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How Private Equity Fuels Non-Bank Lending*

Sharjil Haque† Simon Mayer‡ Teng Wang§

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Abstract

We show how private equity (PE) buyouts fuel loan sales and non-bank participation in the U.S. syndicated loan market. Combining loan-level data from the Shared National Credit register with buyout deals from Pitchbook, we find that PE-backed loans feature lower bank monitoring, lower loan shares retained by the lead bank, and more loan sales to non-bank financial intermediaries. For PE-backed loans, the sponsor's reputation and the strength of its relationship with the lead bank further reduce the lead bank's retained share and monitoring. Our results suggest that PE sponsor engagement substitutes for bank monitoring, allowing banks to retain less skin-in-the game in the loans they originate and to sell greater loan shares to non-banks.

Keywords: Syndicated Loans; Private Equity; LBO; Bank Monitoring; CLO; Securitization; Loan Sales

JEL Codes: G00; G10; G30; G32; G33;

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Two recent capital market trends are the rise of private equity (PE) and leveraged buyouts (LBOs), and the growing participation of non-bank financial intermediaries (such as CLOs or private debt funds) in credit markets, notably, the U.S. syndicated loan market. These two trends are naturally related, as LBO deals are financed to a large extent with syndicated loans (Shivdasani and Wang, 2011). Importantly, both banks (specifically, lead banks in syndicated lending) and PE sponsors are active intermediaries. PE sponsors conduct due diligence, engage with the management, and initiate operational or capital structure changes in their portfolio companies (Kaplan and Stromberg, 2009). Banks screen and monitor borrowers (Gryglewicz, Mayer, and Morellec, 2024), while retaining a share of the loans they originate to maintain sufficient incentives (Gorton and Pennacchi, 1995).

This paper shows that a loan's PE backing substitutes for bank monitoring, allowing banks to retain less skin-in-the-game in the loans they originate and to sell greater loan shares to non-bank financial intermediaries. Relative to comparable non PE-backed loans, PE-backed loans feature (i) lower bank monitoring, (ii) lower loan shares retained by lead banks, and (iii) larger loan shares held by non-bank financial intermediaries (e.g., CLOs or private debt funds). For PE-backed loans, both the reputation of the PE sponsor and the strength of its relationship with the lead bank cause further reductions in monitoring and loan shares retained by the lead bank. Our findings suggest that PE sponsors' actions and engagement with portfolio companies reduce the lead bank's (perceived) expected losses, hence reducing the necessity of bank monitoring. Overall, PE buyouts appear to stimulate non-bank participation, liquidity, and loan sales in the syndicated loan market.

For our empirical analysis, we combine administrative loan-level data from the Shared National Credit (SNC) register, containing extensive information about U.S. syndicated loans with a minimum commitment of $ 20 Mn, with buyout deals from Pitchbook, allowing us to identify PE-backed borrowers and loans. In the SNC register, the lead bank (or lead arranger) of a syndicated loan is required to report detailed information about the loan, including loan ownership shares. Thus, our combined data allow us to observe loan characteristics (including internal risk assessment), lender identity, collateral, lead banks' estimates of default probability and loss given default, the dynamics of banks' and non-bank intermediaries' loan ownership shares, and whether a loan/borrower is PE-backed.

Crucially, bank examiners obtain additional information for a subsample of loans, which allows us, following Gustafson, Ivanov, and Meisenzahl (2021), to construct a time-varying measure of active bank monitoring using textual analysis. Specifically, a loan is actively monitored if there is an audit/inspection/appraisal by a bank in the syndicate or an external

firm hired by the lenders. Our measure indicates that, in a given year, about 20-25 % of the outstanding loans are actively monitored by banks. Consistent with moral hazard in monitoring, a higher loan share retained by the lead bank, referred to as lead share, is associated with increased (active) bank monitoring.

We document three novel facts. First, PE-backed loans (i.e., loans to PE-backed borrowers) are monitored less than non-PE-backed loans. Second, the lead bank retains a smaller loan share (i.e., lead share) and sells a greater share of the loan when the loan is PE-backed. The median lead share is about 20% for PE-backed loans and 25% for non PE-backed loans. When restricting the sample to term loans (as they are more commonly sold than other loan types (Blickle, Fleckenstein, Hillenbrand, and Saunders, 2023)), we find that the median lead share is 13% for PE-backed term loans and 22% for non PE-backed term loans. Third, greater loan shares are sold to and held by non-bank financial intermediaries (in short, non-banks), when the borrower/loan is PE-backed. Among loans with non-zero non-bank holdings, the median (aggregate) loan share held by non-banks is close to 65% for PE-backed and about 23% for non PE-backed loans.

To guide our empirical analysis, we develop a simple model in which a (lead) bank originates a loan that it can sell to non-bank investors. The bank reduces the expected loss associated with the loan — that is, the product of default probability, loss given default, and exposure at default — via monitoring, but monitoring is costly and subject to moral hazard. Hence, monitoring increases with the bank's retained loan share ("lead share"), capturing its skin-in-the-game. We consider that PE sponsors' actions (e.g., due diligence, engagement with management, or governance engineering) substitute for bank monitoring in containing credit risk, which reduces the optimal level of monitoring for PE-backed loans; our empirical analysis validates this assumption. Thus, when a loan is PE-backed, the bank requires less monitoring incentives via the retention of a loan share. In summary, the model predicts, in line with aforementioned empirical facts, that PE sponsor engagement substitutes for bank monitoring, thereby lowering lead share and spurring loan sales to non-banks.

Motivated by the theory's predictions, we regress our measure of bank monitoring, the lead share, and measures of non-bank participation on an indicator, capturing whether the loan is PE-backed. We control for loan characteristics, including loan size, loan type, maturity, utilization rate, origination date, and ex-ante measures of credit risk. Additionally, we include various fixed effects, such as borrower sector-time (i.e., industry-time) and importantly (lead) bank-time. Thus, in our baseline loan-level regressions, we effectively compare, at a given point in time, observably similar loans of the same type and similar risk level is-

sued by the same lead bank to PE-backed and non PE-backed borrowers in the same sector. Our findings reveal that relative to comparable non PE-backed loans, PE-backed loans are associated with lower bank monitoring and lead share, and more loan sales to non-banks.

The economic magnitude implied by our estimates is particularly significant when focusing on term loans, which are more commonly sold than other loan types. For term loans, a loan's PE backing is associated with a reduction in the lead share by about 2.5 percentage points, which corresponds to a 11% reduction in the lead share, given a median lead share of 22% for non PE-backed term loans. When assessing the effect of private equity on non-bank participation, we restrict our sample to loans that have non-zero non-bank holdings, meaning that we exclude illiquid loan types and loans that are not sold. The sample then primarily consists of term loans. We find that PE-backed loans feature approximately 10% higher non-bank participation, as measured by the total loan share held by non-banks or by its dollar value, relative to comparable non-PE-backed loans.

According to our theory and its proposed mechanism, PE sponsor engagement should reduce bank monitoring and lead share more significantly, when the lead bank has greater expectations or trust in the sponsor's capabilities to substitute for its monitoring. Consistent with this idea, we find that (i) high sponsor reputation (based on past deals) and a (ii) strong lender-sponsor relationship (through repeated lender-sponsor interactions in past LBO deals) are associated with lower bank monitoring and lead share.

Following Demiroglu and James (2010), we create a measure of PE sponsor reputation based on past deal volume. Intuitively, high-reputation sponsors should be more experienced, skilled, or less capital-constrained, enhancing their capabilities to reduce the necessity of bank monitoring through their engagement. Our empirical findings reveal that relative to other PE-backed and non PE-backed loans, loans backed by high-reputation sponsors feature lower monitoring and lead share. Among PE-backed term loans, high sponsor reputation is associated with a reduction in lead share by about 6 percentage points, which is economically large given a median lead share of about 13% for PE-backed term loans.

PE sponsors and lenders often interact repeatedly in buyout deals, creating a lender-sponsor relationship (Malenko and Malenko, 2015). Intuitively, a strong lender-sponsor relationship should mitigate lender-sponsor information asymmetries or induce the sponsor to perform actions that substitute for monitoring. Consequently, this should reduce the lead bank's monitoring and retained share. To test this hypothesis, we devise for a given lender-sponsor pair a (binary) measure of the strength of their relationship. This measure is based on their interactions in past buyout deals and, more concretely, on the past total (dollar)

loan commitments of the lender to firms backed by the sponsor (Ivashina and Kovner, 2011). In our loan-level regressions, we regress our measure of monitoring and lead share on the measure of lender-sponsor relationship strength, while controlling for loan characteristics and including various fixed effects. In particular, we include *firm-time* fixed effects (Khwaja and Mian, 2008) to effectively compare at a specific point in time observably similar loans to the same PE-backed borrower made by distinct lenders, who differ in their relationship with the sponsor. As firm-time fixed effects account for any time-varying borrower characteristics, including its PE backing, we sidestep issues related to the non-random selection of PE targets and identify the effects of lender-sponsor relationships on loan-specific outcome variables.

Our findings confirm that for PE-backed loans, a stronger lender-sponsor relationship is associated with both lower monitoring and lead share, and accordingly more loan sales to non-banks. Among PE-backed term loans, a strong lender-sponsor relationship causes a reduction in lead share by about 6 percentage points; given a median lead share of 13% for PE-backed term loans, the economic magnitude is large. One can view the strength of the lender-sponsor relationship as a measure of the intensive margin effects of a loan's PE backing. Intuitively, a lender should expect the actions of a PE sponsor to more significantly reduce the need for its monitoring when a strong relationship with the sponsor is maintained. Under this interpretation, our results show that a loan's PE backing reduces monitoring and lead share on the intensive margin. This also suggests that our baseline findings on the effects of private equity on the extensive margin do not merely reflect selection of PE targets and, to some part, capture the (causal) effects of PE sponsor engagement.

In our theory, PE sponsors' actions increase the expected recovery value of the loan and reduce banks' expected losses. This, in turn, lowers the lead bank's perceived ex-ante credit risk and curbs its monitoring efforts. Empirically, we confirm that PE-backed loans are associated with both lower (i) loss given default, which is inversely related to a loan's recovery rate, and (ii) expected losses for lenders. A loan's expected loss is the product of the lead bank's estimates of probability of default, loss given default, and exposure at default. These quantities are reported by the lead bank in the SNC database and thus capture its expectations about (ex-ante) credit risk. Our findings suggest that lenders perceive (and report) lower ex-ante credit risk and expected losses for PE-backed loans.

Although PE-backed loans are associated with lower measures of ex-ante credit risk, they could still perform worse ex-post. Interestingly, we find that PE-backed loans tend to default more often than non PE-backed loans, but these effects vanish once we control for a loan's ex-ante probability of default or firm fixed effects. When comparing PE- and non PE-backed

loans with similar ex-ante credit risk, we do not find any significant differences in default rates. The worse ex-post performance of PE-backed loans seems therefore attributable to selection and not related to PE sponsors' engagement as such.

Provided that PE sponsor engagement substitutes for bank monitoring, these effects should be stronger for loans that are riskier and more information-sensitive. To test this hypothesis, we follow Gustafson et al. (2021) and use collateral information in the SNC data to identify loans backed by volatile collateral (such as accounts receivable, inventories, and securities). All else equal, these loans should be riskier and more information-sensitive and so require more monitoring. As expected, we find that the negative association between a loan's PE backing and bank monitoring is stronger for loans backed by volatile collateral. This observation lends further support to the mechanism proposed in our theory.

Our theory also predicts that the sensitivity of monitoring to lead share reflects the severity of the moral hazard problem regarding bank monitoring. We show that PE-backed loans are associated with both lower monitoring and a lower sensitivity of monitoring to lead share. This finding indicates that PE-backed loans feature less severe moral hazard and asymmetric information problems in loan sales. Consequently, PE sponsors appear to stimulate loan sales by mitigating moral hazard and asymmetric information in loan sales.

While a loan's PE backing reduces active bank monitoring, it could be that PE-backed loans are simply monitored in a different way, i.e., via covenants (Wang and Xia, 2014). Importantly, we do not find evidence that for PE-backed loans, there is more covenant-based monitoring or that covenant-based monitoring substitutes for active bank monitoring. In particular, PE-backed term loans even have a lower number of covenants and are more often cov-lite than comparable non PE-backed loans, while the difference is less pronounced for credit lines. This suggests that there is less *overall* monitoring for PE-backed loans.

