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Kristian Blickle
Quirin Fleckenstein
Sebastian Hillenbrand
Anthony Saunders

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Abstract

We make use of Shared National Credit Program (SNC) data to examine syndicated loans in which the lead arranger retains no stake. We find that the lead arranger sells its entire loan share for 27 percent of term loans and 48 percent of Term B loans, typically shortly after syndication. In contrast to existing asymmetric information theories on the role of the lead share, we find that loans that are sold are less likely to become non-performing in the future. This result is robust to several different measures of loan performance and is reflected in subsequent secondary market prices. We explore syndicated loan underwriting risk as an alternative theory that may help explain this result.

Key words: syndicated lending, loan sales, lead arranger

Blickle: Federal Reserve Bank of New York (email: kristian.blickle@ny.frb.org). Fleckenstein, Hillenbrand, Saunders: NYU Stern School of Business. The authors thank James Finch for sharing his knowledge about loan syndications. They also thank Peter Gseller for helpful discussions on the institutional details. Any errors are the authors' own. The views expressed in this paper are those of the authors and do not necessarily represent the position of the Federal Reserve Bank of New York, the Federal Reserve Bank of Dallas, or the Federal Reserve System.

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1 Introduction

According to classical banking theories, lead arrangers should retain a significant share of the loans they help syndicate. This follows from the argument that they possess an informational advantage, relative to other participants, and are typically tasked with loan monitoring.[1] The retention argument therefore relies on two motives: the avoidance of adverse selection (Leland and Pyle (1977)) and the mitigation of moral hazard (Gorton and Pennacchi (1995); Holmstrom and Tirole (1997)). Consistent with these theories, prior studies have found empirical evidence which suggests that the lead share at origination serves as a mechanism to overcome asymmetric information problems (Ivashina (2009); Sufi (2007)).

However, recent work by Bord and Santos (2012, 2015) has demonstrated a rise in the originate-to-distribute model in the syndicated loan market, i.e. banks originate loans in order to sell them to institutional investors. This fact, coupled with the emergence of a liquid secondary market for syndicated loans, questions the conventional wisdom of the role of the lead arranger share; the part of the loan the originating lead bank holds on its balance sheet.

In this paper, we examine the role of the lead share using Shared National Credit Program (SNC) data. SNC is a credit registry for syndicated loans that tracks loan ownership over time. Hence, in contrast to most of the prior literature, which has examined the lead share at origination using Dealscan, SNC data allows us to observe the lead share over the loan's entire duration.[2] Equipped with this rich data, we study a number of unexplored questions regarding lead arrangers' behavior: (i) Do lead arrangers ever sell their entire stake in a loan after the syndicated loan has been originated, (ii) if so, for which type of loans and how rapidly after origination do they sell, and (iii) what are the implications of lead share sales for the asymmetric information problems in the syndicated loan market.

Using SNC data, we find that the lead bank sells its entire share for 12% of all loans and for 27% of all term loans prior to loan maturity. For loans catering to institutional investors, the lead arranger sells more often; 48% of all term B loans and 41% of all leveraged term loans. Two additional determinants of lead share sales are the all-in-drawn spread and, in particular, the share of funds and CLOs among the pool of loan participants. In almost all cases, the sale of the arranger's share occurs shortly after loan origination.[3] Moreover, we show that the lead bank retains no exposure to the borrower through

[1] For instance, Benmelech et al. (2012) argue that the lead share ensures that the securitization of syndicated loans is not associated with adverse selection.

[2] Notable studies that use the lead share as reported in the SNC data are Bord and Santos (2012, 2015), Bruche et al. (2017), Gustafson et al. (2017), Paligorova and Santos (2018), Santos and Shao (2018), Irani et al. (2018), and Balasubramanyan et al. (2019).

[3] Lee et al. (2019) find, independently of us, that, for leveraged term loans, the lead agent reduces its share on the days

other loans in 49% of cases in which it sold its entire stake.[4]

We examine the implications of these findings for any potential asymmetric information problems arising between the lead arranger and investors in the syndicated loan market. We compare the ex-post performance of loans sold by the lead arranger after origination with those that the lead arranger retains on its balance sheet. We measure the performance of a loan by a variable that indicates whether the loan becomes 'non-accruing', i.e. the borrower missed a scheduled payment. We find that loans in which the lead bank retains no share are less, rather than more, likely to become non-accruing in the future, conditional on ex-ante default risk. This relationship holds for two different measures of ex-ante default risk: (a) the all-in-drawn spread at origination observed in Dealscan and (b) the lead arranger's internal risk rating of the loan, provided as part of the SNC program. Our baseline results show that a sale of the entire lead-stake by the arranger, after origination, is associated with a 1% lower probability that the loan becomes non-accruing in the future. This coefficient is economically large, considering that the unconditional probability of a loan getting classified as non-accruing is only 2.4% in the SNC data.

Our results remain statistically and economically significant for a battery of alternative specifications as well as for three further measures of loan performance: (1) an indicator of whether the lead arranger and the Federal Reserve Examiners classify parts of the loan as being rated "non-pass" at some future date, (2) a variable that indicates whether payments by the borrower ever become '90-days past due', and (3) the price of the loan in the secondary market as observed by LSTA. Ultimately, our findings question the role of the lead share as a mechanism to mitigate adverse selection and moral hazard concerns. Instead, our findings highlight the role of underwriting risk faced by lead arrangers when syndicating loans.

The term underwriting risk subsumes a number of issues, which the lead arranger might face in the course of syndicating loans. For example, the syndication and sale of a badly performing loan might damage the reputation of the lead arranger. This might hinder its ability to act as a lead arranger in future loan syndications.[5] Alternatively, the lead arranger might syndicate a loan with the intention of selling it, i.e. originate to distribute the loan. Thereafter, the market might not be willing to absorb the loan under the conditions arranged by the lead bank, i.e. the loan becomes a "hung" deal. This

following origination until its share is almost zero within 2-3 months. This is consistent with the fact that many institutional investors, such as CLOs, prefer to buy in the secondary market for tax reasons (See Taylor et al. (2006), p.165).

[4]Of course, this is conditional on all loans observed in the SNC data. Potentially, the lead arranger could hold other loans of the borrower that are too small to be included in the SNC, though these would likely be secured by different collateral. Gustafson et al. (2017) provide an excerpt from a monitoring requirement description that mainly lists collateral valuation and verification as monitoring activity.

[5]The reputation argument has been studied by Gopalan et al. (2011) and Winton and Yerramilli (2015).

argument is in line with "pipeline risk" as proposed by Bruche et al. (2017).[6] We are able to show that the results of a number of indicative tests point toward pipeline risk as a key factor determining lead arrangers' behavior post origination. First, we find that loans sold by the lead arranger, in which the share of funds and CLOs among participants is high, perform better ex-post. Second, loans with a high all-in-drawn spread – typically loans that the lead arranger intends to sell – that remain on the balance sheet of the lead arranger, are more likely to default. This implies the market is unwilling to absorb a loan with the arranged risk-to-spread characteristics. Third, loans sold by the lead bank to syndicates that include participants with which the arranger has had extensive past relationships, perform worse. The last argument is consistent with lead arrangers being able to sell loans, which the market assessed to be high risk, to relationship banks.

Finally, for a small subset of loans, we are able to relate the lead share at origination, obtained from Dealscan, to the lead share over the loan's duration, as observed in the SNC data. We reach two conclusions. First, for loans sold by the lead arranger, the arranger's share typically changes shortly after origination. This implies that the lead share at origination, as recorded in Dealscan, can be misleading. Many banks buy on the primary market with agreements to resell immediately to an institutional investor such as a CLO on the secondary market. The lead share at origination, as observed in Dealscan, may not be a good measure for the lead arranger's exposure to the borrower over the loan's duration.[7] Second, we show that the Dealscan sample, for which the lead share at origination is observed, is biased. Lead arranger sales occur much less frequently (4%) in this sample.[8] This may be due in part to the fact that lead arrangers self report loans in the Dealscan database and such reporting may be subject to a bank's self-selection. By comparison, using the stringent reporting requirements of the SNC program, we can circumvent the selection bias in the self-reported and weakly populated lead shares in Dealscan by using SNC data.

We contribute to a large literature that studies the information asymmetry problems between banks and investors, in particular in the syndicated loan market. A number of papers argue that the two issues resulting from asymmetric information, adverse selection and moral hazard, are mitigated when the lead bank retains part of the loan on its balance sheet (see Leland and Pyle (1977); Holmstrom and

[6]Pipeline risk is likely more prominent for loans that are targeted toward institutional investors, because these investors' demand is typically more cyclical (Ivashina and Sun (2011)).

[7]The average term loan's duration is approximately 4 years

[8]By contrast, we obtain similar results on the frequency of total lead share sales when comparing the SNC sample to a Dealscan–SNC sample, for which we require only a non-missing all-in-drawn spread. Our matched Dealscan–SNC sample, for which we observe the all-in-drawn spread, contains 21,357 loans. The requirement to additionally observe the lead share at origination lowers the number of loans to 5,626.

Tirole (1997)). Sufi (2007) shows that the lead arranger keeps a larger share at origination for loans with stronger monitoring requirements. Moreover, Ivashina (2009) finds that a larger share held by a lead bank at origination reduces the spread demanded by investors. Both studies use the lead share at origination from Dealscan in their analysis.

Studies that directly examine the monitoring behavior of the lead bank are Plosser and Santos (2016) and Gustafson et al. (2017). The latter authors find that monitoring efforts by the lead bank are positively correlated with its retained share, consistent with the theory proposed by Holmstrom and Tirole (1997). Strikingly, they find that active monitoring is positively associated with future covenant violations. By comparison, Plosser and Santos (2016) question the assumed role of the lead bank as the sole monitor of a syndicated loan. Using a different measure of monitoring activity than Gustafson et al. (2017) they find no differential monitoring activity between lead banks and banks that are mere syndicate participants. We view these studies as further evidence that the importance of moral hazard is likely to be lower than previously thought, if present at all.

Even earlier studies have tackled the information asymmetry problem by studying the stock price reaction of the borrower following loan sales by a participant bank. They find mixed evidence. Consistent with our findings for the loan price reaction, Gande and Saunders (2012) find that borrowers' stock price reacts positively to loan sales. In contrast, Dahiya et al. (2003) using a small sample of seasoned loan sales find a negative price reaction consistent with adverse selection.

The paper proceeds in the following order: In Section 2, we discuss the role of the lead share in asymmetric information theories regarding the syndicated loan market and present the SNC data. Subsequently, we document the frequency of lead share sales and explore their determinants in Section 3. We test the asymmetric information problem in Section C.2. Section 5 discusses our results through the lens of alternative theories on the role of the lead arranger. Section 6 concludes.

2 Background and Data

2.1 The Theoretical Role of the Lead Share

In this section we discuss the possible role of the lead arranger's retained share in alleviating asymmetric information problems between the lead arranger and other syndicate participants.

