and zero otherwise. Panel C reports the Poisson regression results on time-on-the-market (TOM). The dependent variable is the number of days that a loan is in a syndication process before loan inception. The mean value of TOM is reported at the bottom of Panel C. The regressions in Panel A and Panel B use subsamples of the 291 loans to PE-backed IPO companies with lead share information. The regressions in Panel C use the 234 loans to both PE-backed and non-PE-backed IPO companies out of the 2,920 loan facilities for which we have information on TOM. Some loans in the 2,920 facilities do not have lead share information. All models also control for year, industry, loan type, and deal package purpose dummy variables, but their coefficients and z-statistics are omitted below. See Appendix A1 for detailed variable definitions. The *z*-statistics in the parentheses below the coefficient estimates are calculated using robust standard errors corrected for heteroskedasticity and clustering at the borrowing company level. For the Logit regressions in Panel B, the economic effects of *PE-Bank Relationship ($)* are reported in the brackets below the z-statistics. The economic effect of an independent variable is calculated as follows: For each observation, we vary the variable from one standard deviation below to one standard deviation above its actual value if it is a non-binary variable or vary it from zero to one if it is a dummy variable, and use the coefficients from the Logit regression to calculate the change in the predicted probability, holding all other variables fixed. We average the change in the predicted probability over all observations in the sample to get the economic effect.

	Panel A: Number of lenders		Panel B: Foreign bank participation		Panel C: Loan time-on-market	
Name of variable	(1)	(2)	(3)	(4)	(5)	(6)
PE Sponsor Dummy					-0.10	-0.42
					(-0.58)	(-0.19)
PE-Bank Relationship ($)	0.32*	0.27*	3.10*	7.98***	-0.45*	-0.66**
	(1.91)	(1.83)	(1.92)	(2.61)	(-1.77)	(-2.16)
			[30.3%]	[37.2%]		
Lead Lender Reputation		-0.31		1.08		1.54**
		(-1.18)		(0.24)		(2.53)
New Lender Dummy		-0.14*		-1.46		-0.09
		(-1.73)		(-1.09)		(-0.64)
PE Firm Reputation		0.01		0.53***		0.01
		(1.04)		(2.91)		(0.33)
No. of Fin. Covenants		0.09***		2.15***		0.02
		(2.95)		(3.23)		(0.39)
No. of Non-Fin. Covenants		0.04**		0.57		-0.01
		(2.11)		(1.32)		(-0.17)
Performance Pricing Dummy		0.16*		0.85		0.17
		(1.93)		(0.98)		(1.32)
Secured Loan Dummy		-0.02		0.90		0.38
		(-0.27)		(0.57)		(1.23)
Ln (Loan Amount ($m))		0.17***		1.68***		0.11
		(4.51)		(3.76)		(1.39)
Ln (Maturity)		0.24***		0.82		-0.10
		(2.89)		(0.99)		(-0.63)
Market-to-Book	-0.09**	-0.07**	-0.50**	-0.69	0.00	0.05
	(-2.29)	(-2.15)	(-2.11)	(-1.32)	(0.04)	(0.87)
Ln (Market Cap. ($m))	0.27***	0.16***	1.63***	1.61**	0.01	-0.10
	(5.14)	(3.64)	(4.25)	(2.29)	(0.18)	(-1.07)
Dividend Payer Dummy	-0.20	-0.11	-0.48	1.65	0.00	0.03
	(-1.46)	(-0.78)	(-0.44)	(0.74)	(0.01)	(0.21)
Leverage	0.40**	0.36***	0.75	-0.83	0.57**	0.42
	(2.36)	(2.73)	(0.52)	(-0.32)	(2.06)	(1.37)
Tangibility	0.02	-0.13	2.08	4.82*	-1.09***	-1.13**
	(0.12)	(-0.77)	(1.56)	(1.67)	(-2.69)	(-2.29)
Ln (1+Borrower Age)	-0.08	-0.07*	0.14	0.49	-0.12	-0.05
	(-1.42)	(-1.71)	(0.41)	(1.03)	(-1.12)	(-0.54)
Profitability	-0.02	-0.07	-2.69	-7.15	1.55*	1.20
	(-0.07)	(-0.33)	(-1.11)	(-0.78)	(1.75)	(1.22)
Operating Loss Dummy	-0.27**	-0.18**	-0.25	2.46	-0.04	-0.14
	(-2.40)	(-2.00)	(-0.31)	(1.23)	(-0.20)	(-0.62)
Beta÷10	0.53	0.09	-2.19	-5.99	-0.69	-0.17
	(0.75)	(0.17)	(-0.53)	(-0.56)	(-0.58)	(-0.14)
Stock Return Volatility	-0.88**	-0.65**	-1.23	-6.87	0.31	0.14
	(-2.38)	(-2.33)	(-0.31)	(-1.28)	(0.42)	(0.20)
Term Spread (%)	0.26**	0.18*	1.84**	3.18***	0.25**	0.29**
	(2.26)	(1.76)	(2.51)	(2.63)	(2.01)	(2.27)
Default Spread (%)	0.01	0.10	0.94	0.44	1.01**	0.69
	(0.07)	(0.66)	(0.82)	(0.30)	(2.17)	(1.22)
Constant	-2.88***	-3.81***	-39.27***	-64.75***	3.74***	4.61***
	(-5.41)	(-6.32)	(-8.50)	(-6.23)	(5.03)	(4.35)
Mean of the Dependent Variable	5.14	5.14			31.05	31.05
Observations	287	287	278	278	234	234
Adj. R-squared	0.34	0.39	0.57	0.75	0.32	0.36