Finally, we highlight the robustness of our findings by employing coarsened exact matching (CEM), as, e.g, in Davis, Haltiwanger, Handley, Jarmin, Lerner, and Miranda (2014). We match PE-backed and non PE-backed loans that are similar along various loan characteristics (loan size, collateral type, collateral valuation, maturity, loan risk) and firm characteristics (industry and location). Our key findings remain robust in the matched sample analysis, in that a loan's PE backing is associated with both lower monitoring and lead share (i.e., more loan sales to non-banks). In addition, we demonstrate that our results remain robust to controlling for the lead bank's estimate of the loan's probability of default. Interestingly, when including the estimated probability of default in our regression, we find that riskier loans are associated with increased monitoring and a higher lead share, i.e., fewer loan sales.

Related Literature. First, our work contributes to the extensive literature on syndicated lending and loan sales. Sufi (2007) and Ivashina (2009) show that the retention by the lead arranger mitigates asymmetric information problems in syndicated lending.[1] Recent empirical studies highlight that banks sell syndicated loans after origination (Drucker and Puri, 2009; Bord and Santos, 2012; Irani and Meisenzahl, 2017; Irani, Iyer, Meisenzahl, and Peydro, 2021; Blickle et al., 2023; Chen, Lee, Neuhann, and Saidi, 2023). Chernenko, Erel, and Prilmeier (2022) and Jang (2023) study non-bank direct lenders. Non-bank financial intermediaries buy syndicated loans in the secondary market (Ivashina and Scharfstein, 2010; Lee, Li, Meisenzahl, and Sicilian, 2019; Lee, Liu, and Stebunovs, 2022). Related, Berlin, Nini, and Edison (2020) and Beyhaghi, Nguyen, and Wald (2019) identify factors that have contributed to the rise of non-bank lending, while Fleckenstein, Gopal, Gutierrez Gallardo, and Hillenbrand (2020), Fleckenstein (2022), and Aldasoro, Doerr, and Zhou (2022) focus on its cyclicality. The implications of loan sales and securitization on lead bank incentives and loan terms are studied empirically in Benmelech, Dlugosz, and Ivashina (2012), Bord and Santos (2012), Nadauld and Weisbach (2012), and Wang and Xia (2014), and theoretically in Gryglewicz et al. (2024).[2] Bruche, Malherbe, and Meisenzahl (2020) analyze pipeline risk in loan syndication. We contribute to this literature by showing that private equity stimulates loan sales and non-bank participation in the market for syndicated loans.

Our work also relates to the literature on bank monitoring, pioneered by seminal theoretical work (see, e.g., Diamond (1984)). Gustafson et al. (2021) construct a measure of active bank monitoring and show that monitoring increases with lead share, while Kundu, Jiang, and Xu (2023) identify lenders' rent extraction during renegotiation as a monitoring incentive mechanism. Cerqueiro, Ongena, and Roszbach (2016) analyze the relationship between collateral values and monitoring. Heitz, Martin, and Ufier (2022) study the determinants of bank monitoring for construction loans. Weitzner and Beyhaghi (2022) and Claessens, Ongena, and Wang (2023) provide evidence for bank information production, e.g., via monitoring. Weitzner and Howes (2021) analyze the cyclicality of bank information production. Wang (2019) demonstrates that local information affects banks' decisions to expand through M&A or branching, which in turn impacts lending outcomes. Blickle,

[1] Theoretical work predicts that in syndicated lending, the lead arranger (or lead bank) retains a share of the loan to maintain sufficient incentives to screen and monitoring borrowers (see, e.g., (Diamond, 1984; Holmstrom and Tirole, 1997; Hartman-Glaser, Piskorski, and Tchistyi, 2012; Gryglewicz et al., 2024)) or to mitigate asymmetric information problems associated with loan sales (Fuchs, Gottardi, and Moreira, 2022).

[2] Focusing on mortgage markets, Keys, Mukherjee, Seru, and Vig (2010), Purnanandam (2011), Demiroglu and James (2012), and Begley and Purnanandam (2017) study, among others, the effects of skin-in-the-game, securitization, and loan sales on originator incentives and mortgage quality.

Parlatore, and Saunders (2021) find that banks specialize and gain industry-specific information affecting loan terms and performance. We add to the literature on bank monitoring and information production by showing that PE sponsors' actions substitute for bank monitoring and information production. A broader implication is that, with the rise of private equity, information production in private markets may shift from banks (traditionally, the most important financiers for private firms) toward PE investors.

We add to the literature on the effects of private equity. Axelson, Jenkinson, Strömberg, and Weisbach (2013) study the determinants of buyout leverage. Fahlenbrach, Rotermund, and Steffen (2023) analyze how LBO funding structure changed after the global financial crisis. Kaplan and Stromberg (2009) and recent theories on private equity (Malenko and Malenko, 2015; Gryglewicz and Mayer, 2022) highlight that PE sponsors affect firm value and outcomes through operational, governance, and financial engineering.[3] Ivashina and Kovner (2011), Demiroglu and James (2010), Shive and Forster (2021), Achleitner, Braun, Hinterramskogler, and Tappeiner (2012), and Haque and Kleymenova (2023) examine how PE sponsors and their reputation affect the terms of debt financing and debt covenants (and their violation) in LBOs. We contribute by showing that PE sponsor engagement reduces expected losses for lenders and therefore substitutes for bank monitoring.

1 Data and Facts

In this section, we describe our data sources. We also establish novel empirical facts about how bank monitoring, loan sales and non-bank participation differ across PE-backed and non PE-backed loans. In what follows, we use the term bank, lender, or lead bank interchangeably. Appendix A presents an overview of the variable definitions.

SNC Database. Our primary data is loan-level data from the Shared National Credit (SNC) register, which is maintained by the Board of Governors of the Federal Reserve System, the Federal Deposit Insurance Corporation, and the Office of the Comptroller of the Currency. The data provides information for all syndicated loans in the U.S. with a minimum total commitment of $ 20 million and at least three federally supervised institutions participating in the syndicate. The administrative agent of a loan —- the lead arranger

[3] A large empirical literature then studies the effects of PE sponsors' actions on firm outcomes and value creation (see, among others, Boucly, Sraer, and Thesmar (2011); Cronqvist and Fahlenbrach (2013); Harford and Kolasinski (2014); Bernstein and Sheen (2016); Antoni, Maug, and Obernberger (2019); Aldatmaz and Brown (2020); Cohn, Hotchkiss, and Towery (2022); Fracassi, Previtero, and Sheen (2022)).

or lead bank — is required to report detailed information about the loan at regular intervals. In particular, it reports the lead share (i.e., the loan share held by the lead bank), the loan shares held by all members and banks of a loan syndicate, and the loan shares held by non-bank financial intermediaries.[4] The SNC data contain detailed information on lender identity, loan terms, loan type, maturity, loan origination date, borrower characteristics, collateral, and loan shares. We emphasize that the SNC data do *not* report loan spreads or firm-level financial information in a systematic way, so they are not available for our analysis; importantly, neither loan spreads nor firm financial information are necessary for our research question.[5] In addition, a separate schedule of SNC data contains information on loan covenants and covenant compliance. Of particular interest for our analysis is the so-called lead arranger share or lead share, which we denote for loan l at time t by $LeadShare_{l,t}$. The lead share is the share of the loan (commitment) retained by the lead bank. It thus captures the lead bank's exposure to loan performance and skin-in-the-game, which determines the lead bank's monitoring incentives. Note that the lead bank is typically in charge of screening and monitoring (Gustafson et al., 2021), whereas other members of the syndicate typically take a more passive role. Importantly, for a given loan, we observe the lead share at every report date before maturity, i.e., at several points in time.

Construction of Bank Monitoring Variable. Crucially for our analysis, bank examiners obtain additional information and conduct an examination for a subset of these loans.[6] This information in the SNC's exam sample contains textual descriptions about whether and how lenders are actively monitoring their borrower, as well as about the collateral securing debt facilities. Active monitoring includes field exams or audits conducted by the lead bank as well as third-party appraisals conducted by external firms hired by the lender. Using the methodology of Gustafson et al. (2021), we conduct detailed textual analysis of the exam sample and construct a measure of active bank monitoring $Monitoring_{l,t} \in \{0, 1\}$. Here, $Monitoring_{l,t} = 1$ indicates that loan l is actively monitored at report date t.[7] As in Gustafson et al. (2021), we run a controlled loan-level regression of our measure of monitoring

[4] The reporting frequency is annual before 2015, quarterly in 2015, and semi-annual since then. The SNC data report the facility of each loan deal separately. Thus, when a loan deal consists of a credit line and a term loan, we obtain two separate observations.

[5] The SNC exams do not require firms to report loan spreads and standardized firm financial information. Our understanding of the data suggests such information is provided for a non-random sample of loans, which may create additional sample selection issues and hamper systematic data analysis.

[6] This exam sample may consist relatively riskier loans, so there might be selection toward riskier loans.

[7] Gustafson et al. (2021) also provides an example of the textual description that they — and we — use to measure bank monitoring. We refer interested readers to their paper to see how lenders provide this information.

$Monitoring_{l,t}$ on $LeadShare_{l,t}$. We find that the coefficient on $LeadShare_{l,t}$ is positive and statistically significant at the 1 percent level with a point estimate of 0.284.[8] The (positive and significant) sensitivity of our measure of active bank monitoring with respect to lead share indicates that monitoring is subject to moral hazard, in that the lead bank's incentives to monitor increase with its skin-in-the-game.

Data on PE and LBO deals. Our private equity (PE) data source is Pitchbook. We obtain deal-level information related to PE sponsor name, portfolio company name, industry, and deal date. For a subset of deals, we also observe the deal size. Pitchbook is widely considered one of the most comprehensive PE databases and is especially strong for the U.S. data and the most recent decade (Gornall, Gredil, Howell, Liu, and Sockin, 2021). We focus exclusively on buyouts (as opposed to venture or growth capital). Following Cohen, Dice, Friedrichs, Gupta, Hayes, Kitschelt, Lee, Marsh, Mislang, Shaton, et al. (2021), we match the SNC data set to our Pitchbook data set using a string matching algorithm on the name and industry of the portfolio company, and manually verify the accuracy of the match. We restrict the sample to SNC loans that include information on bank examination and obligors for at least two years pre- and post-buyout. After this filtration process, we can match 3,659 unique SNC credit facilities, i.e., loans, with 1,574 unique PE-backed borrowers and 467 unique PE sponsors. Our sample period is 2012 to 2022. In the cross-section, the total loan amount originated by borrowers that were ever PE-backed is around $ 1.21 trillion.

1.1 Empirical Facts

Table 1 presents loan-level summary statistics for PE-backed loans (Panel A) and non PE-backed loan (Panel B); a loan is PE-backed if the borrower firm is PE-backed, i.e., PE-owned or PE-sponsored. In Table 1, we classify (with slight abuse of notation) all borrowers as PE-backed when they are or become PE-backed at some point in our sample. Thus, the sample of PE-backed loans contains observations of loans made to borrowers, which, at the observation date, are already PE-backed (i.e., have undergone a buyout) or will become PE-backed in the future (i.e., will undergo a buyout). The averages and percentiles reported in Table 1 are with respect to the distribution of observations across loans (and firms) and over time.

[8] Controls include the share of the loan held by the lead bank, natural log of loan commitment, natural log of loan maturity, indicators for loan type fixed effects, collateral fixed effects, SNC report date fixed effects, origination time fixed effects, industry fixed effects, lead bank fixed effects and lead bank internal risk ratings. Gustafson et al. (2021) find a similar estimate of $\beta_1 = 0.309$, which can be seen as a validation of our measure. Our adjusted R^2 is 17.5 percent, while they obtain a somewhat higher R^2 of 29 percent.