Standard banking theory argues that banks are informed intermediaries, which have the delegated role to screen and monitor in order to mitigate the information asymmetry problem between borrowers

and lenders (Diamond (1984); Gorton and Pennacchi (1995); Holmstrom and Tirole (1997)). However, monitoring and screening efforts by banks are assumed to be costly and unobservable in these models, which gives rise to a potential moral hazard problem, between the lead bank and syndicate participants. The solution to this moral hazard problem, as argued by Gorton and Pennacchi (1995) and Holmstrom and Tirole (1997), is that the bank does not sell the entire loan it originates. Thus, in the syndicated loan market, where the lead bank is typically thought to assume the role of monitor,[9] it has to retain a material share of each loan. These models predict that absent any "skin-in-the-game", the lead bank would not undertake monitoring efforts, leading to potentially worse loan outcomes for syndicate members.

In addition to the moral hazard problem of monitoring, the banking literature has argued that the retained share solves another problem of information asymmetry between the lead bank and investors. The lead bank obtains superior information about the borrower through screening, monitoring and prior lending relationships, which requires the lead bank to signal a borrower's quality by retaining a share in the loan. This reduces investors' concerns regarding adverse selection (Leland and Pyle (1977)).

Hence, the traditional theory regarding syndicated loans suggests that the lead arranger rarely sells its entire loan share, because, in such a case, one would expect lax monitoring and adverse selection. According to this theory, loans that are entirely sold by the lead arranger should perform worse ex-post. If this is not the case, it would suggest that, absent any other incentive mechanism, the lead arranger is not able to gain any informational advantage and that monitoring discretion by the lead arranger is not relevant for the loan outcome.

2.2 Data

We use three data sources: SNC, Dealscan and LSTA.

Our primary data is loan-participant-time-level data from the Shared National Credit (SNC) Program, 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 program encompasses all syndicated loans with a minimum aggregate commitment of 20 million USD (100 million USD effective January 1, 2018), which are held by at least two (three effective January 1, 2018) federally supervised

[9] The role of the lead bank as monitor is a common perception of the loan syndication process (see the detailed description in Sufi (2007)). However, Plosser and Santos (2016) have questioned this assumption recently, arguing that non-lead bank participants conduct equal monitoring efforts.

institutions.[10] The administrative agent of a qualifying loan is obliged to report, at the end of each year,[11] the commitment held by each participant, the participant's identity, and more detailed information on the loan. The data allows us to observe the lead arranger's share at the end of every year over the entire duration of the loan, for every reported loan. We want to stress that the SNC data does not allow us to observe the lead share at loan origination, but only at each of the (annual) SNC report dates.

The SNC data reports the facility of each loan deal separately. Thus, when a loan deal consist of a credit line and a term loan, we obtain separate information on the two loans and we can therefore observe the lead arranger share separately for both loans. We treat such loans as distinct loans in most of our analyses.

In addition to information on the ownership of the loan, SNC data contains bank internal credit ratings and indicators of whether the loan is non-accruing, 90 days past due, or rated "non-pass" by the arranging bank and Federal Reserve Examiners. We make use of this information in order to control for the ex-ante riskiness of a loan and for assessing the ex-post loan performance.

Our sample starts in 1993 and ends in 2018. In order to have a consistent panel, in which we observe each loan shortly after origination, we exclude loans that are first observed in the SNC more than 400 days after origination. This mostly excludes loans that were originated before 1993.[12] We observe a total of 71,019 distinct loans in our cleaned sample. Because of the nature of the SNC reporting requirements, the SNC likely has less coverage of the leveraged term loan market, in which many loans get sold to institutional investors (Irani et al. (2018)). Nevertheless, we observe 3,819 leveraged term loans in the SNC data.

We merge the SNC data with loan origination data from Dealscan and secondary market prices from LSTA. From Dealscan we obtain the all-in-drawn spread, which we use as a measure of ex-ante default risk. For a small subset of loans, Dealscan also contains the lead arranger's share at origination. LSTA reports secondary market quotes from loan dealers. We compute loan prices as the average of the bid and ask quote. For the merge procedures we use a fuzzy match algorithm similar to Cohen et al. (2018) based on the borrower name and common loan variables.

Throughout the paper, we use slightly different samples depending on which variables are necessary in order to conduct the analysis. We provide an overview of these samples in Section A in the appendix.

[10] A detailed description of the reporting requirements can be found under https://www.newyorkfed.org/medialibrary/media/banking/reportingforms/snc_reporting_instructions_basic.pdf.

[11] The reporting frequency was semi-annual in the years 2016 to 2018 and quarterly in 2015.

[12] In total, we drop 21,171 observations due to this requirement.

3 Loan Shares Sales by the Lead Arranger

In this section, we examine syndicated loans for which the lead arranger has sold its entire stake after origination. We document that these instances occur frequently, especially for loans sold to institutional investors. We also find that, in most cases, the lead arranger has sold out of the loan shortly after origination and retains no other exposures to the borrower through other loans. We also compare the lead share at origination, obtained from Dealscan, to the lead share in the SNC data and find that there is a sample selection bias in the Dealscan subsample for which the share at origination is observable. Finally, we analyze which loan-, lead arranger- and time-characteristics explain sales by the lead arranger.

3.1 How Frequently Does the Lead Arranger Sell Its Share?

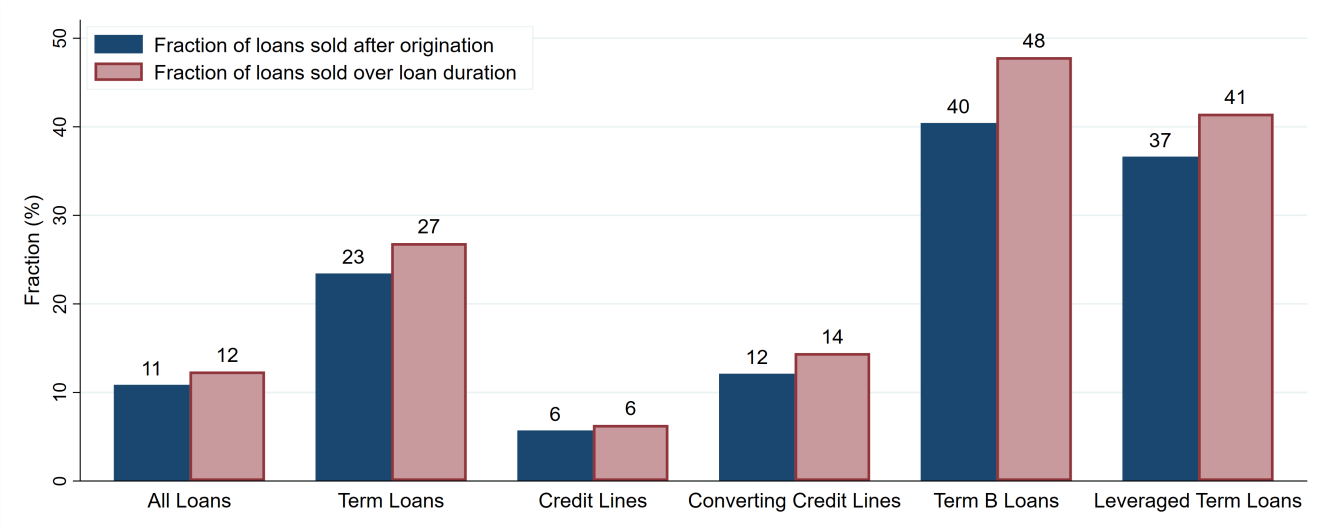
We start our analysis by studying how often the lead arranger sells its *entire* stake in a loan. Of course, partial reductions in the lead share after origination are an interesting subject to study as well. However, in this paper we focus on the extreme cases where the arranger has no remaining "skin-in-the-game", because the implications for the adverse selection and moral hazard problem are clearer. By contrast, a small lead share might still ensure sufficient screening and monitoring. We distinguish two cases of lead share sales: (a) the lead share is zero at the first SNC report date after origination, and (b) the lead share is zero at the last report date at which the loan appears in the SNC data. The interpretation of the first case is that the lead arranger has sold its share of the loan shortly after loan origination, while in the second case the lead arranger sold its share at some time over the life of the loan. For both cases, we plot the fraction of all loans in the SNC data for which the lead share falls to zero in Figure 1. In the figure, we also distinguish between different loan types such as term loans, credit lines, converting credit lines[13], Term B loans and leveraged term loans.[14]

Figure 1 illustrates that the lead arranger sells its entire share for 12% of all loans. The figure also shows, that, in almost all cases, the lead share has already fallen to zero at the first SNC report date after loan origination. This is the case for 11% of all loans. Due to the nature of the SNC data, we do not observe the total universe of outstanding loans at a given time and we miss out on loans that are sold aggressively to non-bank entities. For this reason, the reported fraction of loans for the which the

[13]These are revolving credit lines that convert any outstanding credit at the termination date (usually) automatically into a term loan (Taylor et al. (2006), p.219).

[14]"Term B" refers to term loans for which the principal is repaid in a bullet payment at maturity. In contrast, "Term A" describes term loans for which the principal amortizes over the loan duration.

Figure 1: *Lead Share Sales by Loan Types*



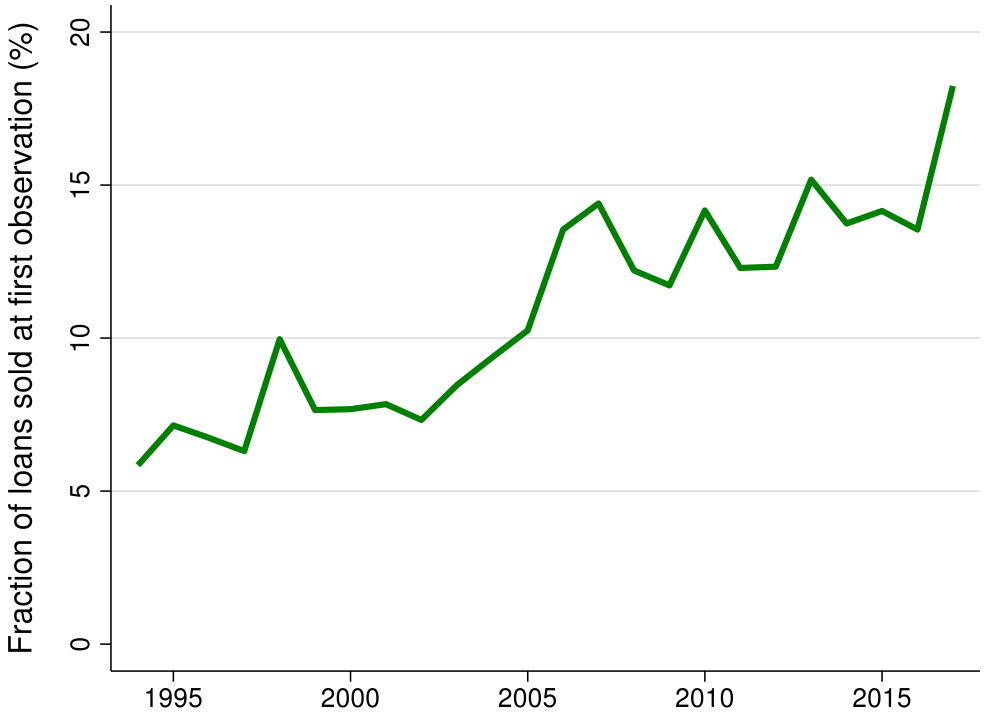
Note: This figure shows the fraction of loans for which the lead arranger sells its entire loan share. We define a loan as (a) sold shortly after origination if the lead share is 0 on the first report date, and (b) as sold over the duration of the loan if the lead share is 0 on the last report date. We include only loans for which the first observation in the SNC data is within 400 days after loan origination. The sample contains 71,019 loans, 14,922 term loans, 37,946 credit lines, 11,194 converting credit lines, 1,880 Term B loans, and 3,819 leveraged term loans.

lead arranger has sold its entire loan share is likely conservative, i.e. can be seen as a lower bound.[15] The figure also documents that the lead arranger sells its entire loan share more often for term loans (27%) than for credit lines (6%). Furthermore, the lead share is zero for more than 40% of loans that cater to institutional investors, such as Term B and leveraged term loans (see Irani et al. (2018)). Again, the lead share is already sold off by the first report date for a large majority of these loans. Thus, the lead arranger often has no balance sheet exposure, i.e. no direct "skin-in-the-game", to the loan over its duration.

