The value of the interbank network: Evidence from the syndicated loan market

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Abstract

We analyze the role of interbank networks on syndicate formation – both lead arranger selection and participant lender selection – in syndicated loans. We also examine the impact of interbank networks on loan costs, and the incremental value created by lead arranger reputation to the participant lenders in the lead arranger's network. Using a large sample of syndicated loans that originated between 1990 and 2010, we find that when the participating lenders in a loan are part of a prior syndicate with the lead arranger, the loan costs are significantly lower for the borrower even after controlling for a variety of other factors and issues. The evidence suggests that interbank relationships lower search costs in syndicate formation, result in more efficient information production, lower within-syndicate agency costs, and some of these savings accrue to the borrower. Sufi (2007) finds that prior relationship with a borrower is more important than relationship with the lead arranger in participant lender selection. We find similar results, but also find that when we analyze incremental probabilities, the likelihood of inclusion in a syndicate rises from 18.5% to 30% for lenders who are also related to the lead arranger compared to those that are only related to the borrowers. Our findings are more prominent for informationally opaque borrowers. We also find that even after controlling for the link between reputation and bank network size, banks with large interbank networks are more likely to lead loan syndications, and lenders with a prior link to the arranger are more likely to participate in the syndicates of more reputed banks. Our event study results show that when lead arrangers' reputations decline or when relationships terminate because of lead arranger bankruptcy, lenders in the lead arrangers' network lose market value and the value loss is greater when the decline in the lead arranger's reputation is deeper.

Key Words: Interbank relationship, Loan cost, Network, Syndicated loan

JEL Classification: D82, G12, G14, G21, G24

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Abstract

We analyze the role of interbank networks on syndicate formation – both lead arranger selection and participant lender selection – in syndicated loans. We also examine the impact of interbank networks on loan costs, and the incremental value created by lead arranger reputation to the participant lenders in the lead arranger's network. Using a large sample of syndicated loans that originated between 1990 and 2010, we find that when the participating lenders in a loan are part of a prior syndicate with the lead arranger, the loan costs are significantly lower for the borrower even after controlling for a variety of other factors and issues. The evidence suggests that interbank relationships lower search costs in syndicate formation, result in more efficient information production, lower within-syndicate agency costs, and some of these savings accrue to the borrower. Sufi (2007) finds that prior relationship with a borrower is more important than relationship with the lead arranger in participant lender selection. We find similar results, but also find that when we analyze incremental probabilities, the likelihood of inclusion in a syndicate rises from 18.5% to 30% for lenders who are also related to the lead arranger compared to those that are only related to the borrowers. Our findings are more prominent for informationally opaque borrowers. We also find that even after controlling for the link between reputation and bank network size, banks with large interbank networks are more likely to lead loan syndications, and lenders with a prior link to the arranger are more likely to participate in the syndicates of more reputed banks. Our event study results show that when lead arrangers' reputations decline or when relationships terminate because of lead arranger bankruptcy, lenders in the lead arrangers' network lose market value and the value loss is greater when the decline in the lead arranger's reputation is deeper.

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Introduction

Financial intermediaries have a comparative advantage in producing information, and they play a critical role in solving information asymmetry problems that occur between issuers and buyers of securities in the financial market (e.g., Leland and Pyle (1977), Diamond (1984), Ramakrishnan and Thakor (1984), Fama (1995), Boot and Thakor (2000)). When banks can reuse borrowers' information from repeated transactions, such "relationship banking" creates value for both the borrowers and the relationship banks.[1] Many empirical studies also document that relationship banking lowers issuing and borrowing costs and helps relationship banks win future business from clients. This evidence applies to both bank loan lending and security underwriting (e.g., Drucker and Puri (2004), Shenone (2004), Yasuda (2005), Bharath, et al. (2007, 2011), and Fernado, et al. (2012)).

In addition to repeated interactions between banks and firms, scholars have also studied the relationship between banks in the financial markets. In equity IPOs, Corwin and Schultz (2005) examine IPO syndications and find that interbank relationships are critical in forming future syndicates. They argue that ongoing relationships between investment banks "serve to minimize free-riding and moral hazard problems in syndicates when members are expected to actively participate in information production and in marketing the IPO." They go on to find that an underwriter is more likely to be part of a syndicate if it had been part of a prior syndicate led by the same book manager.

Some studies investigate the interbank relationships on other financing activities besides IPOs. For instance, Huang, et al. (2008) study the bank network function in the private placement of public equity (PIPE) and they find that large networks help banks attract more investors and

[1] See more discussion in Boot (2000).

issuers pay fees for banks' network functions. Henderson and Tookes (2010) argue that relationship banking is able to reduce the search frictions and lower the underpricing for convertible bond issues.