Table 1: Loan Sample Summary Statistics

	N	Mean	SD	p25	p50	p75
Panel A: PE-backed Borrowers						
Loan Size ($ million)	15,687	362	637	52	150	400
Maturity (quarters)	15,687	23.6	10.3	20	21	28
Utilization Rate	15,687	0.65	0.41	0.21	0.99	1
Loan Risk	15,687	0.32	0.47	0	0	1
Lead Share	15,687	0.24	0.17	0.10	0.21	0.35
Lead Share - Term Loans	7,224	0.18	0.17	0.06	0.13	0.25
Loan Size - Credit Lines	7,420	241	398	45	100	265
Loan Size - Term Loans	7,224	498	801	90	231	549
Loan Size - Other Loans	1,043	284	543	39.3	99.5	285
Non-Bank Holdings ($ million)	8,637	332	659	20	80.9	380
Loan Share Held by Non-Banks	8,637	0.57	0.36	0.18	0.66	0.93
Panel B: Non PE-backed Borrowers						
Loan Size ($ million)	18,886	326	545	63.2	150	375
Maturity (Quarters)	18,882	29.7	12.6	17	20	28
Utilization Rate	18,886	0.62	0.39	0.23	0.75	1
Loan Risk	18,882	0.28	0.45	0	0	1
Lead Share	18,886	0.28	0.17	0.15	0.25	0.37
Lead Share - Term Loans	6,069	0.27	0.17	0.13	0.22	0.36
Loan Size - Credit Lines	10,306	358	486	80	180	435
Loan Size - Term Loans	6,069	336	688	49.6	136	359
Loan Size - Other Loans	2,551	168	292	41.6	95	200
Non-Bank Holdings ($ million)	9,457	206	495	19.1	50	184
Loan Share Held by Non-Banks	9,457	0.37	0.33	0.09	0.24	0.68

(a) *Notes: This table reports the cross-sectional distribution and summary statistics of loan-level variables for PE-backed and non PE-backed loans. The loan size and total non-bank holding are expressed in $ million. All variables are defined in the Appendix A.*

We distinguish between pre- and post-buyout periods in our formal empirical analysis.

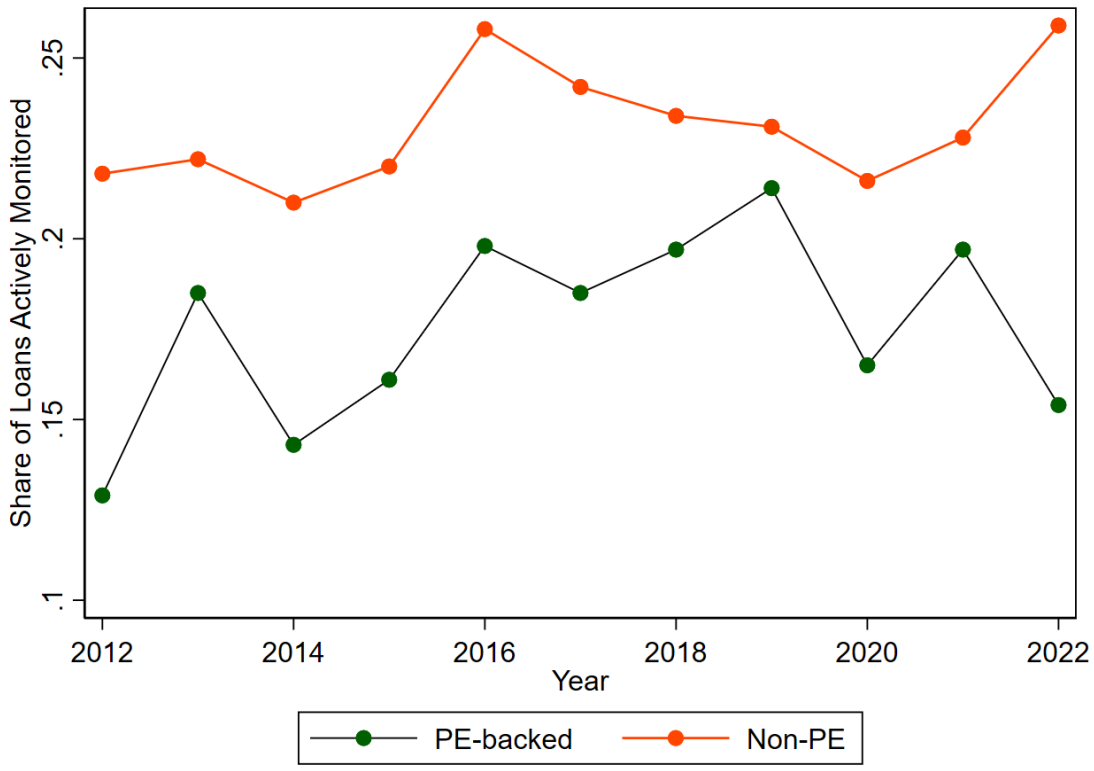
We classify loans into (revolving) credit lines, term loans, and pool all other loans together; the majority of loans in our sample are credit lines or term loans. PE-backed and non PE-backed loans are similar in terms of loan size, where the median loan size of both groups is approximately $150 million. The median maturity of PE-backed and non PE-backed loans is similar too and equals about 5 years. In addition, the SNC data contains a loan risk dummy for examined loans, which captures whether the bank examiner views the loan as risky. Our summary statistics reveal that according to bank examiner assessment, PE-backed loans tend to be (slightly) more risky than non PE-backed ones. Next, we document three novel facts that motivate our following analysis.

Fact 1: PE-backed loans are monitored less. Figure 1 plots the share of PE-backed (green line) and non PE-backed loans (red line) that are actively monitored in a given year.[9] In all years, PE-backed loans are associated with less active bank monitoring, i.e., non PE-backed loans are monitored more intensely. Over the entire sample period, around 20-25 percent of the non PE-backed loans and 15-20 percent of PE-backed loans are actively monitored. Crucially, this pattern may reflect (i) non-random selection of companies by PE sponsors or (ii) that PE sponsors' actions substitute for bank monitoring. Our empirical analysis that follows provides evidence for the second channel (ii), but cannot rule out that the first channel (i) contributes to the findings too.

Fact 2: The lead share is lower for PE-backed loans. Table 1 shows that the mean and median of the lead bank's retained share ("lead share") is lower for PE-backed than for non PE-backed loans. The median lead (arranger) share for PE-backed loans is 21 percent and thus 4 percentage points lower than for non PE-backed loans. When focusing on term loans that are more commonly sold than other types of loans (Blickle et al., 2023), this difference is even more pronounced, in that the median lead share is about 13% for PE-backed and 22% for non PE-backed term loans. The lead share captures the lead bank's skin-in-the-game and is therefore directly related to its incentives to monitor the borrower (Gryglewicz et al., 2024). In syndicated lending, the lead bank and other banks in the syndicate typically sell loan shares after origination to non-bank financial intermediaries (in short, non-banks), such as collateralized loan obligations (CLOs) or private debt funds. Thus, the lower lead share observed for PE-backed loans indicates that the lead bank sells a greater share of the loan to non-banks, when the borrower is PE-backed.

[9]Note that in this figure, we do not distinguish between pre-(post-) buyout PE observations.

Figure 1: Measure of Active Monitoring



(a) *Notes: This chart plots the share of loans that are actively monitored by lenders, split between PE-backed and non-PE loans. Bank monitoring is constructed following Gustafson et al. (2021).*

Fact 3: Non-bank participation is higher for PE-backed loans. Our data allow us to observe how much of a loan is held by banks and non-bank financial intermediaries. For a given loan at specific point in time, we observe the identity and loan share held by every single non-bank financial intermediary (in dollar amount). Broadly, these non-bank lenders include CLOs, hedge funds, mutual funds, private debt funds, business development companies (BDCs), insurance companies, etc. We use this information to calculate the loan amount (in dollars) and loan share held by all non-banks. As Table 1 shows, the median share of the loan commitment held by non-banks is around 66 % for PE-backed and 24% for non PE-backed loans. The mean non-bank share for the full sample is 49.1 percent (not reported), which is slightly higher than what Chodorow-Reich and Falato (2022) report in their SNC sample. Likewise, Table 1 reports that for PE-backed loans, the median aggregated dollar holdings of non-banks are about $ 80 million, while they equal only $ 50 million for non PE-backed loans; in calculating the dollar amount of non-bank holdings, we focus on loans with non-zero non-bank holdings. Interestingly, the median loan size is similar for PE-backed and non PE-backed loans. Overall, non-bank participation is higher for PE-backed than for non PE-backed loans, both in percentages and dollar terms.

2 Simple Theoretical Framework

To guide our thoughts on the following empirical analysis and to rationalize the empirical facts presented in the previous Section, we develop a simple theoretical framework. A (lead) bank originates a loan and sells this loan to non-bank investors. The bank keeps fraction $LeadShare$ of the loan, and thus sells the remainder $1 - LeadShare$ to non-banks. The loan pays a cash flow normalized to 1 if it does not default (with probability $1 - p$) and a cash flow of $1 - L < 1$ if it defaults (with probability p). The loan's expected loss is pL, i.e., the product of probability of default p and the loss given default L. The bank's expected loss is $LeadShare \cdot (pL)$. Thus, $LeadShare$ captures the bank's exposure to loan performance. The lender reduces the loan's expected loss $EL(m) := pL$ via costly monitoring m at time $t = 0$ (i.e., $EL'(m) \leq 0$) against quadratic cost $c(m) = \frac{m^2}{2}$. The bank is subject to moral hazard, in that it optimizes

$$\min_{m \in [0,1]} \Big\{ \lambda LeadShare \cdot EL(m) + (1 - \lambda) EL(m) + c(m) \Big\}. \tag{1}$$

That is, the bank minimizes the loan's expected loss plus the cost of monitoring, but its objective considers a weighted average of its private expected loss $LeadShare \cdot EL(m)$ and

total expected loss $EL(m)$, with weight λ capturing in reduced form the severity of moral hazard. When $\lambda = 1$, the bank only cares about its private expected loss proportional to the retained share $LeadShare$, so moral hazard is severe. When $\lambda = 0$, the bank cares about total expected loss, so there is no moral hazard. We employ this specification in (1) with $\lambda \in [0, 1]$ to allow in reduced form for intermediate levels of moral hazard/agency conflicts.[10]

Let $PE \in \{0, 1\}$ indicate whether the loan is PE-backed. We stipulate $EL(m) = A(1-\alpha \cdot PE)(1-m)$, assuming $A > 0$ and appropriate parameters ensuring $EL(m) \geq 0$. PE sponsors are active investors which conduct pre-investment due diligence (screening), monitor their portfolio companies' operations, engage with management, and provide liquidity support to resolve distress situations (Kaplan and Stromberg, 2009; Bernstein, Lerner, Sorensen, and Strömberg, 2017; Hotchkiss, Smith, and Strömberg, 2021). The parameter $\alpha \neq 0$ captures that these actions conducted by PE sponsors may affect a loan's expected loss and so the necessity of bank monitoring m.

The first order condition in (1) implies (for interior $m \in (0, 1)$):

$$m = LeadShare \cdot \lambda A(1 - \alpha PE) + (1 - \lambda)A(1 - \alpha PE). \tag{2}$$

Thus, monitoring decreases with the severity of moral hazard λ and with αPE. Optimal lead share $LeadShare^*$ and monitoring m^* — linked via the incentive condition (2) — minimize sum of total expected loss, cost of monitoring, and (opportunity) cost of capital $\gamma LeadShare^*$, that is,

$$\min_{m \in [0,1]} EL(m) + c(m) + \gamma LeadShare \quad \text{s.t.} \quad (2). \tag{3}$$

Retaining $LeadShare > 0$ is costly with $\gamma > 0$ capturing this cost, for instance, because the lead bank faces a higher cost of capital, is more impatient or risk-averse, or faces more regulatory constraints than non-bank investors buying the loan. Provided optimal lead share $LeadShare^*$ is interior and lies in $(0, 1)$, it solves the first order condition to the optimization in (3), so that[11]

$$LeadShare^* = 1 - \frac{\gamma}{\lambda[A(1 - \alpha PE)]^2}. \tag{4}$$

Thus, optimal lead share $LeadShare^*$ and the amount of the loan sold $1 - LeadShare^*$

[10] In practice, the lead bank might care about total expected loss beyond how it affects its private payoff for instance due to reputational concerns.

[11] We consider that parameters are such that the expression for the lead share in (4) is well-defined, i.e., $LeadShare^* \in [0, 1]$.

decreases and increases with αPE, respectively.

According to the model, the effects of private equity on monitoring and lead share crucially depend on the sign of the parameters α and λ. Crucially, our empirical results in Sections 3 suggest that $\lambda > 0$ and $\alpha > 0$, in that there is moral hazard and a loan's PE backing reduces the need for monitoring.[12] Note that when $\alpha > 0$, then $\frac{\partial^2 EL(m)}{\partial PE \partial m} > 0$, so a loan's PE backing PE and bank monitoring m are substitutes.