The fact that the lead arranger sells its share for many term loans immediately after loan origination suggests that the role of the lead arranger in the term loan market is similar to the role of the underwriter in the bond and equity market. In these markets, the underwriting bank seeks to distribute the whole asset to outside investors. This is line with the interpretation of the lead arranger in Bord and Santos (2012) and Bruche et al. (2017). Consistent with Bord and Santos (2012)'s notion of a rise in the originate-to-distribute model for banks, we find that the fraction of loans, for which the lead arranger has sold its entire share after origination, has been increasing over time, as depicted in Figure 2. In this figure, we plot, for each report year, the fraction of loans, for which the lead arranger share is zero at the first

[15] This follows from the following reasoning: We have shown that loans are typically sold directly after origination. It therefore seems likely that some loans are sold to institutional investors before the first SNC report date. If it has been sold by the lead bank and other participating banks, we would then never observe such a loan in SNC. According to this logic, the reported numbers of lead share sales would be too low.

Figure 2: *Lead Share Sales over Time*



Note: This figure shows the fraction of loans each year for which the lead arranger has sold its entire share by the time the loan is first observed in the SNC data. We include only loans for which the first observation in the SNC data is within 400 days after loan origination. The figure is based on 71,019 loans from SNC.

report date. Whereas in 1995 the average lead arranger had sold its entire share in about 6% of loans immediately following origination, this fraction had risen to almost 15% by 2007. By the end of 2017, roughly 18% of all loans had a lead share of zero by the first report date.

3.2 Changes in Lead Share Based on Dealscan

The lead share in Dealscan has been widely studied in previous literature. In this section, we therefore compare the lead share at origination, according to Dealscan, to the lead share at the time the loan is first reported in SNC. More specifically, we compute the ratio of the lead share at the first SNC report date and the lead share at origination from Dealscan. Let us give a concrete example. Assume that the lead arranger held 20% of the outstanding loan amount at origination and it held 5% of the outstanding loan amount at the time the loan is first reported in the SNC, then the ratio would be 0.25. In other words, the lead arranger retained only 25 percent of its initial loan share and sold the other 75 percent in the secondary loan market within the year of origination.

We then classify loans according to the observed change in lead share into five buckets: The first

bucket contains all loans for which the lead share at the first report date is 0, the second for which the lead share is 0-50% (excluding 0%) of its original level, then 50-99% and so forth. Table 1 shows the fraction of loans in each group. Column 1 and 2 report the statistics for the Dealscan–SNC subsample. For these matched loans, we can observe the lead arranger's share at origination in Dealscan. For many loans in Dealscan, the share at origination is not observed. For these loans we can only document the fraction of loans for which the lead share is zero at first observation in SNC. This is reported in column 3 and 4. Finally, column 5 and 6 report the fraction of loans for the entire SNC sample. By comparing the numbers in column 1 and 2 to the other columns, we can detect any sample selection bias in the Dealscan–SNC subsample that contains the lead share at the origination date.

Table 1: ***Changes in Lead Shares Using Dealscan***

	Dealscan–SNC subsample containing the share at origination		Dealscan–SNC sample		SNC sample	
	(1) All loans	(2) Term loans	(3) All loans	(4) Term loans	(5) All loans	(6) Term loans
$\frac{\text{Lead share at first SNC observation}}{\text{Lead share at origination (Dealscan)}}$	Fraction of loans in each category					
above 101%	4%	5%				
99-101 % (Share unchanged)	78%	63%	Lead arranger share at			
50-99 %	10%	15%	origination not observed			
0-50%	4%	8%				
0% (Share sold completely)	4%	9%	11%	27%	11%	23%
Total number of loans	5,626	637	21,357	5,620	71,019	14,922

Note: This table shows the change in the lead share after origination: We compute the ratio of the lead share at the first SNC report date and the lead share at loan origination (from Dealscan). We then group loans according to the observed lead share change. The table reports the fraction of loans within each group. The analysis is based on a merged loan sample from Dealscan and SNC. Columns 3 through 6 make use of the lead share at the time the loan is first observed in SNC, but for which we do not need to observe the lead share at origination in Dealscan.

Table 1 reveals two important facts. First, complete loan share sales by the lead arranger are far less common in the sub-sample of matched Dealscan-SNC loans, for which Dealscan provides the lead share (4%, column 1), relative to the full SNC sample (11%, column 5). Second, lead share sales occur with similar frequency in the entire matched Dealscan-SNC sample (11%, column 3) and in the full SNC sample (11%, column 5). Together, the results suggest that there is a previously undocumented sample selection bias in the loans for which Dealscan reports the lead share. Perhaps, this is not surprising, because Dealscan has to rely on lead banks that report their loan shares voluntarily. In contrast, SNC contains lead shares that banks are required to report to their regulators. Another caveat of the lead share reported in Dealscan is that banks often "invest" in the primary market with agreements to resell

to an institutional investor, such as a CLO, on the secondary market immediately following origination. This is because, for tax purposes, buying loans on the secondary market is more advantageous for CLOs than participating in the primary market (Taylor et al. (2006), p. 165). Hence, the lead share at origination, as observed in Dealscan, likely reflects legal rather than economic ownership of the loan.

3.3 Does the Lead Bank Retain Other Loan Exposures to the Borrower When It Sells?

We have shown in the previous section that the lead arranger often sells its entire share of a loan after origination, i.e. the lead arranger has no "skin-in-the-game" with respect to the loan over its duration. However, the lead arranger might retain borrower exposure through other loans. This could ensure that the lead arranger still has the incentive to engage in costly screening and monitoring efforts. We therefore analyze how often the lead arranger maintains other loan exposures to a borrower, whose most recent loan the lead arranger has originated and fully sold. For this, we focus on lead share sales that occur by the first report date after origination, because, as we have shown before, almost all lead share sales occur by then.

For every loan for which the lead arranger sells its entire loan share by the first report date, we aggregate the exposures of the lead arranger to the borrower through all other loans in the SNC data at that report date.[16] We then sort loans into four groups based on the lead arranger's residual loan exposures to the borrower: (a) loans for which the lead arranger has no other loan exposures to the borrower, (b) loans for which the lead arranger has exposures through other loans in which it is a syndicate member but not a lead arranger, (c) loans for which the lead arranger has exposures through other loans for which it functions as the lead arranger, and (d) loans for which the lead arranger has exposures through loan facilities that are made under the same loan agreement. Table 2 shows the fraction of loans in each group.

Table 2 documents that the lead arranger frequently retains no other loan exposures to the borrower when selling its entire stake in the loan. Among the 7,708 loans with a lead share of zero on their first report date, the lead arranger has no other loan exposure to the borrower for 49% of these loans. The lead arranger has exposure as participant in 28% of the cases. Exposure as lead arranger through other loans is even less common. For only 6% of the loans sold by the first report date does the lead arranger

[16] We want to caution here that we do not observe the entire loan universe as some loans might not fulfill the SNC requirements. The exposure of the lead arranger might therefore be larger than what we observe. However, loans that do not fulfill the requirement are either (a) small loans with an outstanding amount of less than 20 million or (b) held by less than two reporting institutions and therefore more likely to be held outside of the banking sector. Both requirements make us believe that the bias in our analysis is likely to be small.

Table 2: ***Retained Loan Exposures to the Borrower when the Lead Share is Zero***

	All loans	Term loans
	Fraction of loans for which the lead share is zero	
No exposure	49%	38%
Exposures as participant	28%	45%
Exposures as lead arranger	6%	5%
Within-loan-deal exposures (as lead arranger)	17%	12%
Number of loans	7,708	3,498

Note: This table examines the residual exposure of the lead arranger to a borrower when its lead share is zero when first observed in the SNC. For each loan sold by the arranger, we aggregate the exposures of this arranger to the same borrower through all other loans in the SNC data.

have loan exposure as lead arranger in other loan deals. Finally, in 17% of the cases the lead arranger holds loans that were made under the same overall loan agreement. Further, the lead arranger retains more exposure when selling term loans. These remaining loan exposures stem mostly from other loans in which the lead arranger acted as a participant rather than as a lead arranger. Nevertheless, the lead arranger has no other loan exposure for 35% of the term loans for which it has sold its entire loan share shortly after origination.

3.4 Determinants of Lead Share Sales

In this sub-section we analyze the determinants of lead share sales. The purpose of this exercise is to provide a descriptive analysis of the determinants of lead share sales.

For this purpose, we estimate the regression specification:

$$\text{LoanSoldAfterOrigination}_{l,k,t} = \beta_0 + \beta_1 X_l + \beta_2 X_k + \beta_t \delta_t + \epsilon_{l,k,t}. \tag{1}$$

$\text{LoanSoldAfterOrigination}_{l,k,t}$ is an indicator that is 1 if the lead arranger k of loan l has sold its entire share at the first SNC report date, t, and 0 otherwise. We include every loan only once in the analysis: at the first SNC report date after origination. Because we want to condition on loans that are newly originated, we conservatively restrict our sample to loans for which the first observation in the SNC data is at most 400 days after origination. X_l is a vector of loan characteristics, X_k is a vector of lead arranger characteristics, and δ_t denotes SNC report date fixed effects. In all specifications, the vector of loan characteristics X_l includes a term loan dummy, a term B loan dummy, and a leveraged loan

dummy, the logarithm of the loan amount (measured as the total committed exposure amount), the time since origination (in years), and the time to maturity (in years). The leveraged loan indicator, which is provided in the SNC data, can be viewed as a proxy for the riskiness of the loan. Some specifications replace the lead arranger characteristics with lead arranger fixed effects. These fixed effects control for differences in the business model of the lead arranger, such as an "originate-to-distribute" versus an "originate-to-hold". Furthermore, we include report date fixed effects in almost all specifications to account for time trends. The results of estimating equation 1 are shown in Table 3. Additionally, we report results for a sample that contains only term loans in Table B.5. The results, discussed below, remain very similar when we condition on the term loan sample.