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in a two-tailed test.

Table 7

PE-bank relationship and lead bank share: Robustness checks

The dependent variable is the lead bank share at the package level for the regression in Panel D, and is the lead bank share at the facility level for the regressions in other panels. We only report the expanded OLS regression results using the sample (subsamples) of 291 loans to PE-backed IPO companies. The model specifications are the same as those in Table 3 but include an additional control variable, *Lead Bank-IPO Underwriter Overlapping Dummy* in Panel A and *PE-Participant Relationship ($)* in Panel B. *Lead Bank-IPO Underwriter Overlapping Dummy* equals one if the lead bank of the current loan is also the lead underwriter (or one of the lead underwriters) of the borrowing company's IPO, and zero otherwise. For each participant lender in a loan, we compute a measure for its relationship with the PE sponsor as the ratio of the dollar amount of loans from this particular bank to this PE firm's portfolio companies over the dollar amount of all loans to the PE firm's portfolio companies during the past five years. *PE-Participant Relationship ($)* equals the maximum relationship measure for all participant lenders in the loan, and is set to zero for sole lender loans. Compared to Table 3, Panel C of this table reports the Tobit regressions, and Panel D reports the OLS regression results for the lead bank share at the package level. Panels E and F report the OLS regressions results separately for credit lines and term loans. For brevity, only the coefficients of the key independent variables are reported. All other firm-level, loan-level controls and year, industry, loan type, and deal package purpose dummy variables are included in the estimations in the same way as in Table 3, but their coefficients and *t*- or *z*-statistics are not reported below. See Appendix A1 for detailed variable definitions. The *t*-/*z*-statistics in the parentheses below the coefficient estimates are calculated using robust standard errors corrected for heteroskedasticity and clustering at the borrowing company level.

Name of variable	Panel A: IPO underwriter overlapping	Panel B: Relationship with participant banks	Panel C: Tobit regression	Panel D: Package level	Panel E: Credit lines	Panel F: Term loans
PE-Bank Relationship ($)	-0.26***	-0.24***	-0.18***	-0.21**	-0.19**	-0.45**
	(-3.72)	(-3.75)	(-3.52)	(-2.23)	(-2.33)	(-2.26)
Lead Bank-IPO Underwriter Overlapping Dummy	0.09					
	(1.29)					
PE-Participant Relationship ($)		-0.31***				
		(-4.77)				
Lead Lender and PE Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics Controls	Yes	Yes	Yes	Yes	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	291	291	291	187	193	95
Adj. R-squared	0.72	0.75	0.85	0.71	0.78	0.92

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in a two-tailed test.

Table 8

PE-bank relationship and lead bank share: Full sample results

This table reports the OLS regression results on the effects of PE sponsorships and PE-bank relationships on the lead bank share per facility for the sample of 1,627 loans to both PE-backed and non-PE-backed IPO companies. We estimate both the baseline model (columns (1) and (2), for which we only control for the borrower characteristics but not the loan, lender, or PE characteristics) and the expanded model (columns (3) and (4)). For brevity, only the coefficients of the key independent variables are reported. All models control for year, industry, loan type, and deal package purpose dummy variables. See Appendix A1 for detailed variable definitions. The *t*-statistics in the parentheses below the coefficient estimates are calculated using robust standard errors corrected for heteroskedasticity and clustering at the borrowing company level.

Name of variable	(1)	(2)	(3)	(4)
PE Sponsor Dummy	-0.10***		-0.01	
	(-3.31)		(-0.15)	
Strong Relationship Dummy ($)		-0.21***		-0.13*
		(-4.52)		(-1.69)
Weak Relationship Dummy ($)		-0.08**		-0.01
		(-2.28)		(-0.15)
Lead Lender and PE Firm Controls	No	No	Yes	Yes
Loan Characteristics Controls	No	No	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Observations	1,627	1,627	1,627	1,627
Adj. R-squared	0.43	0.44	0.59	0.60

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in a two-tailed test.