The model predicts that a loan's PE backing is associated with lower monitoring and lead share, i.e., more loan sales to non-bank financial intermediaries. It therefore rationalzes all three facts of the previous Section. The mechanism is that due to $\alpha > 0$, PE sponsors' actions substitute for bank monitoring. This reduces the optimal monitoring level and allows the lender to reduce its retained share ("skin-in-the-game"). The strength of this effect is captured by α and should be larger, when the lender expects the PE sponsor to be more effective at reducing the necessity of monitoring. Naturally, the lender places higher expectations or trust in a PE sponsor that has high reputation (as captured by past deals) or has interacted with the lender in the past, creating a lender-sponsor relationship; in this case, $\alpha > 0$ should be larger. The empirical analysis in Section 3.2 confirms that for PE-backed loans, sponsor reputation and the strength of a lender-sponsor relationship cause further reductions in monitoring and lead share.

3 Empirical Analysis

Motivated by our theoretical framework and its predictions, we estimate the following loan-level regression with our measure of monitoring or the lead share as outcome variable $Y_{l,t}$:

$$Y_{l,t} = \beta_1 PE_{i,t} + \ X_{l,i,b,t} + \overline{PE}_i + FEs + \epsilon_{l,i,b,t}, \tag{5}$$

where l, i, b and t denote a given loan, borrower firm, (lead) bank, and SNC report date respectively. $X_{l,i,b,t}$ and FEs are vectors of control variables and fixed effects respectively. The variable of interest is the indicator $PE_{i,t} \in \{0, 1\}$ which takes value 1 if the borrower firm i and thus the loan l is PE-backed at t. Thus, when borrower firm i undergoes a private equity buyout at time t, the indicator $PE_{i,t}$ increases from zero pre-buyout to one post-buyout. A common challenge is the non-random selection of PE targets. To control for firm characteristics which correlate with PE ownership, we include a dummy variable $\overline{PE}_i$,

[12] See Section 3.1 for evidence supporting $\lambda > 0$ and Section 3.3 for evidence supporting $\alpha > 0$.

which equals 1 if firm i is PE-backed at least one time t in our sample.[13] Unless otherwise stated, standard errors are clustered at the lead bank and SNC reporting date level.

We include loan controls, such as logarithm of loan commitment, loan maturity (expressed in quarters), and utilization rate, as well as control for time-varying measures of loan risk, namely the risk dummy reported in the SNC data by the bank examiner.[14] We include (lead) bank-time, sector-time (i.e., industry-time), and loan-origination year-quarter fixed effects. Because term loans are more commonly sold more credit lines (Irani and Meisenzahl, 2017; Blickle et al., 2023), we also include loan-type fixed effects. We include these fixed effects sequentially, to demonstrate that our results are not driven by a small sample of loans and hold in the aggregate. Thus, in our baseline specification, we compare, at a given point in time, observably similar loans of the same type and similar risk level by a specific (lead) bank to PE-backed and non PE-backed borrowers within the same sector.

Section 5.3 provides a matched sample analysis, where we match PE-backed and non PE-backed loans based on loan and firm characteristics. We show that the key findings remain robust to employing a matched sample. In addition, we show in Section 5.2 that our results remain robust to controlling for the *lead bank*'s risk assessment by including its estimate of the probability of default as a control variable. Moreover, Section 5 demonstrates that our results are generally robust to the inclusion of firm or loan fixed effects — in which case we exploit a different type of variation. With firm fixed effects, we essentially compare the loans to the same borrower pre- and post buyout. Including even more stringent loan fixed effects, we effectively compare the same loan pre- and post-buyout.

3.1 Baseline Results

Table 2 presents the regression results with active bank monitoring, i.e., $Monitoring_{l,t}$, as outcome variable. Consistent with moral hazard in monitoring (i.e., positive λ in our theory), monitoring increases with lead share, in that the coefficient on $LeadShare_{l,t}$ is positive and significant. Crucially, the coefficient on $PE_{i,t}$ is negative and significant across all specifications. Thus, relative to comparable non PE-backed loans, PE-backed loans are monitored less, i.e., a loan's PE backing substitutes for bank monitoring. In terms of economic magnitude, a loan's PE backing reduces a (lead) bank's propensity to monitor the loan by about 2

[13] Note that $\overline{PE}_i$ does not vary over time and differs from the indicator $PE_{i,t}$: $\overline{PE}_i = 1$ at time t, if firm i is PE-backed at time t or will be PE-backed at a future time $t' > t$.

[14] The SNC data contains a loan risk dummy for examined loans, which captures whether the bank examiner views the loan as risky. Notably, Section 5 also shows that our results remain robust to controlling for the *lead bank*'s risk assessment by including its estimate of the probability of default as a control variable.

Table 2: Private Equity Reduces Bank Monitoring

$Y_{l,t}$: $Monitoring_{l,t}$	(1)	(2)	(3)	(4)
$PE_{i,t}$	-0.026***	-0.026***	-0.020**	-0.020**
	(0.008)	(0.008)	(0.009)	(0.009)
$LeadShare_{l,t}$	0.246***	0.242***	0.212***	0.193***
	(0.010)	(0.009)	(0.009)	(0.008)
R-squared	0.402	0.411	0.454	0.456
Bank×Time FE	Y	Y	Y	Y
Origination Qtr FE	N	Y	Y	Y
Sector×Time FE	N	N	Y	Y
Loan Type FE	N	N	N	Y
N	34307	34302	34251	34251

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table reports OLS estimates of a linear probability model where the dependent variable is a time-varying measure of bank monitoring, for a given loan-time observation. Each regression specification controls for a given loan's total commitment, utilization, maturity and loan risk, in addition to lead share. All variables are defined in Appendix A. Sectors are defined at the 2-digit NAICS level. Standard errors are clustered at the lead bank and SNC report date.*

percentage points. According to Figure 1 the average propensity to monitor (i.e., the average of $Monitoring_{l,t}$ across l and t) is about 20%. Thus, relative to this average, the propensity of monitoring declines by about 10% when the borrower is PE-backed.

Table 3 presents the regression results with lead share, i.e., $LeadShare_{l,t}$, as outcome variable. Since loan sales are concentrated among term loans whereas other types of loans are sold less frequently (Blickle et al., 2023),[15] we present results for the full sample as well as split by loan types. The coefficient on $PE_{i,t}$ is negative and significant under all our specifications and for different loan types. That is, PE-backed loans are associated with a lower lead share and accordingly more loan sales, relative to comparable non PE-backed loans. Consistent with our theoretical framework, the empirical findings suggest that a loan's PE backing allows the lead bank to sell a greater share of the loan. The negative coefficient on $PE_{i,t}$ is larger, when restricting the sample to term loans. A possible explanation is that term loans are more commonly sold than other loan types, such as credit lines.

In terms of economic magnitude, the regression coefficients indicate that for PE-backed term loans, the lead share is about 2.5 percentage points higher than for similar non PE-backed term loans. According to Table 1, the median lead share of non PE-backed term loans is about 22%. Hence, a loan's PE backing is associated with a reduction in the lead

[15] More in detail, Blickle et al. (2023) show that typically only term loan B are sold to non-bank investors, while credit lines are rarely sold.

Table 3: Private Equity Reduces Lead Share

$Y_{i,l,,b,t}$: $LeadShare_{l,t}$	*Full Sample*		*Credit Lines*		*Term Loans*	
	(1)	(2)	(3)	(4)	(5)	(6)
$PE_{i,t}$	-0.012***	-0.011***	-0.007*	-0.007*	-0.025***	-0.024***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
R-squared	0.408	0.426	0.414	0.445	0.428	0.454
Bank×Yr-Qtr FE	Y	Y	Y	Y	Y	Y
Sector×Yr-Qtr	N	Y	N	Y	N	Y
Origination×Yr-Qtr	Y	Y	Y	Y	Y	Y
Loan Type FE	Y	Y	-	-	-	-
N	34302	34251	17445	17363	12966	12857

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table reports OLS estimates of a where the dependent variable is a time-varying measure of the lead arranger's share of a given credit facility, for a given loan-time observation. Each regression specification controls for a given loan's total commitment, utilization, maturity and loan risk. All variables are defined in Appendix A. Sectors are defined at the 2-digit NAICS level. Standard errors are clustered at the lead bank and SNC report date.*

share by about 11%. Loosely speaking, with a median loan size of approximately $ 150 million, the lead bank earns additional $ 3.75 million from loan sales, i.e., must provide $ 4 million less of capital, when a loan is PE-backed.[16]

Because the lead bank typically sells loans after origination to non-bank intermediaries, we expect higher non-bank participation for PE-backed loans. Following Irani et al. (2021), we compute the dollar amount of a given loan l that is held by individual non-banks at report date t. We take two measures of non-bank participation for loan l at time t, namely, (i) the total (percentage) share of loan l held by non-banks at time t, denoted $NonBankShare_{l,t}$, and (ii) the total dollar value of non-banks' holdings of loan l at time t, denoted $NonBankHolding_{l,t}$. The first measure captures non-bank participation in percentage terms, while the second measure captures non-bank participation in dollars.

Next, we estimate our baseline regression with the loan share held by non-banks, that is, $NonBankShare_{l,t}$, and the (logarithm of) dollar value of non-bank holdings, that is, $log\left(NonBankHolding_{l,t}\right)$, as outcome variables. In this regression, we exclude loans with zero shares held by non-banks, leading to a decline in the sample size. As non-bank investors typically do not buy credit lines, the majority of the remaining sample are term loans. Because zero non-bank participation is more common for non PE-backed loans, we exclude

[16] Of course, we acknowledge that these back-of-the-envelope calculations are heuristic and that the stated magnitudes might be off due to selection issues.

Table 4: Private Equity Fuels Non-bank Partipication

$Y_{l,t}$:	$NonBankShare_{l,t}$			$log\,(NonBankHolding_{l,t})$		
	(1)	(2)	(3)	(4)	(5)	(6)
$PE_{i,t}$	0.020***	0.025***	0.023***	0.082***	0.090***	0.085***
	(0.007)	(0.007)	(0.006)	(0.024)	(0.024)	(0.022)
R-squared	0.547	0.610	0.710	0.740	0.779	0.825
Loan Controls	Y	Y	Y	Y	Y	Y
Bank×Time FE	Y	Y	Y	Y	Y	Y
Sector×Time FE	N	Y	Y	N	Y	Y
Origination-Qtr FE	N	N	Y	N	N	Y
Loan Type FE	N	N	Y	N	N	Y
N	17999	17982	17979	17993	17976	17973

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table shows that non-bank participation in syndicated loans rises post-buyout. The dependent variable is the share of the loan held by all non-banks in a syndicated loan (e.g. CLO or private credit fund), expressed as a fraction in columns (1)-(3) and the dollar value of non-bank holdings expressed in logs in columns (4)-(6). Each regression specification controls for a given loan's total commitment (size), utilization, maturity and loan risk.* $PE_{i,t}$ *takes value 1 post-buyout, 0 otherwise. These specifications also include dummies for different types of term loans (Term loan A, B, C, D, etc.) as well as dummies for relatively fewer revolving credit facilities. All variables are defined in Appendix A. Sectors are defined at the 2-digit NAICS level. Standard errors are clustered at the lead bank and SNC report date.*

loans with zero non-bank participation to prevent that these loans drive our results: Including them would likely overstate the effect of private equity on non-bank participation. The results, presented in Table 4, reveal that a loan's PE backing is associated with more non-bank participation and loan sales to non-banks, both in percentage and dollar terms.

Columns (1)-(3) show that a loan's PE backing is associated with an about 2.5 percentage point increase in the loan share held by non-banks. According to Table 1, the median loan share held by non-banks is about 24% for non PE-backed loans. Consequently, a loan's PE backing is associated with approximately a 10% higher loan share held by non-banks. Columns (4)-(6) highlight that for PE-backed loans, the dollar value of non-bank holdings is about 9-10% higher than for comparable non PE-backed loans. Interestingly, the results of Table 4 suggests a similar economic magnitude as the ones in Table 3. For PE-backed loans, the lead share is about 10% lower, while non-bank participation is about 10% higher relative to comparable non-PE-backed loans.

3.2 Sponsor Reputation and Sponsor-Lender Relationships

Guided by our theory in Section 2, the interpretation of the empirical findings is that PE sponsor engagement substitutes for and reduces the necessity of bank monitoring. Thus, a loan's PE backing allows the lead bank to reduce its retained share ("skin-in-the-game") and to sell greater loan shares to non-banks.[17] This reduction in bank monitoring and lead share should be stronger, when the lead bank (lender) expects the PE sponsor to be more effective at substituting for monitoring. Naturally, the lead bank should place higher trust or expectations in a PE sponsor's capabilities to substitute for bank monitoring, when the PE sponsor has high reputation (as captured by past deals) or an ongoing relationship with the lead bank (through interactions in past LBO deals). Consistent with this line of argument, our analysis below reveals that (i) high sponsor reputation and (ii) a strong lender-sponsor relationship are associated with both lower monitoring and lead share. Crucially, we view these results as additional empirical evidence that the effects of private equity on loan monitoring and sales go beyond selection and, to some part, are causal.[18] Moreover, these results lend additional support to our theory and its proposed economic mechanism.