Loan Characteristics. In column 1, we start by examining how various loan characteristics are correlated with lead share sales. The coefficient on the term loan dummy indicates that lead share sales are 11% more likely for term loans. If the loan is a Term B loan, then this number rises to 27%. The fact that term loans are more frequently sold than credit lines might have several reasons. First, the borrower of a credit line faces counterparty risk. This risk arises because the borrower can only exercise the option to draw down the credit line if the lender remains solvent. For this reason, the borrower often contractually restricts credit line sales (see Beyhaghi et al. (2019)). Second, many institutional investors prefer term loans, which can be considered floating-rate equivalents of bonds. Deposit issuing banks, moreover, might even prefer to hold credit lines due to synergies between providing liquidity on the asset and the liability side of their balance sheet (Kashyap et al. (2002); Gatev and Strahan (2006)).

Lead share sales are positively correlated with the ex-ante riskiness of the loan. The coefficient on the leveraged loan indicator in column 1 suggests that for a "leveraged loan" there is a 8% higher probability of the lead arranger selling its entire loan share. This is also confirmed when we introduce the all-in-drawn spread (obtained from Dealscan) as a control in column 2. A 100 basis points higher all-in-drawn spread is associated with a 0.05% higher probability of a lead share sale, all else equal. This is consistent with the fact that banks face higher regulatory oversight when holding high risk/leveraged loans on their balance sheets.[17]

We further control for the time to maturity of a loan. The regression coefficient indicates that a 1 year longer time to maturity is associated with a 2% higher probability of the lead arranger selling its entire stake in the loan after origination.

[17]For example, see the updated leveraged lending guidelines by the Office of the Comptroller of the Currency (OCC), the Board of Governors of the Federal Reserve System, and Federal Deposit Insurance Corporation (FDIC) issued in 2013; available under https://www.federalreserve.gov/supervisionreg/srletters/sr1303a1.pdf

Table 3: ***Determinants of Lead Share Sales***

	Dependent variable: Indicator(Loan sold by lead arranger by first report date)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Term loan	0.107***	0.117***	0.020***	0.098***	0.137***	0.092***	0.095***
	(0.012)	(0.015)	(0.007)	(0.011)	(0.045)	(0.010)	(0.010)
Term B loan	0.163***	0.134***	0.014	0.160***	0.238***	0.146***	0.142***
	(0.025)	(0.030)	(0.023)	(0.025)	(0.031)	(0.024)	(0.024)
Leveraged loan	0.077***	0.032*	-0.023*	0.052***	0.054***	0.014	0.023**
	(0.015)	(0.017)	(0.013)	(0.013)	(0.011)	(0.012)	(0.011)
Time to maturity (in years)	0.018***	0.015***	0.007***	0.016***	0.014***	0.012***	0.012***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Time since origination (in years)	0.021***	0.047***	0.018***	0.021***	0.026***	0.036***	0.032***
	(0.006)	(0.010)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)
log(Loan amount)	0.005***	0.028***	-0.006***	0.004**	-0.002	-0.005***	-0.006***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
All-in-drawn spread (in %)		0.053***					
		(0.004)					
Share of participating funds			0.459***				
			(0.022)				
Lead arranger is investment bank				0.115***			
				(0.015)			
Capital ratio of lead arranger					0.636***		
					(0.203)		
Term loan x Capital ratio					-0.688*		
					(0.394)		
Crisis period						0.012	
						(0.012)	
Year of origination - 1993						0.004***	
						(0.000)	
Report date FE	Y	Y	Y	Y	Y		Y
Lead arranger FE					Y	Y	Y
Sample	SNC	SNC&DS	SNC	SNC	SNC&Y-9C	SNC	SNC
Mean of dependent variable	0.110	0.110	0.110	0.110	0.066	0.110	0.110
R^2	0.08	0.18	0.18	0.09	0.12	0.25	0.25
N	71,019	21,357	71,019	71,019	52,261	71,019	71,019

Note: This table shows results of regression 1. The dependent variable is an indicator that is 1 if the lead arranger has sold its entire share of the loan by the first report date and 0 otherwise; the unit of observation is a loan. We include every loan only once in the analysis: at the first SNC report date after origination. The sample is restricted to loans for which the first observation in the SNC data is within at least 400 days of the origination date of the loan. The all-in-drawn spread is obtained from Dealscan. Capital ratios are from the Federal Reserve's Y-9C data base and are defined as the ratio of equity over total assets. Share of participating funds is defined as the number of funds that hold the loan divided by the total number of loan holders as of the first SNC report date. Standard errors are clustered by lead arranger times SNC report date. Significance levels: *(p<0.10), **(p<0.05), ***(p<0.01).

We also include the time since origination, measured as the difference between the origination date and the first SNC report date at which the loan appears in the data. The coefficient of 0.02 indicates that increasing the time since origination by one year raises the probability of a lead share sale by 2%. The positive but relatively flat relationship is consistent with lead share sales occurring not at, but shortly after, origination.

The coefficient on the logarithm of the total loan amount varies depending on the exact specification. In column 1, we find that there is a positive relationship between the loan amount and lead arranger sales. However, when introducing additional controls in columns 2 to 7, primarily arranger controls or arranger-level fixed effects, the coefficient changes sign.

Term B loans and leveraged loans are more likely to be sold to institutional investors. In column 3, we introduce a loan-specific measure of institutional investors' participation by computing the ratio of the number of loan participants that are funds or CLOs to the number of all participants at the first SNC report date. Funds and CLOs are defined according to institution type codes from SNC. Introducing this variable raises the R^2 from 5 percent (column 1) to 17 percent (column 3). Interestingly, the fund share variable absorbs the effect of the term loan dummy, the Term B loan dummy and the leveraged loan dummy while flipping the sign on the size coefficient. This indicates that it is mostly these loan types that are sold to institutional investors.

Lead Arranger Characteristics. Next, we turn to examining the relationship between lead share sales and the arranger's characteristics. In column 4 we start by adding a dummy that indicates whether the lead arranger acts as an investment bank in the United States.[18] We find that investment banks are 12% more likely to sell their entire lead share consistent with the notion that these banks are more likely to engage in an originate-to-distribute business model.

We use the capital ratio constructed as the ratio of equity capital over total assets (obtained from the Federal Reserve's Y-9C report) as a measure of how well the lead arranger is capitalized. The capital ratio variable is introduced in column 5 along with lead arranger fixed effects. Because the specification also contains report date fixed effects, any identifying variation comes from the cross-sectional variation in lead arrangers' capital ratios relative to their time-series averages. We interact the capital share with the term loan dummy. We find that the coefficient on the non-interacted term is positive, while the interaction is negative. This indicates that there is a differential relationship between lead share sales

[18] We use the investment bank dummy to classify banks that are unlikely to have a strong deposit base in the US. Classified as "investment banks" are Societe Generale, Royal Bank of Scotland, Mizuho, Mitsubishi, Fuji, Deutsche Bank, Credit Suisse, BNP Paribas, Barclays, UBS, Lehman Brother, Bear Stears, Goldman Sachs, Merrill Lynch, and Morgan Stanley.

and the capital share for term loans. A lead arranger with a 100 basis points higher capital ratio is 0.6% less likely to sell its entire stake in a term loan, but 0.7% more likely to sells its stake in a non-term loan (the large majority of these non-term loans consists of non-converting credit lines). The fact that Basel I did not require banks to hold any capital against credit lines with maturity below 365 days may explain this differential relationship. Plosser and Santos (2018) show that banks reacted to Basel I by shortening the maturity of credit lines to 364 days. In equilibrium, better capitalized banks may therefore hold loans with high capital requirements and weaker capitalized banks may retain short-term loan commitments on their balance sheets. The evidence that regulatory capital constraints are associated with loan sales by participant banks has also been shown by Irani et al. (2018).

Time Characteristics. In column 6, we replace the report date fixed effect by a variable that captures the year of the loan's origination and a financial crisis dummy which is 1 if a loan was originated in 2007, 2008 or 2009 and 0 otherwise. The coefficient of the crisis dummy is close to 0 and not statistically significant, indicating that lead arrangers did not sell their loan stakes more aggressively during the financial crisis. The year-of-origination variable is computed as the year of origination, relative to 1993. As an example, the value of the variable for a loan originated in 2000 would be 7. The estimated regression coefficient is 0.004 indicating that the likelihood of lead share sale increased by 0.4 percentage points per year over the sample period. We also showed this time-trend in Figure 2. It is consistent with the notion of an increased presence of institutional investors in recent years.

In column 7, we conclude by regressing our indicator of whether the loan was entirely sold on the loan characteristics, lead arranger fixed effects and report date fixed effects. Together, these controls explain around 25 percent of the variation in the dependent variable in the SNC sample.

4 Asymmetric Information in the Syndicated Loan Market

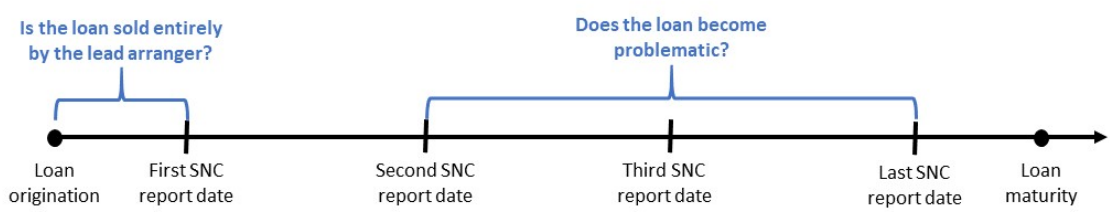
We test the possible asymmetric information problems, resulting from the sale of a lead arranger's stake of a syndicated loan, by examining the relationship between such sales and the probability that the loan encounters repayment difficulties *after* the lead arranger has sold its share. This is a joint test for both, moral hazard and adverse selection effects resulting from such sales. We estimate the regression:

$$\text{ProblemAfterLoanSold}_{l,i,k,t} = \beta_0 + \beta_1 \text{LoanSoldAfterOrigination}_{l,i,k,t} + \beta_2 X_l + \delta_{k,t} + \delta_{i,t} + \epsilon_{l,i,t,k}. \quad (2)$$

where $\text{ProblemAfterLoanSold}_{l,i,k,t}$ is a dummy variable that is 1 if loan l of a borrower active in industry i arranged by lead bank k develops a credit problem at any SNC report date *after* the first report date t. The main explanatory variable $\text{LoanSoldAfterOrigination}_{l,i,k,t}$ is an indicator that is 1 if the lead arranger k of loan l has sold its entire commitment at the first SNC report date t and 0 otherwise. The timing of these variables is further illustrated in Figure 3. As above, we include every loan only once in the analysis: at the first SNC report date after origination. Because we want to condition on loans that are newly originated, we restrict our sample to loans for which the first observation in the SNC data is at most 400 days after origination.[19]

Our primary measure of whether the loan becomes problematic is "non accrual" That is to say, we define a loan as problematic if it becomes non accruing at any point in time after origination. We extend our analysis with additional measures such as: (a) an indicator of whether payments of the borrower are "90 days past due", and (b) a problem indicator indicating whether part of the loan is classified as "non-pass" by the bank and Federal Reserve examiners.[20] The first problem indicators measure actual payment problems, while the last indicator can be seen as a proxy for expected payment shortfalls. In each regression, we exclude the loans for which the relevant problem indicator is one at the first report date. This eliminates any potential cases where the lead arranger sold its share after a problem with the loan has arisen.