In this paper we focus on a specific type of security issue, syndicated loans. Loan syndications share some similar features with public security underwritings. Normally, one or several lead arrangers underwrite loan syndications, negotiate loan terms with the borrowers, and then find other syndicate members, i.e., participant lenders, to share the loans. In public security offerings lead arrangers play a transient intermediary role by bridging sellers and borrowers, however, in syndicated loans lead arrangers usually retain a piece of the loans they underwrite and are responsible for monitoring the borrowers following loan originations.

Given the wide variation in the type of firms that borrow in the syndicated loan market, significant information asymmetry problems exist between lenders and borrowers, and information production by the lead arranger and participant lenders is critical (Sufi (2007) and Henderson and Tookes (2010)). Interbank relationships may alleviate these market frictions because lead arrangers with strong interbank relationships can identify from their network and invite into the syndicate, lenders who are good matches to the borrowers or have more information about the borrowers. In this regard, lead arrangers with larger networks would have lower search costs. Being part of a syndicate of a lead arranger with extensive interbank relationships also potentially alleviates participant lenders' concerns because lead arrangers are unlikely to jeopardize their network, their relationship-specific asset, by underwriting poor quality loans.

Sufi (2007) explores the relationships between lead arrangers and participants in loan syndications. He finds that lenders are more likely to participate in loan syndications if they are closely related to the lead arrangers (either through geographic locations or because of previous

shared loan deals). However, he finds that for solving information asymmetry problems, lenders' relationships with lead arrangers are less important than their relationships with borrowers.

In this paper we extend the work of Sufi (2007) by examining the role of lead underwriter's network in affecting various aspects of a syndicated loan. Our main contributions are in analyzing the following specific issues. (i) We examine whether the lower search cost for lead arrangers with larger networks results in lower borrowing costs for the issuer. (ii) We also analyze whether interbank relationships affect the selections of lead arranger and participant lenders in syndicated loans. (iii) Further, we ask whether the incremental impact of interbank relationships on borrowing costs and lender selections vary with the information asymmetry level of the borrowers. (iv) Also, holding borrower-participant lender relationship constant, we study whether being related to the lead arranger through prior loans incrementally affects participant lender's probability of inclusion in a syndicate. (v) Finally, we study whether the lead arranger's reputation affects the value of the relationship to the other banks in its network?

The Loan Pricing Corporation's (LPC) Dealscan database provides detailed information on the syndicate members in loan syndications, which allows us to identify the interbank relationships for each deal. [2] We find that the participation of lenders with a prior relationship to the lead arranger, i.e., in-network lenders, in loan syndications significantly lowers borrowing costs, and the participation of these lenders who relate to lead arrangers lowers borrowing costs more than participation of lenders who relate to only the borrowers. We argue that the lead arrangers' networks create value because larger interbank relationships not only enable the lead arrangers to form more informationally efficient syndicates and thus lower search costs and

[2] Throughout this paper, we call the potential lead arrangers for the syndicated loans as "banks" and call the lenders in the banks' networks relationship as "in-network lenders." The lead arrangers in syndicated loans could be non-bank institutions, regardless, we refer to all lead arrangers as banks. In this paper, the term "in-network lender" always refers to lenders who have been in a prior syndicate with the lead arranger of this loan.

information production costs, but also allow the lead arrangers great flexibility in selecting participants with a view to reducing the free-riding and moral hazard problems as in Corwin and Schultz (2005).

Similar to Sufi's (2007) findings, we find that in syndicates where the borrowers are more informationally opaque, lenders' relationships with borrowers are more critical compared to their relationships with lead arrangers. However, we also document that lenders who relate to borrowers are more likely to participate in the loans of informationally opaque borrowers when the lenders also relate to the lead arrangers. An analysis of the incremental probabilities reveals that the *likelihood* of inclusion in a syndicate rises by 60% (a jump in the probability of inclusion from 18.5% to 30%) for lenders who are also related to the lead arranger compared to those that are only related to the borrowers. Our findings suggest that wider interbank relationships improve lead arrangers' ability to invite lenders who are good matches with the borrowers in loan syndications. Lenders' relationships with borrowers can potentially solve the information problem, but when the lenders who relate to the borrowers are out of the lead arrangers' networks, the lenders are less likely to be part of the syndicates.

When we analyze lead arranger selection, we find that borrowers are likely to choose banks that have large interbank networks to lead loan syndications, which is especially true for loans that are difficult to syndicate. More interestingly, when banks have strong reputations, their networks have greater values for the in-network lenders. Even after controlling for the possibility that more reputed banks would have larger interbank networks, we find that when lead arrangers have weak reputations, they tend to rely more on lenders who relate to borrowers in the loan syndications and comparatively less so on lenders who relate to lead arrangers. In other words, the interbank relationships are less valuable to in-network lenders if lead arrangers are less reputed, because the

in-network lenders are less likely to be in syndications that less reputed lead arrangers underwrite. We find that lead arrangers' interbank networks play a positive role in reducing borrowing costs and also provide in-network lenders an increased likelihood of participating in the loan syndicate.