The Effect of PE Sponsor Reputation. Following Demiroglu and James (2010), we classify high-reputation PE sponsors using a list from Private Equity International (PEI). PEI ranks sponsors based on the amount of capital raised from limited partners. Effectively, a sponsor's ranking captures its experience and past performance, which should be indicative of its future performance too. In particular, we expect sponsors with high reputations to be more skilled and experienced, or to have better access to capital. Consequently, they are likely to have greater abilities to substitute for bank monitoring through their engagement. To test this hypothesis, we create a dummy variable $Reputation_s \in \{0, 1\}$ taking value 1 if sponsor s appeared in PEI's top 50 funds in either 2019 or 2020.[19] We then regress our measure of active bank monitoring and lead share on the interaction term $PE_{i,t} \times Reputation_s$, which is equal to one if and only if at time t firm i is backed by a high-reputation sponsor. To isolate the effect of reputation, we also control for $PE_{i,t}$. Additionally,

[17] Indeed, as argued before, PE sponsors are active investors which conduct pre-investment due diligence (screening), monitor their portfolio companies' operations, and provide liquidity support and engage with portfolio companies to resolve distress situations. These actions undertaken by PE sponsors may substitute for bank monitoring, leading to optimally lower monitoring efforts by the lender.

[18] We emphasize that we do not claim (full) causality here. The found effect of private equity might reflect both selection and a causal effect. Our findings of this Section provide evidence that the causal effect is non-zero.

[19] Choosing different years does not change our results, as the rankings do not change drastically from one year to the next.

Table 5: The Role of Sponsor Reputation

$Y_{l,t}$:	$Monitoring_{l,t}$			$Lead\ Share_{l,t}$		
	(1)	(2)	(3)	(4)	(5)	(6)
$PE_{i,t} \times Reputation_s$	-0.048***	-0.044***	-0.028***	-0.011***	-0.010**	-0.015***
	(0.010)	(0.010)	(0.010)	(0.004)	(0.004)	(0.005)
$PE_{i,t}$	-0.010	-0.010	-0.010	-0.025***	-0.021***	-0.018***
	(0.009)	(0.009)	(0.010)	(0.005)	(0.005)	(0.005)
$Lead\ Share_{l,t}$	0.255***	0.242***	0.212***			
	(0.020)	(0.020)	(0.019)			
R-squared	0.402	0.411	0.454	0.460	0.486	0.541
Loan Controls	Y	Y	Y	Y	Y	Y
Bank×Time FE	Y	Y	Y	Y	Y	Y
Origination-Qtr FE	N	Y	Y	N	Y	Y
Sector×Time FE	N	N	Y	N	N	Y
Sample	Full	Full	Full	Term Loans	Term Loans	Term Loans
N	34307	34302	34251	12972	12966	12857

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table reports OLS estimates of a linear probability model where the dependent variable is a time-varying measure of bank monitoring in column (1)-(3) and lead share in column (4)-(6), for a given loan-time observation. Each regression specification controls for a given loan's total commitment, utilization, maturity and loan risk (dummy). All variables are defined in Appendix A. Sectors are defined at the 2-digit NAICS level. Standard errors are clustered at the lead bank and SNC report date.*

we include loan controls and various fixed effects, including bank-time, origination-quarter, and sector-year. In this regression, we effectively compare, at a specific point in time, loans backed by high-reputation sponsors to observably similar loans issued by the same lead bank, including other PE-backed loans.

Table 5 shows that when monitoring is the outcome variable, the coefficient on the interaction $PE_{i,t} \times Reputation_s$ is negative, significant, and quantitatively larger than the estimate on $PE_{i,t}$ presented in the baseline in Table 2; see columns (1)-(3).[20] Interestingly, the coefficient on $PE_{i,t}$ is close to zero and statistically insignificant, suggesting that mainly high-reputation substitute for bank monitoring through their engagement. Our results suggest that for PE-backed loans, sponsor reputation is associated with lower bank monitoring. Thus, high-reputation sponsors appear to be more effective at substituting for monitoring.

When analyzing the effects of sponsor reputation on lead share, we focus on term loans, because (i) loan sales are concentrated among term loans while other loan types are sold less frequently (Blickle et al., 2023) and (ii) term loans are the primary source of debt financing for buyouts (Axelson et al., 2013).[21] In the full sample containing term loans, credit lines, and others, the relationship between $PE_{i,t} \times Reputation_s$ and lead share becomes insignificant (we verified this in unreported analysis), which is not surprising given (i) and (ii). For term loans, the coefficient on the interaction term $PE_{i,t} \times Reputation_s$ is statistically significant and negative. Hence, high sponsor reputation is associated with lower lead share and accordingly more loan sales to non-banks. The lead share for a term loan, backed by a high-reputation sponsor, is about 6 percentage points lower than for other comparable term loans. The economic magnitude is large given a median lead share of about 13% for PE-backed term loans.

The Effects of Sponsor-Lender Relationships. PE sponsors and bank lenders often interact repeatedly in buyout deals, creating a lender-sponsor relationship (Malenko and Malenko, 2015). According to our theory, the lead bank reduces monitoring and its retained loan share more strongly, when it expects or trusts a sponsor to be more effective at substituting for bank monitoring. Naturally, the lead bank should have greater trust or expectations in a PE sponsor's ability to substitute for bank monitoring when it maintains a

[20] In more detail, when we only include bank-time fixed effects, the probability of lower bank monitoring conditional on a loan having a high-reputation sponsor is around 7 percent. As we add more fixed effects and move towards our most demanding specification in column (4), we find probability of bank monitoring is 4.2 percent if a loan has a high-reputation sponsor. We observe that the quantitative magnitude of this estimate is more than twice as large as that reported in column (4) of Table 2.

[21] For instance, Blickle et al. (2023) highlight that it is typically term B loans that are sold to non-bank investors, while other types of loans are less frequently sold.

Table 6: Identification using Firm-Time Fixed Effects

$Y_{l,t}$:	$Monitoring_{l,t}$		$Lead\ Share_{l,t}$	
	(1)	(2)	(3)	(4)
$Relationship_{b,s,t}$	-0.221***	-0.190***	-0.065***	-0.062**
	(0.065)	(0.059)	(0.020)	(0.027)
$Lead\ Share_{l,t}$	0.031	0.014		
	(0.035)	(0.035)		
R-squared	0.835	0.840	0.817	0.825
Firm×Time FE	Y	Y	Y	Y
Bank FE	N	Y	N	Y
Loan Controls	Y	Y	Y	Y
Estimation Sample	All Loans	All Loans	Term Loans	Term Loans
N	15694	15690	4793	4790

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table reports robustness checks of results reported in Table 2 and Table 3 using firm-time fixed effects in the spirit of Khwaja and Mian (2008). $Relationship_{b,s,t}$ takes value of 1 if total historical loan commitments across all LBOs between a given sponsor s and bank b pair is greater than the sample average of all pairwise cumulative commitments between any sponsor-bank pair $[s, b]$ at time $t-1$, where t is the date of observation. The mean of this variable is USD 252 million in the sample. In short, it captures whether or not a given sponsor-bank pair at time t has a pre-existing strong relationship through loans related to LBOs. By construction, it can only take value of 1 post-buyout. $PE_{i,t}$ is absorbed by firm-time fixed effects. Each regression specification controls for a given loan's total commitment, utilization, maturity, and risk dummy. All variables are defined in Appendix A. Standard errors are clustered at the lead bank and SNC report date.*

strong relationship with this sponsor. Moreover, a strong lender-sponsor relationship likely incentivizes the sponsor to perform actions that eventually reduce credit risk and the necessity of bank monitoring. As a consequence, we expect a strong lender-sponsor relationship to be associated with both lower bank monitoring and lead share.

To test this hypothesis, we devise, similar to Ivashina and Kovner (2011), a time-varying measure for the strength of the relationship between bank (lender) b and sponsor s. Specifically, at any observation date t, we calculate the (dollar) value of total past loan commitments from bank b to firms backed by sponsor s (up to and including $t-1$), which we denote by $Com_{b,s,t}$.[22] At time t, bank b and sponsor s are said to have a *strong relationship* when this amount $Com_{b,s,t}$ is greater than the sample average of $Com_{b,s,t}$, where the average is taken over time t and lender-sponsor pairs (b,s) and equals about \$ 252 million. We denote a strong relationship between bank b and sponsor s at observation date t by $Relationship_{b,s,t} = 1$. Otherwise, $Relationship_{b,s,t} = 0$.

Next, we regress our measure of bank monitoring and the loan's lead share on the relationship strength measure $Relationship_{b,s,t}$, where we set $Relationship_{b,s,t} = 0$ if the loan l is *not* PE-backed.[23] A potential concern with this empirical design is that lender-sponsor relationship correlates with unobservable firm characteristics that affect monitoring and lead share: For instance, it could be that sponsors tend to involve lenders, with whom they maintain a strong relationship, in deals that do not require extensive monitoring. To identify the effects of a lender-sponsor relationship (beyond selection) and to mitigate these concerns, we follow Khwaja and Mian (2008) and include stringent borrower firm-time fixed effects. Firm-time fixed effects control for any time-varying firm characteristics (including a borrower's PE backing). In some specifications, we also include bank/lender fixed effects to control for lender characteristics that could affect lender-sponsor relationships.

Intuitively, this regression with firm-time fixed effects compares at a specific point in time observably similar loans to the same PE-backed borrower originated by distinct lenders, who differ in their relationship with the sponsor. To exploit this variation, we essentially focus on PE-backed borrowers with multiple lenders. In our sample, about 40% of PE-backed borrowers have multiple lenders. As firm-time fixed effects control for any (time-varying)

[22] Formally, denote the loan commitment of loan l to firm i backed by s at time t by $LC_{l,t}$, and define $\overline{LC}_{l,t} = \max_t LC_{l,t}$. Then, $Com_{b,s,t} = \sum_{l \in s^b_{t-1}} \overline{LC}_{l,t}$, where s^b_t is the set of loans from bank b to firms sponsored by sponsor s up to and including observation date $t-1$. Our results would remain similar if we used the initial loan commitment at origination (rather than maximum loan commitment) or aggregated loan commitments up to time t (rather than $t-1$).

[23] This readily implies $Relationship_{b,s,t} \times PE_{i,t} = Relationship_{b,s,t}$. Indeed, if firm i is not PE-backed, then $PE_{i,t} = Relationship_{b,s,t} = 0$. If i is PE-backed, then $PE_{i,t} = 1$ and $Relationship_{b,s,t} \times PE_{i,t} = Relationship_{b,s,t}$.

borrower characteristics including its PE backing, we sidestep issues related to the non-random selection of PE targets, allowing us to cleanly identify the effects of lender-sponsor relationships on loan-specific outcome variables.

The results presented in Table 6 highlight that a stronger lender-sponsor relationship is associated with lower monitoring and lead share. Columns (1) and (2) illustrate that the coefficient on $Relationship_{b,s,t}$ is negative and highly significant, when monitoring is the outcome variable. In columns (3) and (4), the lead share is the outcome variable. Consistent with practices in earlier analysis, we restrict the analysis in (3) and (4) to term loans only.[24] The coefficient on $Relationship_{b,s,t}$ is significant and negative, and the economic magnitude is large. Among PE-backed term loans, the lead share is about 6 percentage points lower, when the lender-sponsor relationship is strong and $Relationship_{b,s,t} = 1$ (rather than $Relationship_{b,s,t} = 0$). Given a median lead share for PE-backed term loans of about 13% (see Table 1), a strong lender-sponsor relationship reduces lead share by about 40%.[25]

Finally, due to the inclusion of firm-time effects, the regression results from Table 6 cleanly identify the effects of lender-sponsor relationships on monitoring and lead share. One can view the strength of the lender-sponsor relationship as an intensive margin measure for the effects of private equity on monitoring and loan sales. Intuitively, the lender trusts or expects the sponsor to be more effective at reducing the necessity of monitoring through its engagement, when it maintains a strong relationship with this sponsor. Under this interpretation, the regression results from Table 6 identify the effects of private equity on monitoring and loan sales on the intensive margin. This also suggests that our baseline results on the effects of private equity on the extensive margin go beyond selection and capture to some part the (causal) effects of PE sponsor engagement.