Figure 3: ***Illustration of the Timing of Loan Sales and Loan Problems***



Note: This figure illustrates the definition of the variables $\text{ProblemAfterLoanSold}_{l,i,k,t}$ and $\text{LoanSoldAfterOrigination}_{l,i,k,t}$. $\text{LoanSoldAfterOrigination}_{l,i,k,t}$ is an indicator that is 1 if the lead arranger k of loan l has sold its entire loan share at the first SNC report date t and 0 otherwise. $\text{ProblemAfterLoanSold}_{l,i,k,t}$ is a dummy variable that is 1 if loan l issued by lead arranger k incurs a credit problem at any SNC report date after the report date t that follows the loan origination date and 0 otherwise.

We include industry x report date fixed effects $\delta_{i,t}$ in the regression which control for any time-related variation in industry-specific loan market stress, e.g. due to the financial crisis. Lead arranger fixed

[19]Our results, below, can be seen as a lower bound estimates. After all, it is possible that the lead arranger sells its share after the first observation. We would count this loan among those in which the arranger still holds a small stake.

[20]The "non-pass" rating classification is based on the internal risk ratings provided by the lead arranger and an assessment of this rating by the examiner, who then convert it into a standard framework that is homogeneous across all banks.

effects δ_k are also included in order to absorb differences in the quality and characteristics of loans originated by different lead arrangers. For example, lead arrangers might be specialized in lending to borrowers in certain industries. The vector X_l includes several loan characteristics, such as a term loan dummy, a Term B loan dummy, a leveraged loan dummy, the logarithm of the total loan amount, the time since origination, the time to maturity, and ex-ante measures of the loan default risk. We use two different measures of the ex-ante loan default risk: (a) the all-in-drawn spread at origination obtained from Dealscan, and (b) the internal loan rating of the lead arranger bank provided as part of the SNC program. The all-in-drawn spread reflects the price the market believes the borrower should pay for credit, given its risk profile. The internal loan rating is observed at the first SNC report date after loan origination. The advantage of the internal loan rating is that it likely reflects any private information the lead arranger might have about the loan.

Table 4: ***Asymmetric Information in the Syndicated Loan Market***

	Dependent variable: Indicator(Loan became non-accruing after sale)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Loan sold after origination	-0.010*	-0.010**	-0.009***	-0.011**				
	(0.005)	(0.005)	(0.003)	(0.005)				
Total agent-exposure sold					-0.009*		-0.007***	
					(0.005)		(0.003)	
Total exposure sold						-0.008		-0.009**
						(0.007)		(0.005)
All-in-drawn spread (in %)	0.012***	0.012***		0.012***	0.012***	0.012***		
	(0.002)	(0.002)		(0.002)	(0.002)	(0.002)		
Internal loan rating FE			Y				Y	Y
Loan controls	Y	Y	Y	Y	Y	Y	Y	Y
Industry x Report date FE	Y	Y	Y	Y	Y	Y	Y	Y
Arranger FE		Y						
Report date x Arranger FE			Y	Y	Y	Y	Y	Y
Sample	SNC&DS	SNC&DS	SNC	SNC&DS	SNC&DS	SNC&DS	SNC	SNC
Mean of dependent variable	0.024	0.024	0.023	0.024	0.024	0.024	0.023	0.023
R^2	0.05	0.07	0.30	0.18	0.18	0.18	0.30	0.30
N	21,282	21,282	29,088	21,282	21,282	21,282	29,088	29,088

Note: This table shows selected coefficients of regression 2. The dependent variable is a dummy variable that is 1 if the loan becomes non-accruing at any SNC report date after the report date that follows the loan origination date and 0 otherwise; the unit of observation is a loan. The main independent variable "Loan sold after origination" is a dummy variable that is 1 if the lead arranger has sold its entire loan share at the first SNC report date and 0 otherwise. We include every loan only once in the analysis: at the first SNC report date after origination. The sample is restricted to loans for which the first observation in the SNC data is within at least 400 days after the origination of the loan. We exclude any loan for which the dependent variable already takes the value of 1 at the first observation. Included as loan controls are a term loan dummy, a Term B loan dummy, a leveraged loan dummy, the logarithm of the total loan amount, the time since origination, and the time to maturity. The all-in-drawn spread is obtained from Dealscan. Standard errors are clustered by report date x lead arranger. Significance levels: *(p<0.10), **(p<0.05), ***(p<0.01).

As outlined in Section 2.1, the existing theory on the role of the lead arranger's share predicts a positive relationship between the sale of said share and future credit problems. This would follow from a lack of monitoring or adverse selection. For example, the lead arranger might have private information that the loan is of bad quality and therefore sell its share. In addition, a lead share of zero does not induce any incentive for the lead arranger to screen and monitor the loan.

Instead, Table 4 shows a negative relationship in the data. In column 1, we start by regressing the non-accrual indicator on the loan-sold-at-origination dummy variable, controlling for the all-in-drawn spread, the vector of loan characteristics from Table 3 and industry x report date fixed effects. The regression coefficient indicates that a lead share sale is associated with a 1 percentage point lower probability that the loan becomes non-accruing in the future. The unconditional probability of a loan becoming non-accruing in the future is 2.4%. Thus, the sale of the lead share the lead arranger coincides with a roughly 40 percent lower probability, relative to the average. Column 2 further includes arranger fixed effects, which account for any time-constant differences in loan origination quality across arrangers, but the results remain identical. In column 3, we use bank internal risk ratings instead of the all-in-drawn spread in order to control for the loan's ex-ante credit risk and we additionally include arranger x time fixed effects. Effectively, we compare two loans originated in the same year by the same lead bank, with identical bank internal ratings, extended to borrowers of the same industry, differenced by whether one loan is sold and one loan retained on the balance sheet of the lead arranger. On average, the sold loan is 0.9 percentage points less likely to become non-accruing in the future. So far, the results are inconsistent with adverse selection and moral hazard in the syndicated loan market. However, one could argue that remaining exposure through holdings of other loans to the same borrower might sufficiently incentivize the lead arranger to diligently screen and monitor the loan.

In columns (5)-(8) we therefore study loans where the lead agent sold all exposure to a borrower instead of merely a single loan. More specifically, we regress the non-accrual indicator on a dummy that is 1 if the lead arranger sold this loan by the first report date and has no other exposure to this borrower at all (column 6 and 8) or at least as lead agent (column 5 and 7). Again, the results indicate that, conditional on ex-ante risk, the lead arranger is more likely to sell its entire exposure in loans that perform better ex-post. This result holds also when using bank internal credit ratings instead of the all-in-drawn spread at origination in order to control for the current credit risk.

We further explore the stark finding that lead arrangers sell their share for loans that turn out worse ex-post using different measures of ex-post performance. Table 5 reports results from a regression of

different problem measures on the loan-sold-at-origination dummy. We now show that the negative relationship between lead share sales and loan problems also holds across different measures of ex-post performance. In the first two columns, we use an indicator of whether a loan is rated as "non-pass" by the examiners. The regression coefficient indicates that a sale by the lead arranger is associated with a 0.2 percent lower probability that parts of the loan are designated "non-pass" compared to loans it held on its book. This is quite sizeable, as it amounts to about 25% of the unconditional probability that a loan receives a "non-pass" rating by the examiners. Similarly, loans sold by the lead arranger are 0.4 percent less likely to become 90 days past due with their promised payments. Hence, this underscores our finding that loans completely sold-off by the lead bank are positively instead of adversely selected, inconsistent with the traditional view of the syndicated loan market.

Table 5: ***Asymmetric Information – Additional Loan Performance Measures***

	Dependent variable:					
	Non-pass		90 Days past due		Market price	
	(1)	(2)	(3)	(4)	(5)	(6)
Loan sold after origination	-0.020***	-0.032***	-0.004*	-0.001	0.234	0.124
	(0.006)	(0.009)	(0.002)	(0.003)	(0.232)	(0.221)
All-in-drawn spread (in %)		0.040***		0.000	-0.155**	
		(0.002)		(0.002)	(0.002)	
Internal loan rating FE	Y		Y			Y
Loan controls	Y	Y	Y	Y	Y	Y
Industry x Report date FE	Y	Y	Y	Y	Y	Y
Report date x Arranger FE	Y	Y	Y	Y	Y	Y
Sample	SNC	SNC&DS	SNC	SNC&DS	SNC,DS&LSTA	SNC,DS&LSTA
Mean of dependent variable	0.082	0.099	0.010	0.007	99	99
R^2	0.29	0.22	0.17	0.1	0.7	0.68
N	26,971	20,032	29,369	21,339	1,418	1,315

Note: This table shows results of regression 2. In column (1) and (2) the dependent variable is a dummy variable that is 1 if the loan is ever rated as problematic (i.e. a portion is designated "non-pass") at any SNC report date after the report date that follows the loan origination date and 0 otherwise. In column (3) and (4) the dependent variable is an indicator that is 1 if a loan payment is more than 90 days past due at any report date after the first report date following origination and 0 otherwise. Columns (5) and (6) report the results using the price of the loan that is closest to but before the first report as dependent variable; the unit of observation is a loan. The main independent variable "Loan sold after origination" is a dummy variable that is 1 if the lead arranger has sold its entire commitment by the first SNC report date and 0 otherwise. We include every loan only once in the analysis: at the first SNC report date after origination. The sample is restricted to loans for which the first observation in the SNC data is within at least 400 days after the origination of the loan. We exclude any loan for which the dependent variable already takes the value of 1 at the first observation, this causes variation in the number of observations. Included as loan controls are a term loan dummy, a Term B loan dummy, a leveraged loan dummy, the logarithm of the total loan amount, the time since origination, and the time to maturity. The all-in-drawn spread is obtained from Dealscan. Standard errors are clustered by report date x lead arranger. Significance levels: *(p<0.10), **(p<0.05), ***(p<0.01).

We provide further evidence for this positive selection in column 5 and 6 of Table 5. We use secondary market prices obtained from LSTA to analyze whether loans sold by the lead arranger trade at higher or lower prices. For each loan, we obtain the last secondary market price before the first

SNC report date, if available. This ensures that we are likely to capture the price of a loan after it has been sold by the lead arranger. We then regress this loan price on the loan-sold-after-origination variable. Theories on adverse selection and moral hazard interpret lead share sales as a negative signal. According to these theories, we should therefore expect a negative price reaction following a lead share sale. In contrast, we find a positive, but statistically insignificant relationship between lead share sales and secondary market prices as reported in column 5 and 6. The result is based on a small subset of the data and therefore noisily estimated. However, this result is consistent with the positive selection of loans that are sold, as identified above.