3.3 Private Equity and Measures of Ex-Ante Credit Risk

In our theory in Section 2, the core mechanism is that PE sponsor engagement decreases the bank's expected losses, thereby substituting for bank monitoring. Intuitively, as the lead bank associates a lower expected loss with a PE-backed loan, the need for monitoring diminishes. The following analysis shows that a loan's PE backing is indeed associated with

[24] We restrict the analysis to term loans, because loan sales are concentrated among term loans while other types of loans are sold less frequently (Blickle et al., 2023). As before in our analysis on the effects of PE sponsor reputation, the relationship between $Relationship_{b,s,t}$ and lead share becomes insignificant (we verified this in unreported analysis). We attribute this outcome to the fact that typically only term loans are sold to non-bank investors.

[25] Admittedly, this number has to be taken with some caveat, as Table 1 reports a median lead share for PE-backed term loans in general, including ones characterized by a strong lender-sponsor relationship.

a lower expected loss for lenders and a lower loss given default, providing empirical support for the assumption $\alpha > 0$ in our theory and the proposed mechanism. Expected loss and loss given default are reported by the lead bank in the SNC database. Loss given default is inversely related to the loan's recovery value, while expected loss is the product of the lead bank's estimate of loss given default, probability of default, and exposure to the loan at default. Therefore, expected loss and loss given default both can be viewed as measures of ex-ante (expected) credit risk from the lead bank perspective. In contrast, the loan risk dummy — which we typically include as control variable in our regressions — is reported by the bank examiner, thus serving as a measure of credit risk from the bank examiner perspective. Overall, banks seem to associate a higher recovery value, and lower expected losses and credit risk with loans when the borrower is PE-backed.

Expected Loss. For a given loan l at report date t, we construct a measure of the lead bank's expected loss, $EL_{l,t}$. The lead bank's expected loss associated with a loan is the product of loan's loss given default ($LGD_{l,t}$), probability of default ($PD_{l,t}$) and the bank's exposure at default ($EAD_{l,t}$), all of which are reported in the SNC database by the lead bank. We then estimate our baseline regression (5) with $log\ (1 + EL_{l,t})$ as the outcome variable, with similar control variables and fixed effects as in our baseline analysis.[26] Additionally, we control for the lead share, which may affect the reported values of loss given default and probability of default in the SNC database. Table 7 reports that a loan's PE backing is associated with significantly lower expected loss. That is, at a given point in time, the same lead bank estimates a lower expected loss for loans to PE-backed borrowers, relative to comparable loans to non PE-backed borrowers in the same industry.

Loss Given Default. A lower expected loss could reflect a lower probability of default or a lower loss given default, i.e., higher recovery value in the event of default. We now show that PE backing reduces a loan's loss given default, i.e., enhances recovery value. To do so, we perform the same regression as before, but with loss given default $LGD_{l,t}$ as the outcome variable. The results of Table 8 show that a loan's PE backing is associated with significant reduction in loss given default. The loss given default for PE-backed loans is about 2-4 percentage points lower than for comparable non PE-backed loans. The effect is economically large, given that the median loss given default is about 24%. That is, PE sponsor engagement appears to enhance a loan's recovery value (estimated by the bank).

[26] We use $log\ (1 + EL_{l,t})$ since around 20 percent of the loans in our full sample have expected loss of 0, due to term loans that have been sold off entirely and thus have 0 expected exposure at default.

Table 7: Banks' Expected Loss and PE-ownership

$Y_{l,t} : log(1 + EL_{l,t})$	(1)	(2)	(3)	(4)
$PE_{i,t}$	-0.802***	-0.604***	-0.665***	-0.680***
	(0.127)	(0.121)	(0.123)	(0.117)
R-squared	0.433	0.459	0.506	0.545
Bank×Time FE	Y	Y	Y	Y
Origination-Qtr FE	N	Y	Y	Y
Sector×Time	N	N	Y	Y
Loan type	N	N	N	Y
N	15595	15590	15501	15501

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table reports difference-in-difference estimates where the dependent variable is a time-varying measure of banks' expected loss for a given loan, and is expressed as* $log(1 + EL_{l,t})$. *Expected loss is computed as the product of a bank's reported exposure at default, the borrower's default probability and loss given default for a given loan-time observation. All variables are defined in Appendix A. Sectors are defined at the 2-digit NAICS level. Each regression specification controls for a given loan's total commitment, utilization, maturity, and risk, and exposure at default, in addition to lead share. Standard errors are clustered at the lead bank and SNC report date level.*

Table 8: Loss Given Default and PE backing

$Y_{l,t} : LGD_{l,t}$	(1)	(2)	(3)	(4)
$PE_{i,t}$	-0.017***	-0.014***	-0.015***	-0.015***
	(0.005)	(0.004)	(0.004)	(0.004)
R-squared	0.370	0.397	0.448	0.449
Bank×Time FE	Y	Y	Y	Y
Origination-Qtr FE	N	Y	Y	Y
Sector×Time	N	N	Y	Y
Loan type	N	N	N	N
N	15595	15590	15501	15501

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table reports difference-in-difference estimates where the dependent variable is a time-varying measure of banks' expected loss given default for a given loan, and is expressed as a fraction between 0 and 1. All variables are defined in Appendix A. Sectors are defined at the 2-digit NAICS level. Each regression specification controls for a given loan's total commitment, utilization, maturity, and risk, in addition to lead share. Standard errors are clustered at the lead bank and SNC report date level.*

3.4 Private Equity and Loan Performance

We emphasize two important caveats of our previous analysis. First, our regressions compare observably similar PE-backed and non PE-backed loans. Although we control for an observable measure of ex-ante credit risk (as per the bank examiner's assessment), PE-backed loans could be systematically more risky, for instance, because PE-backed companies tend to have higher leverage. Likewise, PE sponsors could target riskier companies, or their actions could increase credit risk post-buyout. Second, our analysis indicates that PE backing is associated with lower ex-ante measures of credit risk, such as the expected loss or loss given default reported by the lead bank. It could be that PE-backed loans are associated with lower ex-ante or expected credit risk, but perform worse ex-post.

To test whether PE-backed loans perform worse ex-post and default more often, we construct a dummy variable $Default_{l,t} \in \{0, 1\}$. This dummy is equal to one if and only if loan payments are more than 60 days due, in that the loan is in *default*. We regress $Default_{l,t}$ on $PE_{i,t}$, controlling for loan and borrower characteristics and including various fixed effects. Some of our regression specifications also control for the lead bank's estimate of the probability of default, $PD_{l,t}$, reported in the SNC data.

Table 9 illustrates that, without controlling for firm fixed effects or the lender's ex-ante estimate of the probability of default, PE-backed loans default more often than non-PE-backed loans; see column (1) of Table 9. This finding suggests that PE-backed loans may perform worse ex-post. However, these results vanish, once we control for measures of ex-ante credit quality or default risk. In particular, when we include firm fixed effects in column (2) or account for the lead bank's estimate of probability of default $PD_{l,t}$ in column (3), we find that PE-backed loans do not exhibit a higher propensity to default. The worse ex-post performance of PE-backed loans appears therefore attributable to selection, and not to PE sponsor engagement as such. Importantly, our findings suggest that the lower levels of monitoring for PE-backed loans do not reflect the selection of riskier loans for PE deals. Indeed, our baseline regressions control for loan characteristics, including ex-ante credit quality. Furthermore, our findings indicate that the lower expected loss $EL_{l,t}$ associated with PE-backed loans likely reflects a lower loss given $LGD_{l,t}$ default rather than a lower probability of default $PD_{l,t}$.

Table 9: Default and Private Equity

$Default_{l,t}$	(1)	(2)	(3)
$PE_{i,t}$	0.014***	0.009	0.001
	(0.003)	(0.006)	(0.003)
$PD_{l,t}$			0.218***
			(0.017)
R-squared	0.227	0.647	0.334
Bank×Time FE	Y	Y	Y
Sector×Time	Y	Y	Y
Origination-Qtr FE	Y	Y	Y
Loan Controls	Y	Y	Y
Firm FE	N	Y	N
N	30063	28002	17060

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table examines if PE-backed loans are associated with systematically default rates.* $Default_{l,t}$ *is a dummy which takes value of 1 if any payment (interest or principal) related to a loan is past due for 60 days or more. The reduction in sample size in column (1) relative to baseline is due to dropping erroneous entries on days past due. Firm FE leads to a reduction of 2000 singletons in column (2). Default Probability, used in specification (3), are ex ante estimates provided by the lead bank in the syndicate at a given point in time, and are also reported for a subset of the benchmark sample. Each regression specification controls for a given loan's total commitment, utilization, maturity, and risk rating. Sectors are defined at the 2-digit NAICS level. Standard errors are clustered at the lead bank and SNC report date.*

4 Other Results

4.1 Monitoring, Loan Sales, and Volatile Collateral

Bank monitoring often involves appraising a loan's collateral and thus should be more relevant for loans backed by riskier or more volatile collateral. Intuitively, such loans are more "information-sensitive" and thus require more monitoring. Therefore, the negative association between a loan's PE backing and monitoring should be stronger for loans backed by volatile collateral.[27] The SNC database contains information about the collateral backing a loan and allows us to test this hypothesis. Following Gustafson et al. (2021), we construct a dummy $VolatileCollateral_{l,t} \in \{0,1\}$ which takes value 1 if and only if loan l is backed at t by volatile collateral, namely, accounts receivable, inventories, and securities. See Table A1 in Appendix B for the different types of collateral. We then regress our measure of monitoring on $VolatileCollateral_{l,t} \times PE_{i,t}$, while including fixed effects and loan controls. Notably, the regression specification that we use is directly implied by our theory model.[28]

The results (presented in Table 10) illustrate that the coefficient on the interaction term $PE_{i,t} \times VolatileCollateral_{l,t}$ is significant and negative. That is, a loan's PE backing more strongly reduces (the need for) monitoring when the loan is backed by volatile collateral and thus more information-sensitive. In line with our baseline results, the individual effect of $PE_{i,t}$ is also negative, indicating that PE backing substitutes for bank monitoring in general. This effect is amplified for loans backed by volatile collateral. Importantly, we view these results as empirical support for our theory and its proposed mechanism.

4.2 Private Equity and Moral Hazard in Monitoring

We show that PE sponsors also mitigate moral hazard and incentive problems associated with monitoring and loan sales. We do so by tightly linking the following empirical analysis to our theory in Section 2. To begin with, we can rewrite equation (2) from our theory in

[27] Indeed, according to equations (2) and (6) in the theory Section 2, the sensitivity of monitoring to PE backing PE increases with A which may capture the riskiness of the loan or its underlying collateral. The theory therefore predicts that the the reduction in monitoring and lead share associated with a loan's PE backing should be stronger for riskier loans (i.e., loans backed by riskier collateral).

[28] Specifically, we estimate $Y_{l,t} = \beta_0 PE_{i,t} \times VolatileCollateral_{l,t} + \beta_1 PE_{i,t} + X_{l,i,b,t} + FE_{l,i,b,t} + \epsilon_{l,i,b,t}$. To arrive at this specification through the lens of the theory in Section 2, one can rewrite (2). Defining for an arbitrary value $\overline{A} > 0$, the dummy $VolatileCollateral = \mathbb{I}\{A > \overline{A}\}$, we can rewrite (2) as

$$Monitoring = \hat{const} + \hat{\gamma}_0 \times VolatileCollateral + \hat{\gamma}_1 \times PE + \hat{\gamma}_2 \times PE * VolatileCollateral,$$

with $\beta = LeadShare$ and $\hat{const} = [(1-\lambda) + \lambda\beta] \min\{A, \overline{A}\}$, $\hat{\gamma}_0 = [(1-\lambda) + \lambda\beta] \max\{A - \overline{A}, 0\} \leq 0$ $\hat{\gamma}_1 = -\alpha[(1-\lambda) + \lambda\beta] \min\{A, \overline{A}\} < 0$, and $\hat{\gamma}_3 - \alpha[(1-\lambda) + \lambda\beta] \max\{A - \overline{A}, 0\} \leq 0$.

Table 10: Monitoring and Collateral Volatility

$Y_{l,t}$: $Monitoring_{l,t}$	(1)	(2)	(3)	(4)
$PE_{i,t} \times VolatileCollateral_{l,t}$	-0.099***	-0.101***	-0.080**	-0.076**
	(0.028)	(0.028)	(0.038)	(0.038)
$PE_{i,t}$	-0.036***	-0.073***	-0.067***	-0.041***
	(0.008)	(0.007)	(0.007)	(0.007)
R-squared	0.192	0.281	0.293	0.363
Bank-Time FE	Y	Y	Y	Y
Origination Yr-Qtr FE	Y	Y	Y	Y
Sector-Time FE	N	Y	Y	Y
Loan Type	N	N	Y	N
Collateral Type	N	N	N	Y
N	34302	34251	34251	34238

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table reports the baseline regression augmented with an interaction of PE and a dummy taking value 1 if a loan is backed by high volatility collateral, defined similar to Gustafson et al. (2021). Each regression specification controls for a given loan's total commitment, utilization, maturity and loan risk. All variables are defined in Appendix A. Sectors are defined at the 2-digit NAICS level. Standard errors are clustered at the lead bank and SNC report date.*

Section 2 with $m = Monitoring$ as follows:

$$Monitoring = const + \gamma_1 \times PE + \gamma_2 \times LeadShare + \gamma_3 \times PE \cdot LeadShare, \qquad (6)$$

where $const = (1-\lambda)A \geq 0$, $\gamma_1 = -(1-\lambda)A\alpha < 0$, $\gamma_2 = \lambda A \geq 0$, and $\gamma_3 = -\lambda A\alpha < 0$. Notice that the sensitivity of monitoring m with respect to lead share, i.e., $\gamma_2 + \gamma_3 \times PE$ quantifies the severity of moral hazard in monitoring — as captured by the model parameter λ. Interpreted broadly, it quantifies asymmetric information problems in loan sales. As such, if PE sponsors indeed mitigate moral hazard, then it must be $\gamma_3 < 0$.

We empirically test whether $\gamma_3 < 0$. For this sake, we take specification (6) to the data. Specifically, we regress our measure of bank monitoring on $PE_{i,t}$, $LeadShare_{l,t}$, and the interaction $PE_{i,t} \times LeadShare_{l,t}$. We include the same loan controls and fixed effects as in the baseline to compare observably similar loans by the same lead bank that primarily by their PE backing. Table 11 shows that the coefficient on the interaction $PE_{i,t} \times LeadShare_{l,t}$ is negative and significant, while the coefficient on $LeadShare_{l,t}$ is positive and significant. These results are consistent with (6) and validate our model. Consistent with moral hazard in monitoring, monitoring exhibits (positive) sensitivity to lead share, but less so for PE-backed

Table 11: Monitoring, Lead Arranger's Share, and Private Equity

$Y_{l,t}$: $Monitoring_{l,t}$	*Full Sample*		*Credit Lines*		*Term Loans*	
	(1)	(2)	(3)	(4)	(5)	(6)
$PE_{i,t} \times LeadShare_{l,t}$	-0.084**	-0.061	-0.169***	-0.121*	-0.149**	-0.192***
	(0.038)	(0.037)	(0.065)	(0.067)	(0.067)	(0.063)
$Lead\ Share_{l,t}$	0.251***	0.219***	0.275***	0.232***	0.170***	0.165***
	(0.020)	(0.020)	(0.031)	(0.031)	(0.032)	(0.032)
$PE_{i,t}$	-0.007	-0.007	-0	-0.011	0.044***	0.070***
	(0.011)	(0.011)	(0.022)	(0.023)	(0.015)	(0.015)
R-squared	0.411	0.454	0.401	0.464	0.466	0.542
Bank×Time FE	Y	Y	Y	Y	Y	Y
Sector×Time	N	Y	N	Y	N	Y
Origination×Yr-Qtr	Y	Y	Y	Y	Y	Y
N	34302	34251	17445	17363	12966	12857

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table reports OLS estimates of a triple interaction specification where the dependent variable is a time-varying measure of bank monitoring, for a given loan-time observation. All regressions include lower-order interactions, unless absorbed by fixed effects. Each regression specification controls for a given loan's total commitment, utilization, maturity and loan risk. All lower-order interactions have been included in the regression, but ommited from display for brevity. All variables are defined in Appendix A. Sectors are defined at the 2-digit NAICS level. Standard errors are clustered at the lead bank and SNC report date.*

loans. This indicates that moral hazard in monitoring is less severe for PE-backed loans. Our findings suggest that PE sponsor engagement reduces moral hazard and asymmetric information problems in monitoring and loan sales, thereby facilitating loan sales.

4.3 Private Equity and Loan Covenants

Existing literature has shown that PE-backed firms tend to obtain more generous loan terms and covenant structures (Ivashina and Kovner, 2011). Moreover, bank monitoring is often associated with loan covenants (Wang and Xia, 2014; Gustafson et al., 2021) and covenant-based monitoring, reflecting the idea that more and tighter covenants imply more monitoring.[29] A potential concern behind our results is that, while PE-backed loans are associated with less active monitoring, they may be subject to more covenant-based monitoring. In this case, PE-backed loans would not be subject to less but only to a different type of monitoring. Notably, we do not find evidence that for PE-backed loans, covenant-based monitoring substitutes for active monitoring. In fact, relative to comparable non PE-backed loans, PE-backed terms loans are more likely cov-lite and have a lower number of covenants.

At time t, loan l is defined as cov-lite if it does not have any financial maintenance covenants. The indicator $CovLite_{l,t} \in \{0, 1\}$ equals to 1 if and only if loan l is cov-lite at t. We also examine the number of covenants, denoted $\#Covenants_{l,t}$. The median SNC loan in our sample has 1 covenant, while the third quartile has 3 covenants with a mean of around 2.3.[30] We then estimate regression equation (5) with $CovLite_{l,t}$ and $Log(1+\#Covenants_{l,t})$ as outcome variables, respectively. Since term loans generally have a different covenant structure than credit lines, we estimate the regressions over the full sample, as well as separately for the sample of term loans.[31]

Table 12 presents the results. In column (1), we observe that PE-backed and non PE-backed loans do not exhibit a significantly different propensity to be cov-lite, as the coefficient on $PE_{i,t}$ is not significant.[32] However, when focusing on term loans in column (2), PE-backed loans are associated with a roughly 3 percent higher probability of being cov-lite. Columns (3) and (4) illustrate that, for both the full sample and term loans, PE-backed loans are

[29] Gustafson et al. (2021) refer to this type of monitoring as "covenant-based monitoring" and show that covenant-based may substitute or complement active bank monitoring, which is our measure of monitoring.

[30] For this definition, we do not differentiate between financial covenants and other covenants but simply count the number of total covenants in a given syndicated loan facility. This information comes from the SNC Covenant View.

[31] When we estimate the model with outcome variable $CovLite_{l,t}$, we also control for the number of covenants in a given loan.

[32] This may reflect that revolving credit facilities mostly retain traditional financial maintenance covenants, consistent with the rise of split control rights as shown in Berlin et al. (2020).

Table 12: Private Equity and Covenant-Based Monitoring

$Y_{l,t}$:	$CovLite_{l,t}$		$Log(1+\#Covenants_{l,t})$	
	(1)	(2)	(3)	(4)
$PE_{i,t}$	-0.015	0.030**	-0.022***	-0.037***
	(0.010)	(0.014)	(0.005)	(0.008)
R-squared	0.217	0.286	0.230	0.311
Bank×Year FE	Y	Y	Y	Y
Sector×Year	Y	Y	Y	Y
Origination Yr-Qtr FE	Y	Y	Y	Y
Sample	Full	Term Loans	Full	Term Loans
N	34895	17459	34895	17459

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table examines if PE-backed loans are subject to more covenant-based monitoring. In columns (1) and (2), the outcome variable takes value 1 if a loan is cov-lite, defined in A. In columns (3) and (4), the outcome variable is the natural log of 1 plus the number of covenants in a given loan. Each regression specification controls for a given loan's total commitment, utilization, maturity and loan risk. Since covenant lite loans are typically associated with term loans, we estimate the model in columns (2) and (4) on the term loan sample only. All variables are defined in Appendix A. Sectors are defined at the 2-digit NAICS level. Standard errors are clustered at the lead bank and SNC report date.*

associated with fewer covenants. Although fewer covenants do not necessarily imply less covenant-based monitoring, we do not find any meaningful evidence that PE-backed loans are subject to *more* covenant-based monitoring. That is, a loan's PE backing appears to reduce and substitute for *overall* bank monitoring.[33]

5 Robustness Tests

We conduct a number of additional checks to highlight the robustness of our results.

5.1 Loan and Firm Fixed Effects

We run our baseline regression (5) with our measure of bank monitoring as the outcome variable, while including firm fixed effects. This way, we essentially exploit the variation in bank monitoring of loans to a specific borrower firm pre- and post-buyout. Put differently,

[33] One limitation of this analysis is that we do not actually observe the covenant violation threshold. Covenants may be set more tightly for sponsor-backed loans, even if the number of covenants is lower in PE, as reported in column (3). We encourage the reader to keep this caveat in mind.

Table 13: Robustness Test: Benchmark Result with Borrower Firm Fixed Effects

$Y_{l,t}$: $Monitoring_{l,t}$	(1)	(2)	(3)	(4)
$PE_{i,t}$	-0.027**	-0.027**	-0.029***	-0.028**
	(0.011)	(0.011)	(0.011)	(0.011)
R-squared	0.775	0.775	0.774	0.775
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Loan Type FE	N	Y	N	Y
Loan Controls	Y	Y	N	N
N	32746	32746	32746	32746

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table reports OLS estimates of a linear probability model where the dependent variable is a time-varying measure of bank monitoring, for a given loan-time observation. Loan controls include a loan's total commitment, utilization, maturity and loan risk. All variables are defined in Appendix A. Sectors are defined at the 2-digit NAICS level. Year FE is a dummy for the last date of review by SNC examiners for a given calendar year. Standard errors are clustered at the lead bank and SNC report date.*

we compare loans of similar type and risk level to the same borrower pre- and post-buyout. Table 13 illustrates that, consistent with our baseline results, PE-backed loans are associated with less bank monitoring. The coefficient on $PE_{i,t}$ is of similar magnitude as in Table 2, but is only significant at the 10% level. That is, loans to the same borrower are monitored more intensely prior to the private equity buyout; they are monitored less post-buyout when the borrower is PE-backed. In other words, we confirm our baseline finding that a borrower's PE backing substitutes for bank monitoring.

Notably, some of our results also go through when including more stringent loan fixed effects. With loan fixed effect, we essentially compare the same loan pre- and post-buyout. This comparison is possible and meaningful, because roughly one-third of the PE-backed loans in our sample were originated at least one year *before* the buyout and mature at least one year post-buyout. Table 14 presents the regression results with $LeadShare_{l,t}$ and $Monitoring_{l,t}$ as the outcome variables, while including loan fixed effects. With loan fixed effects, PE-backed loans are associated with significantly lower lead share and thus significantly more loan sales (see columns (1) and (2)). Specifically, for a given loan, lead share is about 1.7 percentage points lower post- than pre-buyout. Given a median lead share of about 20-25%, this corresponds to a reduction in lead share of about 7% post-buyout, relative to pre-buyout. Our findings suggest that at the time of buyout (or shortly after), the lead bank sells a significant part of the loan.

Table 14: Robustness Test: Lead Share with Loan Fixed Effects

	$LeadShare_{l,t}$		$Monitoring_{l,t}$	
	(1)	(2)	(3)	(4)
$PE_{i,t}$	-0.017***	-0.017***	0.007	0.007
	(0.004)	(0.004)	(0.020)	(0.020)
$PE_{i,t} \times Lead\ Share_{l,t}$			-0.145*	-0.145*
			(0.078)	(0.078)
R-squared	0.929	0.929	0.892	0.892
Loan FE	Y	Y	Y	Y
Loan Type FE	N	Y	N	Y
Year FE	Y	Y	Y	Y
N	24935	24935	24935	24935

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table reports robustness checks of results reported in Table 3 and Table 11 using Loan Fixed Effects following Blickle et al. (2023). Loan fixed effects is constructed using unique IDs for each SNC loan. Each regression specification controls for a given loan's total commitment, utilization, maturity and loan risk. All variables are defined in Appendix A. Sectors are defined at the 2-digit NAICS level. Standard errors are clustered at the lead bank and SNC report date.*

Whereas the individual effect of $PE_{i,t}$ on monitoring is negative but no more statistically significant, the interaction $PE_{i,t} \times LeadShare_{l,t}$ remains negative and statistically significant (albeit at lower level) similar to the results reported in Table 11. As such, even with loan fixed effects, we find evidence that PE-backed loans are associated with less severe moral hazard in monitoring, which facilitates loan sales to non-banks.