In this section we have shown that there exists a negative relationship between lead share sales and loan problems, conditional on ex-ante default risk. These results are inconsistent with theories on the role of the lead arranger share as a mechanism to prevent adverse selection and moral hazard in the syndicated loan market. Our results imply that, absent any other incentive mechanism,[21] the lead arranger does not possess any private information about the loan and that the discretion to monitor by the lead arranger does not affect the loan performance. For example, monitoring efforts by the lead arranger might be observable by other syndicate participants or the monitoring task might be outsourced to external auditing companies.

5 Why Do Lead Arrangers Keep the Bad Loans?

While our results are inconsistent with traditional theories on the role of the lead arranger share, they are in line with syndicated loan underwriting risk, i.e. the lead arranger's risk when originating a loan in order to distribute it. We explore the sources of underwriting risk for the lead arranger in this section.

Underwriting risk materializes when the lead arranger underwrites a bad loan and could occur for the following two reasons. First, underwriting loans that the market views as fundamentally flawed or incorrectly priced increases the risk that the arranger will be unable to sell the loan to informed investors. As a consequence, the lead bank would have to retain these loans on its balance sheet. Bruche et al. (2017) refer to this as pipeline risk. Second, in case investors buy the bad loan in good faith, the lead arranger risks its reputation if the loan later defaults. Hence, the lead arranger might have an incentive to keep the bad and sell the good loans, guarding its reputation. We investigate syndicated

[21] For example, Neuhann and Saidi (2016) argue that lead arrangers have non-loan exposures to borrowers through the cross-selling of financial services such as securities underwriting. According to this theory, insufficient monitoring would lead to a loss of future revenues from the banking relationship. This ensures that the lead arranger monitors the borrower sufficiently even without any loan share. This theory however does not address the adverse selection problem.

loan underwriting risk with a series of tests in the following section.

Table 6: ***Sources of Underwriting Risk***

	Dependent variable: Non-accrual indicator			
	(1)	(2)	(3)	(4)
Loan sold after origination	0.002	-0.000	-0.011**	-0.014***
	(0.007)	(0.007)	(0.005)	(0.005)
Loan sold x Share of participating funds	-0.021**			
	(0.010)			
Loan sold x High all-in-drawn Spread		-0.014*		
		(0.008)		
Loan sold x 45-Day change in VIX before origination			-0.110*	
			(0.064)	
Loan sold x Top-3 participants of lead arranger				0.014*
				(0.008)
Share of participating funds	-0.004			
	(0.010)			
High all-in-drawn Spread		0.009**		
		(0.004)		
45-Day change in VIX before origination			-0.025	
			(0.024)	
Top-3 participants of lead arranger				0.000
				(0.003)
All-in-drawn spread	0.012***	0.010***	0.012***	0.012***
	(0.001)	(0.002)	(0.001)	(0.002)
Loan controls	Y	Y	Y	Y
Industry x Report date FE	Y	Y	Y	Y
Report date x Arranger FE	Y	Y	Y	Y
Sample	SNC&DS	SNC&DS	SNC&DS	SNC&DS
Mean of dependent variable	0.024	0.024	0.024	0.024
R^2	0.18	0.18	0.18	0.18
N	21,282	21,282	21,282	21,282

Note: This table shows results of regression 2 with the inclusion of interaction terms. We interact whether a loan has been sold by the lead arranger at first observation with certain loan or market characteristics. We make use of the following interactions: the change in the VIX from 45 days before origination to the origination date (column 1), the share of the loan held by funds CLOs on the first report date (column 2), an indicator that takes the value of 1 if one or more of the lead arranger's top 3 participants holds part of the loan on the first report date (column 3), and an indicator of whether the all-in-drawn spread for the loan is higher than the average all-in-drawn spread. The dependent variable is a dummy variable that is one if loan i issued by lead arranger k has become non-accruing on any SNC report date after the first report date t that follows the loan origination date; the unit of observation is a loan. The sample is restricted to loans for which the first observation in the SNC data is within at least 400 days after the origination of the loan. The all-in-drawn spread is obtained from Dealscan. Standard errors are clustered by report date x lead arranger. Significance levels: *(p<0.10), **(p<0.05), ***(p<0.01).

We explore the drivers of our baseline results through a series of interaction terms. Variables that we include as interaction terms relate to pipeline or reputation risk. More specifically, we examine heterogeneities of our baseline result with respect to (a) the presence of institutional investors in the

syndicate, (b) the change in market conditions before loan origination and (c) whether there is a participant in the syndicate with which the lead arranger has had an extensive past relationship. The results of these analyses are reported in Table 6.

Pipeline risk is presumably more concentrated among loans that cater to institutional investors, because these rather risky loans are seldom kept on bank balance sheets. We make use of two different measures that track whether a loan is more suited to institutional investors: (a) the number of funds and CLOs as a fraction of all syndicate participants at the first report date, and (b) an indicator for whether the loan has an above-average all-in-drawn spread. In column 1, we interact whether the lead arranger has sold its share at first observation with the share of participants that are funds or CLOs. The regression coefficient of -0.021 indicates that loans that are sold by the lead arranger and thereafter held entirely by funds are 2.1 percentage points less likely to become non-accruing relative to loans that are sold by the lead arranger but where we observe no participating institutional investors. This coefficient is economically large given that the unconditional probability of a loan becoming non-accruing is 2.4%. Introducing this interaction term changes the coefficient on the loan-sold-after-origination variable from -0.011 (Table 4, column 4) to 0.002 and renders it insignificant.

In a similar vein, we find that the negative relation between lead share sales and loan performance is dominated by risky loans (column 2). These too are more likely to be held by institutional investors.[22] The results indicate that underwriting risk is more pronounced among loans typically sold to institutional investors, consistent with pipeline risk.

Another possible source of pipeline risk for the lead arranger stems from changes in the institutional funding costs during the syndication process, which typically takes 45 days (Bruche et al. (2017)). In a typical syndication process, the lead arranger guarantees a limit in the credit spread to the borrower before promoting the deal to investors. When investors' funding costs rise - their demand for loans deteriorates - the lead arranger has to step in and take on residual amounts of the loan that could not be sold at the promised spread limit. Arguably, loan demand would first decline for more tightly priced deals. We test this prediction using the change in the CBOE Volatility Index (VIX) during a 45 day window before the origination date. We take this as a broad proxy for a measure of changes in funds' capital costs during the syndication process. Column 3 in Table 6 reports evidence that is consistent with this interpretation of pipeline risk. An increase in the VIX during the 45 days before loan origination

[22]See Section C.2 in the appendix for a brief discussion of the split of loans held by various investor groups according to the all-in-drawn spread.

is associated with a stronger negative relationship between loan sales and the likelihood of the loan becoming non-accruing in the future. A 1 percentage point increase in the expected volatility of the equity market during the syndication process is associated with a 0.1 percentage point lower probability of becoming non-accruing.

If the lead arranger is indeed concerned about selling a relatively bad loan, then it might particularly fear censure from frequent syndication partners. Presumably, the lead arranger relies more on these participants for future syndicated loans. We therefore include an interaction term in regression 2 that accounts for heterogeneous effects, depending on whether a Top-3 participant of the lead arranger is in the syndicate. For each period, we count the number of past participant-arranger interactions. We then rank the number of these past interactions to determine whether a participant is among the "top 3" participants for this arranger. The results displayed in column 4 of Table 6 reveal that loans sold-off by the lead arranger, that at least one of its top-3 participants invests in, tend to perform worse than those sold and held by non-frequent participants. This is somewhat inconsistent with reputation concerns. However, it is possibly consistent with lead arrangers being able to unload undesirable loans to partner institutions, when market demand is low.

6 Conclusion

In this paper, we make use of Shared National Credit Registry (SNC) data to analyse the role of the lead arranger's stake in a syndicated loan. We find that the lead arranger sells its entire share in loans it helps syndicate in a significant number of instances (approximately 12% of all loans). This is particularly the case for loans aimed at institutional investors, such as leveraged loans or Term B loans which are sold more than 40% of the time. The lead arranger has typically sold its entire stake in the loan shortly after loan origination, leaving it with no "skin-in-the-game" over the duration of the loan.

However, traditional theories on the role of the lead arranger argue that a sufficient loan share is necessary to avoid asymmetric information problems. These theories predict that loans for which the lead arranger sells its entire stake should perform worse. We find, however, that these loans are less likely to become problematic in the future. Our finding contradicts the aforementioned theories and is robust to a large number of alternative specifications.

Our results question the role of the lead arranger's share in syndicated loans. First, they indicate that there is no special purpose for the lead arranger's stake when it comes to ensuring loan quality

through monitoring. Monitoring may be outsourced to third parties or may be observable to other syndicate participants, opening the arranger up to censure should it fail to monitor. Second, it may be hard for individual banks, acting as lead arranger, to gain an informational advantage over all other participants in the syndicated loan market. The increased presence of large, sophisticated institutional investors that have the ability to disintermediate banks (Chernenko et al. (2019)) might be responsible for this development.

References

Balasubramanyan, L., Berger, A. N., Koepke, M. M., 2019. How do lead banks use their private information about loan quality in the syndicated loan market? Journal of Financial Stability 43, 53–78.

Benmelech, E., Dlugosz, J., Ivashina, V., 2012. Securitization without adverse selection: The case of clos. Journal of Financial Economics 106 (1), 91–113.

Beyhaghi, M., Deng, S., Li, Y., 2019. Creditor control rights and borrower protection: The role of borrower consent clause in private debt contracts. Available at SSRN 3450889.

Bord, V., Santos, J. A., 2012. The rise of the originate-to-distribute model and the role of banks in financial intermediation. Economic Policy Review 18 (2), 21–34.

Bord, V. M., Santos, J. A., 2015. Does securitization of corporate loans lead to riskier lending? Journal of Money, Credit and Banking 47 (2-3), 415–444.

Bruche, M., Malherbe, F., Meisenzahl, R. R., 2017. Pipeline risk in leveraged loan syndication.

Chernenko, S., Erel, I., Prilmeier, R., 2019. Nonbank lending. Tech. rep., National Bureau of Economic Research.

Cohen, G., Friedrichs, M., Gupta, K., Hayes, W., Lee, S. J., Marsh, W. B., Mislang, N., Shaton, M., Sicilian, M., 2018. The us syndicated loan market: Matching data. Federal Reserve Bank of Kansas City Working Paper (18-09).

Dahiya, S., Puri, M., Saunders, A., 2003. Bank borrowers and loan sales: New evidence on the uniqueness of bank loans. The Journal of business 76 (4), 563–582.

Diamond, D. W., 1984. Financial intermediation and delegated monitoring. The review of economic studies 51 (3), 393–414.

Gande, A., Saunders, A., 2012. Are banks still special when there is a secondary market for loans? The Journal of Finance 67 (5), 1649–1684.