5.2 Controlling for Probability of Default

Our baseline regressions control for the loan risk dummy, which reflects whether the bank examiner views the loan as risky. As such, we effectively control for a loan's risk level from the bank examiner perspective. Different to the loan risk dummy (reported by the bank examiner), the lead bank also reports an estimate of the loan's probability of default $PD_{l,t}$. Thus, $PD_{l,t}$ captures the loan's expected risk level from the lead bank perspective.

Notably, Table 15 shows that our results remain robust, when including the lead bank's estimate of probability of default as a control variable in our baseline regression. In particular, Table 15 shows that across all specifications, PE-backed loans are associated with lower bank monitoring and lower lead share, i.e., more loan sales to non-banks. Interestingly, the coefficient on $PD_{l,t}$ is positive and statistically significant. This suggests that riskier loans

Table 15: Robustness with Default Probability Estimates

$Y_{l,t}$:	$Monitoring_{l,t}$			$Lead\ Share_{l,t}$		
	(1)	(2)	(3)	(4)	(5)	(6)
$PE_{i,t}$	-0.066***	-0.059***	-0.045***	-0.012***	-0.012***	-0.013***
	(0.011)	(0.011)	(0.011)	(0.004)	(0.004)	(0.004)
$LeadShare_{l,t}$	0.264***	0.219***	0.206***			
	(0.022)	(0.023)	(0.023)			
$PD_{l,t}$	0.094***	0.080***	0.046***	0.028***	0.027***	0.018***
	(0.013)	(0.013)	(0.013)	(0.004)	(0.004)	(0.005)
R-squared	0.379	0.441	0.460	0.359	0.415	0.441
Loan Controls	Y	Y	Y	Y	Y	Y
Bank×Time FE	Y	Y	Y	Y	Y	Y
Sector×Time FE	N	Y	Y	N	Y	Y
Origination-Qtr FE	N	N	Y	N	N	Y
Loan Type FE	N	N	Y	N	N	Y
N	18466	18382	18377	18466	18382	18377

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table reports robustness of the baseline regressions incorporating lender-estimated probability of default as additional control. The remaining specification is identical to the baseline. All variables are defined in Appendix A . Sample size drops because probability of default is not reported for all credit facilities. Sectors are defined at the 2-digit NAICS level. Standard errors are clustered at the lead bank and SNC report date.*

are associated with more monitoring and a larger loan share retained by the lead bank. Put differently, when the lead bank views the loan as more risky, it exerts more monitoring efforts and retains more skin-in-the-game. Likewise, one can interpret these results as evidence that ceteris paribus, riskier loans are less likely to be sold, i.e., are less liquid.

5.3 Matched Sample Analysis

To compare PE-backed and non PE-backed loans with similar characteristics, we now conduct a Coarsened Exact Matching (CEM) analysis, as, e.g., in Davis et al. (2014). We match PE-backed and non PE-backed loans on loan size, maturity, loan risk (dummy reported by the bank examiner), collateral structure and value, borrowers' industry (sector), location, and the year of investment.[34] Notice that while the matching covariates mostly include loan

[34]The CEM process groups continuous matching variables into strata and identifies exact matches based on the grouped data and additional discrete variables. The method assigns weights to each observation to

Table 16: Robustness Test: Matched Sample Analysis

$Y_{l,t}$:	$Monitoring_{l,t}$		$Lead\ Share_{l,t}$	
	(1)	(2)	(3)	(4)
$PE_{i,t}$	-0.027**	-0.006	-0.011***	-0.012***
	(0.011)	(0.011)	(0.003)	(0.003)
$Lead\ Share_{l,t}$	0.276***	0.213***		
	(0.028)	(0.027)		
R-squared	0.403	0.492	0.419	0.497
Bank×Time FE	Y	Y	Y	Y
Origination Qtr FE	Y	Y	Y	Y
Sector×Time	N	Y	Y	Y
Loan Type FE	N	Y	N	Y
Loan Controls	Y	Y	Y	Y
N	16894	16801	16894	16801

* $p < .10$, ** $p < .05$, *** $p < .01$

(a) *Notes: This table reports robustness checks of baseline results reported in Table 2 and Table 3 using CEM Iacus et al. (2012). We identify pairs of PE-backed and non PE-backed loans that are similar in size, maturity, risk, collateral structure, and value to the borrowers that operate in the same sector and location during a certain year. Each regression specification controls for a given loan's total commitment, utilization, maturity and loan risk. All variables are defined in Appendix A. Sectors are defined at the 2-digit NAICS level. Standard errors are clustered at the lead bank and SNC report date.*

characteristics, we also match on firm characteristics, such as location or industry. In addition, we match loans based on their risk level and collateral value, which likely reflect firm characteristics too.

Table 16 presents the regression results using the matched sample of PE-backed and non PE-backed loans. As in the baseline, we include various loan controls (such as loan commitment, maturity, or loan risk) and fixed effects, including bank-time, origination-date, or sector-time. Table 16 highlights that our main findings remain robust when using the matched sample. In particular, a loan's PE-backing is associated with both lower monitoring and lead share. We view these results as evidence for the robustness of our empirical findings. Furthermore, they suggest that our findings do not merely reflect selection but, to some part, the (causal) effects of PE sponsor engagement.

normalize any variance in the distribution between the matched observations within a given stratum. Strata without a match receive a zero weight and are excluded from the sample. After matching, the data can be used to estimate differences in means for the outcome variables between the two groups. See Iacus, King, and Porro (2012) for further discussion on CEM's additional attractive statistical properties.

6 Conclusion

This paper shows how private equity buyouts stimulate loan sales and non-bank participation in the market for U.S. syndicated loans. Combining administrative data from the Shared National Credit register with buyout deals from Pitchbook, we show that a loan's PE backing is associated with lower active bank monitoring, lower loan shares retained by lead banks, and more loan sales to non-bank financial intermediaries, such as CLOs or private debt funds. For PE-backed loans, both the reputation of the sponsor and the strength of its relationship with the lead bank cause further reductions in the lead bank's monitoring and retained loan share. The key mechanism behind our results is that PE sponsors' actions (such as engagement with management or due diligence) substitute for bank monitoring, allowing banks to retain less skin-in-the-game in the loans they originate. Moreover, we show that a loan's PE backing is associated with lower expected losses and loss given default, which are measures of expected ex-ante credit risk reported by the lead bank. The intuition is that a bank perceives lower ex-ante credit risk and thus a lower need to monitor the loan, when the borrower is PE-backed.

Importantly, our paper points to the rise of private equity as a novel mechanism that has contributed to the rise of non-bank lending and shadow banking; this mechanism is not (directly) related to bank regulation. Interestingly, while both non-bank lending and private equity are often associated with financial fragility and (excessive) leverage, our paper as well as the existing literature (see, e.g., Shivdasani and Wang (2011) or Fahlenbrach et al. (2023)) shed light on how non-bank lending and private equity interact. It is therefore an interesting avenue for future research to study the broader implications of the uncovered relationship between non-bank lending and LBO activity.

Our result that private equity stimulates non-bank lending likely has important implications for (i) loan terms, (ii) total borrowing activity, and (iii) total liquidity in the syndicated loan market. Ceteris paribus, more non-bank lending should lead to higher loan supply and so to more borrower-friendly loan terms, as observed for PE-backed borrowers (Ivashina and Kovner, 2011). Because buyout activity also generates demand for syndicated loans in addition to stimulating non-bank lending and their supply, the rise of private equity likely has generated substantial liquidity in the syndicated loan market.

Finally, our paper has implications for the anatomy of information production in financial markets, especially, private capital markets. Traditionally, bank debt was the most important source of financing for private firms. A fundamental role of banks is to produce information via screening and monitoring borrowers. However, our analysis reveals that PE

sponsors' monitoring or due diligence substitutes for bank monitoring and information production. Therefore, a broader implication is that, with the rise of private equity, information production in private markets shifts from banks toward PE investors. The implications of this development remain to be studied.

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Online Appendix

A Variable Definitions

- $Monitoring_{l,t}$, i.e., our measure of active bank monitoring, is defined as a dummy variable for whether or not a lead bank actively monitors a loan. Specifically, we define active monitoring as field exams of the borrowers conducted by the lead bank as well as third-party appraisals (Gustafson et al., 2021).
- *Committed Exposure* is defined as the commitment amount of a given credit facility in millions of US dollars. For all of our analysis, we express this amount in natural logs.
- *Utilization Rate* is defined as the outstanding drawn amount divided by the total credit line commitment amount. This variable always takes the value of one for term loans
- *Loan Maturity* is defined as the difference between the loan maturity date and origination date (in quarters) of a given credit facility.
- *Credit Line* is an indicator variable that takes the value of one if the credit facility is a revolving line of credit and zero elsewhere.
- *Term Loan* is an indicator variable that takes the value of one if the credit facility is a term loan and zero elsewhere.
- *Loan Risk or Risk:* is defined as a dummy variable taking value 1 in a given quarter if bank examiners assigns 100 percent of a commitment as either 'special mention', 'doubtful' or 'sub-standard'.
- $CovLite_{l,t}$, indicating whether loan l is cov-lite at t, is defined as a dummy variable if a given SNC loan does not contain any financial maintenance covenants.
- *Leveraged Loan Flag:* is defined as a dummy variable equals to one if the loan is reported as a leveraged loan.
- $PD_{l,t}$ (or PD) is the probability of default that is reported by bank-holding companies at each report date for a given loan. It is computed following Basel II Advanced Risk-Based Capital Standards- Preamble and Final Rule Definition.
- $LGD_{l,t}$ (or LGD) is the loss given default that is reported by bank-holding companies at each report date for a given loan.
- $ED_{l,t}$ (or ED) is the exposure at default that is reported by bank-holding companies at each report date for a given loan.
- *Bank's Expected Loss* $EL_{l,t}$ (or EL) is computed as $PD_{l,t} \times LGD_{l,t} \times ED_{l,t}$.

- *Non-Bank Exposure*: Defined in two ways. For loan l at time t, namely, (i) the total (percentage) share of loan l held by non-banks at time t, denoted $NonBankShare_{l,t}$, and (ii) the total dollar value of non-banks' holdings of loan l at time t, denoted $NonBankHolding_{l,t}$. The first measure (i) captures non-bank participation in percentage terms, while the second measure captures non-bank participation in dollars.

- $LeadShare_{l,t}$ is defined as the ratio of the share of a given loan-time facility that is held by the agent (lead) bank.

- $Reputation_s$ is a dummy that takes value 1 if a given sponsor s is ranked in the top 40 sponsors in Private Equity International in 2019 and 2020.

- $Relationship_{b,s,t}$ is a dummy that takes value 1, if (lead) bank b maintains a "strong" relationship with sponsor s at time t. Specifically, at any observation date t, we calculate the (dollar) value of total past loan commitments from bank b to firms backed by sponsor s (up to and including $t-1$), which we denote by $Com_{b,s,t}$. Formally, denote the loan commitment of loan l to firm i backed by s at time t by $LC_{l,t}$, and define $\overline{LC}_{l,t} = \max_t LC_{l,t}$. Then, $Com_{b,s,t} = \sum_{l \in s^b_{t-1}} \overline{LC}_{l,t}$, where s^b_t is the set of loans from bank b to firms sponsored by sponsor s up to and including observation date $t-1$. At time t, bank b and sponsor s are said to have a *strong relationship* when this amount $Com_{b,s,t}$ is greater than the sample average of $Com_{b,s,t}$, where the average is taken over time t and lender-sponsor pairs (b, s) and equals about $ 252 million.

B Additional Tables

Table A1: Loan Share by Collateral Type

	PE-backed loans		Non PE-backed loans	
Collateral Type	Share in Sample	Mean Loan Value	Share in Sample	Mean Loan Value
Real Estate	0.025	195	0.101	173
Fixed Assets	0.026	171	0.031	298
Blanket Lien	0.682	342	0.533	416
Accounts Receivable	0.071	214	0.058	280
Unsecured	0.046	630	0.069	751
Others	0.150	333	0.208	388

(a) *Notes: This table reports the share of loans backed by different types of collateral for each firm-type. Data is at the unique loan-level. Loan values are in $ Mn. For fixed assets, we aggregate across three categories defined in the SNC data: Fixed Assets, Furniture, Fixtures, & Equipment and Property, Plant, Equipment. Further definitions are provided in Appendix A.*