Gatev, E., Strahan, P. E., 2006. Banks' advantage in hedging liquidity risk: Theory and evidence from the commercial paper market. The Journal of Finance 61 (2), 867–892.

Gopalan, R., Nanda, V., Yerramilli, V., 2011. Does poor performance damage the reputation of financial intermediaries? evidence from the loan syndication market. The Journal of Finance 66 (6), 2083–2120.

Gorton, G. B., Pennacchi, G. G., 1995. Banks and loan sales marketing nonmarketable assets. Journal of monetary Economics 35 (3), 389–411.

Gustafson, M., Ivanov, I., Meisenzahl, R. R., 2017. Bank monitoring: Evidence from syndicated loans. Available at SSRN 2831455.

Holmstrom, B., Tirole, J., 1997. Financial intermediation, loanable funds, and the real sector. the Quarterly Journal of economics 112 (3), 663–691.

Irani, R. M., Iyer, R., Meisenzahl, R. R., Peydro, J.-L., 2018. The rise of shadow banking: Evidence from capital regulation.

Ivashina, V., 2009. Asymmetric information effects on loan spreads. Journal of financial Economics 92 (2), 300–319.

Ivashina, V., Sun, Z., 2011. Institutional demand pressure and the cost of corporate loans. Journal of Financial Economics 99 (3), 500–522.

Kashyap, A. K., Rajan, R., Stein, J. C., 2002. Banks as liquidity providers: An explanation for the coexistence of lending and deposit-taking. The Journal of finance 57 (1), 33–73.

Lee, S. J., Li, D., Meisenzahl, R. R., Sicilian, M. J., 2019. The u.s. syndicated term loan market: Who holds what and when? FEDS Notes. Washington: Board of Governors of the Federal Reserve System. https://doi.org/10.17016/2380-7172.2473.

Leland, H. E., Pyle, D. H., 1977. Informational asymmetries, financial structure, and financial intermediation. The journal of Finance 32 (2), 371–387.

Neuhann, D., Saidi, F., 2016. Bank deregulation and the rise of institutional lending. University of Texas at Austin Working Paper.

Paligorova, T., Santos, J. A., 2018. Nonbank investors and loan renegotiations. Available at SSRN 2892068.

Plosser, M. C., Santos, J. A., 2016. Bank monitoring. Available at SSRN 2697146.

Plosser, M. C., Santos, J. A., 2018. The cost of bank regulatory capital. FRB of New York Staff Report (853).

Santos, J. A., Shao, P., 2018. Loan ownership and liquidity in the secondary loan market. Available at SSRN 2951451.

Sufi, A., 2007. Information asymmetry and financing arrangements: Evidence from syndicated loans. The Journal of Finance 62 (2), 629–668.

Taylor, A., Sansone, A., et al., 2006. The handbook of loan syndications and trading. McGraw Hill Professional.

Winton, A., Yerramilli, V., 2015. Lender moral hazard and reputation in originate-to-distribute markets. Available at SSRN 1986956.

Appendix for "The Myth of the Lead Arranger Share"

Kristian Blickle
Quirin Fleckenstein
Sebastian Hillenbrand
Anthony Saunders

A Samples Used Throughout the Paper

Table A.1: ***Samples***

Name	Used in section	All loans	Term loans
Dealscan & SNC sample containing share at origination	3.2	5,626	637
Dealscan & SNC sample containing all-in-drawn spread	3.4, C.2, 5	21,357	5,620
SNC sample containing internal risk rating	C.2, 5	29,427	12,011
SNC sample	3.1, 3.2, 3.4	71,019	14,922
LSTA, Dealscan & SNC sample	C.2	1,418	1,233

Note: This table shows the number of loans for the different samples. All samples are restricted to loans for which the first observation in the SNC data is at most 400 days after origination.

B Loan Share Sales by the Lead Arranger

B.1 Changes in Lead Shares over Loan Duration Using Dealscan

Table B.1: ***Changes in Lead Shares over Loan Duration Using Dealscan***

	Dealscan-SNC sample containing the share at origination		Dealscan-SNC sample		SNC sample	
	(1) All loans	(2) Term loans	(3) All loans	(4) Term loans	(5) All loans	(6) Term loans
Lead share at last SNC observation / Lead share at origination (Dealscan)	Fraction of loans in each category					
above 101%	4%	5%				
99-101 % (Share unchanged)	78%	63%	Share not observed			
50-99 %	11%	14%	at origination			
0-50%	4%	8%				
0% (Share sold completely)	4%	9%	12%	31%	12%	27%
Total number of loans	5,626	637	21,357	5,620	71,019	14,922

Note: This table shows the change in the lead share after origination: We compute the ratio of the lead share at the last observation in the SNC data and the lead share at the origination (from Dealscan). We then group loans according to the observed lead share change. The analysis is based on a merged loan sample from Dealscan and SNC.

B.2 Changes in Lead Shares over Loan Duration Using SNC

Table B.2: ***Change in Lead Share over Loan Duration using SNC***

	(1) All loans	(2) Term loans	(3) Credit lines	(4) Converting credit lines
Lead share at last SNC report date / Lead share at first SNC report date	Fraction of loans in each category			
above 101%	10%	7%	12%	8%
99-101 % (Share unchanged)	64%	56%	65%	64%
50-99 %	11%	6%	14%	9%
0-50%	3%	4%	2%	4%
0% (Share sold completely)	12%	27%	7%	14%
Total number of loans	71,019	14,922	37,946	11,194

Note: This table shows the change in the lead share after the first SNC observation. The change is measured by the lead share at the first SNC report date (in percent) divided by the lead share at the last report date (in percent). We then group loans based on the change in the lead share. The table reports the fraction of loans in each group. The table is constructed using only SNC data.

B.3 Summary statistics

Table B.3: ***Summary Statistics for Determinants of Lead Share Sales***

	Mean	S.D.	P25	P50	P75	N	Source
Loan sold after origination	0.11	0.31	0.00	0.00	0.00	71,019	SNC
Term loan	0.21	0.41	0.00	0.00	0.00	71,019	SNC
Term B loan	0.03	0.16	0.00	0.00	0.00	71,019	SNC
Leveraged loan	0.10	0.30	0.00	0.00	0.00	71,019	SNC
log(Loan size)	18.46	1.47	17.50	18.42	19.47	71,019	SNC
Time since origination (in years)	0.38	0.29	0.12	0.35	0.59	71,019	SNC
Time to maturity (in years)	4.43	2.20	3.00	5.00	5.04	71,019	SNC
All-in-drawn spread (in %)	2.25	1.53	1.12	2.00	3.00	21,357	Dealscan
Share of participating funds	0.14	0.27	0.00	0.00	0.14	71,019	SNC
Lead arranger is investment bank	0.13	0.34	0.00	0.00	0.00	71,019	SNC
Capital ratio of lead arranger	0.09	0.02	0.07	0.09	0.11	52,261	Call reports
Crisis period	0.08	0.27	0.00	0.00	0.00	71,019	SNC
Year of origination - 1993	12.29	7.89	5.00	12.00	20.00	71,019	SNC

Note: This table presents summary statistics of variables used in Section 3.4. For each loan, only the first SNC observation after loan origination is regarded. The numbers are based on all loans in the SNC data, for which the first observation in the SNC data is within at least 400 days after the origination of the loan.

Table B.4: ***Correlation Table for Determinants of Lead Share Sales***

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Loan sold after origination	1.00												
(2) Term loan dummy	0.21	1.00											
(3) Term B loan dummy	0.16	0.32	1.00										
(4) Leveraged loan dummy	0.14	0.27	0.15	1.00									
(5) log(Loan size)	0.06	0.12	0.11	0.11	1.00								
(6) Time since origination	0.02	0.02	-0.01	-0.05	0.06	1.00							
(7) Time to maturity (in years)	0.16	0.16	0.11	0.14	-0.01	0.03	1.00						
(8) All-in-drawn spread	0.29	0.39	0.18	0.30	-0.29	0.02	0.31	1.00					
(9) Share of participating funds	0.41	0.44	0.35	0.34	0.20	0.01	0.28	0.54	1.00				
(10)Lead arranger is investment bank	0.18	0.18	0.09	0.22	0.09	0.00	0.12	0.30	0.34	1.00			
(11) Capital ratio of lead arranger	0.09	0.25	0.06	0.24	0.03	0.05	0.08	0.36	0.14	0.32	1.00		
(12) Crisis period	0.02	0.12	0.04	-0.10	0.03	0.11	-0.03	0.03	0.03	0.02	0.03	1.00	
(13) Year of origination - 1993	0.12	0.41	0.14	0.43	0.26	0.01	0.09	0.37	0.27	0.18	0.62	0.09	1.00

Note: This table presents pairwise correlations between variables used in Section 3.4. For each loan, only the first SNC observation after loan origination is regarded. The numbers are based on all loans in the SNC data, for which the first observation in the SNC data is within at least 400 days after the origination of the loan.

B.4 Determinants of Lead Share Sales - Term Loans

Table B.5: ***Determinants of Lead Share Sales - Term Loans***

	Dependent variable: Indicator(Loan sold by lead arranger by first report date)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Term B loan	0.124***	0.088***	-0.011	0.127***	0.180***	0.139***	0.133***
	(0.026)	(0.030)	(0.024)	(0.025)	(0.029)	(0.022)	(0.022)
Leveraged loan	0.140***	0.029	-0.029	0.096***	0.091***	0.071***	0.067***
	(0.024)	(0.026)	(0.020)	(0.019)	(0.015)	(0.016)	(0.015)
Time to maturity (in years)	0.023***	0.024***	0.003	0.018***	0.033***	0.018***	0.018***
	(0.019)	(0.030)	(0.017)	(0.019)	(0.021)	(0.019)	(0.019)
Time since origination (in years)	0.088***	0.148***	0.059***	0.093***	0.111***	0.109***	0.115***
	(0.019)	(0.030)	(0.017)	(0.019)	(0.021)	(0.019)	(0.019)
log(Loan amount)	0.033***	0.055***	-0.018***	0.022**	0.017**	-0.003	-0.003
	(0.006)	(0.008)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
All-in-drawn spread (in %)		0.075***					
		(0.006)					
Share of participating funds			0.533***				
			(0.031)				
Lead arranger is investment bank				0.115***			
				(0.015)			
Capital ratio of lead arranger					-1.251		
					(0.965)		
Crisis period						-0.002	
						(0.028)	
Year of origination - 1993						0.002	
						(0.002)	
Report date FE	Y	Y	Y	Y	Y		Y
Lead arranger FE					Y	Y	Y
Sample	SNC	SNC&DS	SNC	SNC	SNC&Y-9C	SNC	SNC
Mean of dependent variable	0.230	0.230	0.230	0.230	0.160	0.230	0.230
R^2	0.10	0.17	0.25	0.14	0.22	0.3	0.31
N	14,922	5,620	14,922	14,922	9,213	14,922	14,922

Note: This table shows results of regression 1. The dependent variable is an indicator that is 1 if the lead arranger has sold its entire loan share by the first report date and 0 otherwise; the unit of observation is a loan. We restrict the sample to term loans. We include every loan only once in the analysis: at the first SNC report date after origination. The sample is restricted to loans for which the first observation in the SNC data is within at least 400 days of the origination date of the loan. The all-in-drawn spread is obtained from Dealscan. Capital ratios are from the Federal Reserve Y-9C data and are defined as the ratio of equity over total assets. Share of participating funds is defined as the number of funds that hold the loan divided by the total number of loan holders as of the first SNC report date. Standard errors are clustered by lead arranger times SNC report date. Significance levels: *(p<0.10), **(p<0.05), ***(p<0.01).

C Asymmetric Information in the Syndicated Loan Market

C.1 Summary Statistics for Problem Indicators

Table C.1: ***Summary Statistics for Problem Indicators***

	Mean	SD	P25	P50	P75	N	Source
Non-accrual status	0.03	0.16	0.00	0.00	0.00	21,357	SNC
90 days past due	0.01	0.09	0.00	0.00	0.00	21,357	SNC
Problem rating	0.15	0.36	0.00	0.00	0.00	21,357	SNC
Secondary market price	98.53	2.00	98.50	99.93	100.62	1,838	LSTA

Note: This table presents summary statistics of variables used in Section . Based on all loans in SNC data.

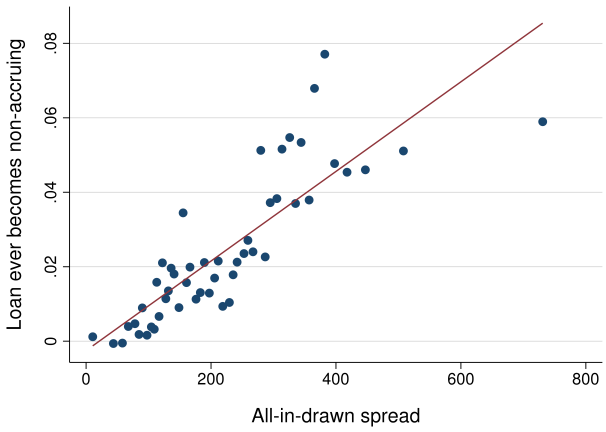
Table C.2: ***Correlation Table for Problem Indicators***

	(1)	(2)	(3)	(4)
(1) Non-accrual status	1.00			
(2) 90 days past due	0.187	1.00		
(3) Problem rating	0.394	0.08	1.00	
(4) Secondary market price	-0.199	-0.045	-0.207	1.00

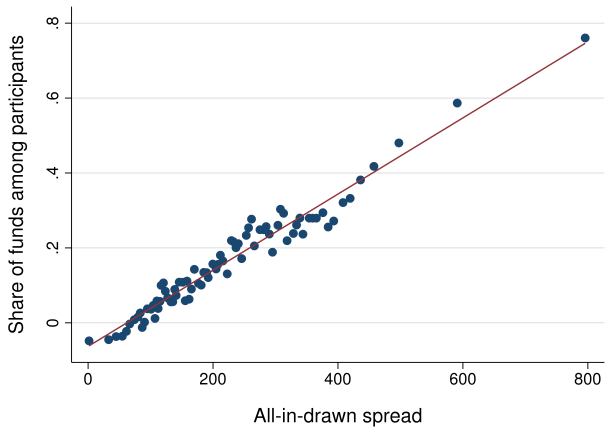
Note: This table presents correlations between variables used in Section . Based on all loans in SNC data.

C.2 All-in-Drawn Spread and Syndicate Participants

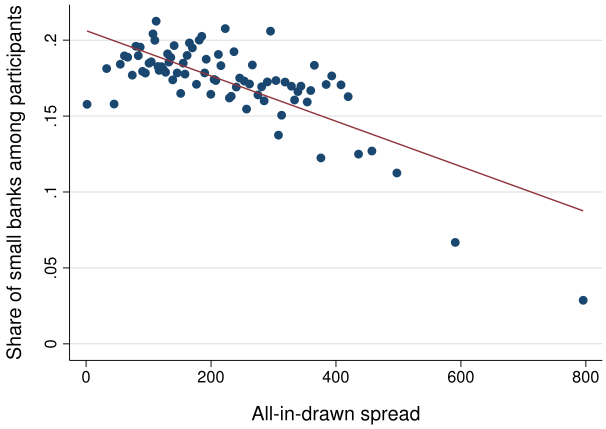
In this appendix section we show that all-in-drawn spread strongly correlates with loan riskiness as expected. Moreover, we show that this causes a split of participants according to type. Less risky loans are held by small regional banks. More risky loans are predominantly bought by institutional investors.



(a) *Loan Risk*



(b) *Loans for Institutional Investors*



(c) *Loans for Small Banks*

Figure C.1: ***All-in-drawn Spread relative to key loan characteristics*** *This figure depicts the all-in-drawn spread relative to whether a loan ever become non-accruing (i.e. loan risk), the share of funds and CLOs as participants, and the share of small banks as participants. Each loan appears only once, at first observation. We condition on loans that are no older than 400 days since origination.*

D Monitoring

In this section, we analyze the extent to which (a) monitoring activities are affected by whether the lead arranger sells its stake in the loan and (b) the degree to which various monitoring activities correlate with loan performance. As in the paper above, we denote a loan as non-performing if it ever becomes non-accruing at any point after the lead arranger has sold its stake.

For certain loans, Federal Reserve Examiners will request additional details from the lead arranger. This allows supervisors to properly **examine** the loan's risk. The additional information on examined loans can include descriptions of the collateral. From the descriptions of the pledged loan collateral, it is sometimes possible to infer monitoring activity. We are able to identify several distinct types of monitoring or collateral evaluation activities. In the subsequent analyses, we make use of (a) whether the bank evaluates the collateral itself (b) whether the collateral is valued according to audited financial statements or (c) whether the collateral is valued and monitored based on a borrower base certificate.

Bank evaluations are identified by words and phrases that include, but are not limited to: "bank internal evaluation", "value determined by bank calculation", "loan officer estimate", etc. Evaluations based on audited financial statements are described by "Audited financial statements", "third party audit" or similar phrases. Finally, borrowing base certificates are described as such "borrowing base certificate". We are careful to weed out phrases that specifically negate monitoring. These are not infrequent and explain that a bank does **not** monitor a certain way.

We estimate the following equation separately for each of the three ways in which banks might monitor or evaluate the collateral.

$$\text{MonitoringActivity}_{i,k,t} = \beta_0 + \beta_1 \text{LoanSoldAfterOrigination}_{i,k,t} + \beta_2 X_i + \delta_k + \delta_t + \epsilon_{i,t,k}. \tag{D.1}$$

"Monitoring Activity" is one of the three ways bank's might evaluate collateral. It takes the value of 1 for loan i of lead arranger k at time t if we can identify that the loan is evaluated/monitored a certain way. The remaining equation takes the form of equation 2 described above. Given that not all loans are examined, the matched SNC and Dealscan sample is very small. We make use of the SNC sample with loan internal risk characteristics for the regression in this appendix section to avoid a small sample bias. We have documented, above, that these samples behave similarly with respect to our key variables.

In Table D.1 we show that monitoring activity correlates with whether the loan is sold by the arranger. However, the direction of this correlation can differ. In column (1) we observe no statistical relationship between bank internal evaluations and sales of the lead arranger's stake. In column 2, we find that loans, in which the arranger sells its share, are more likely to be evaluated by audited financial statements. Finally, borrowing base certificates are less common for loans sold off completely by the lead arranger.

In Table D.2 we relate the type of monitoring activity to whether the loan ever becomes non accruing. The remainder of the regression is as described above. We find that both borrowing base certificates and financial statement audits are negatively correlated with loans becoming non accruing. The effects are economically meaningful. Monitoring with financial audit statements is correlated with a 50% lower probability of becoming non-accruing, relative to the unconditional mean. This type of monitoring is frequently outsourced to financial accounting firms and also the type of monitoring most associated

Table D.1: ***Monitoring Activity and Loan Sales***

	(1) Bank Evaluated	(2) Audit FS	(3) Collateral Base Cert
Loan sold at first observation	-0.00295	0.0214**	-0.0306***
	[-0.33]	[2.18]	[-4.00]
Mean	0.120	0.131	0.129
R^2	0.381	0.390	0.390
N	14336	14336	14336
Sample	SNC	SNC	SNC
Arranger FE	No	No	No
Report Date FE	No	No	No
Arranger-Time FE	Yes	Yes	Yes
Loan Rating FE	Bank Internal	Bank Internal	Bank Internal
Industry-Time FE	Yes	Yes	Yes

t statistics in brackets

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: This table shows results of regression D.1. The dependent variable is an indicator that is 1 if the lead arranger k of loan i has has indicated whether the loan will be monitored a certain way and 0 otherwise; the unit of observation is a loan.We include a series of loan controls that include time to maturity, loan size, time since origination, term and leverage loan indicators. We include every loan only once in the analysis: at the first SNC report date after origination. The sample is restricted to loans for which the first observation in the SNC data is within at least 400 days after the origination of the loan and for which examiner data is available. Significance levels: *(p<0.10), **(p<0.05), ***(p<0.01).

with loans from which the arranger has divested. The lead bank may therefore not be monitoring those loans it sells off completely itself anyway.

It is worth noting that bank internal evaluations are negatively (though insignificantly) related to performance. It is possible to infer from this that the bank has limited knowledge it can exploit when evaluating borrower-specific collateral. However, there are a number of factors that may affect these results. We are careful not to interpret our results as causal. Rather we demonstrate correlations between monitoring activities, loan sales, and ultimate performance.

A further caveat relates to examiner files. As mentioned above, not all loans are examined. Examinations are more frequent for larger loans that are more risky. Moreover, not all examined loans include information detailed enough to allow us to determine how or if the loan is monitored.

Table D.2: ***Monitoring and Non-Accrual***

	(1)	(2)	(3)
Bank evaluated collateral	-0.00229		
	[-0.24]		
Financial statement Audit		-0.0122*	
		[-1.68]	
Collateral base certificate			-0.0175*
			[-1.78]
Mean	0.024	0.024	0.024
R^2	0.376	0.376	0.377
N	13837	13837	13837
Sample	SNC	SNC	SNC
Arranger FE	No	No	No
Report Date FE	No	No	No
Arranger-Time FE	No	No	No
Loan Rating FE	Bank Internal	Bank Internal	Bank Internal
Industry-Time FE	Yes	Yes	Yes

t statistics in brackets

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: This table shows results of a regression that relates monitoring activity to whether a loan becomes non-accruing. The dependent variable is an indicator that is 1 if loan *i* of lead arranger *k* first observed at time *t* ever becomes non accruing after the first date at which it is observed. The unit of observation is a loan. We include every loan only once in the analysis: at the first SNC report date after origination. The sample is restricted to loans for which the first observation in the SNC data is within at least 400 days after the origination of the loan and for which examiner data is available. Significance levels: *(p<0.10), **(p<0.05), ***(p<0.01).