Our findings from syndicated loans are markedly different from what the equity IPO literature documents. The equity IPO literature finds that underwriters favor their relationship investors at issuers' costs and the interbank relationships are more important for less reputed lead arrangers. Our findings suggest that strong interbank relationships in loan syndications actually benefit borrowers by significantly lowering the borrowing costs and the banks' reputations enhance the interbank networks' value.

To address the value creation from interbank relationships for in-network lenders, we conduct event studies to examine in-network lenders' stock reactions (i) to the termination of interbank relationships and (ii) to the positive and negative changes in lead banks' reputations. Fernado, et al. (2012) find that the bankruptcy of Lehman Brothers caused negative market reactions for the firms that had prior equity underwriting business with Lehman Brothers. Their finding suggests that relationship banking creates value for issuers from the equity underwriting business. In our first analysis, we use Lehman Brothers' collapse to investigate how valuable are interbank relationships to the syndicated loan market's lenders who participated in the loan syndications that Lehman Brothers underwrote before the bankruptcy. Lehman Brothers' bankruptcy terminated the interbank relationships because Lehman Brothers exited the market and as a result the relationship investors lost future lending opportunities with Lehman Brothers. Bankruptcy is different from the acquisitions or mergers where the interbank relationships may continue following the events. Further, because Lehman Brothers had a good reputation in the loan market, the termination of the interbank relationships should have had significant adverse

impact on Lehman Brothers' in-network lenders in the loan market. In fact, our results show that the stock returns were significantly negative for Lehman Brothers' in-network lenders in the five-day window around Lehman Brothers' bankruptcy announcement. The negative returns are robust to controlling for the market returns and the financial sector's returns. This event study illustrates the importance of interbank relationships to the participants in the syndicated loan market.

We also shed some light on how important the lead arrangers' reputations are to the interbank networks. Altınkılıc and Hansen (2009) document that most analyst recommendations associate with public news, in the sense that upgrades are accompanied by good news, and downgrades with bad news. We use analyst recommendation revisions of the lead arrangers to proxy for their reputation changes. We obtain the analyst recommendation revisions from the FirstCall database.[3] We identify the real time recommendation revisions to the underwriters in the syndicated loan market from years 1997 to 2010 (inclusive). An upgrade revision combined with positive stock reaction indicates a reputation gain and a downgrade revision combined with negative stock reaction indicates a reputation loss. [4]

We examine how the in-network lenders' stocks react to the lead arrangers' reputations changes. Our results show that when negative market reactions confirm the downgrades for lead arrangers, the in-network lenders also experience negative stock market reactions. The more negative the lead arrangers' stock returns, the more negative the in-network lenders' stock returns. We find similar results for the upgrade cases. The results confirm our earlier finding that the stronger the lead arrangers' reputations in the loan market, the greater the value of interbank relationships to the lenders in the network.

[3] We start in year 1997 because we are able to find only a few observations prior to that time.
[4] We use the stock returns to confirm the information content of recommendation revisions. We are not arguing that analyst recommendation revisions are informative, but rather the recommendation revisions are consistent with public news' information content.

Our study undertakes a comprehensive analysis of the role of interbank relationships in the syndicated loan market. We find that the interbank networks are valuable to banks because banks are more likely to lead loan syndications when they have large networks. The interbank relationships are also important to in-network lenders because these lenders are more likely to participate in loan syndications compared to the lenders that are not related to the lead arranger. Even for lenders who relate to borrowers, the relationships with lead arrangers are critical for them to have opportunities to participate in loan syndications, especially for informationally opaque borrowers. Borrowers also favor lead arrangers' with large interbank networks because the participation of lead arrangers' in-network lenders significantly lowers borrowing costs. However, when lead arrangers have weak reputations, their in-network lenders are less likely to be part of the syndications, even if these lenders also relate to borrowers. Thus, lead arrangers' reputations strengthen the benefits for the lenders in the arrangers' network.

The rest of the paper is organized as follows: Section 2 discusses the data and sample statistics; Section 3 presents the empirical model and results on the value of interbank relationships and the selection of participants and lead arrangers in the loan syndications; Section 4 conducts events studies on the value of interbank relationships to the lenders in the syndicated loan market; Section 5 concludes.

2 Data and summary statistics

We collect sample data from several different databases. The syndicated loans' information is from the LPC Dealscan. Each loan deal agreement may consist of several facilities or tranches (for example, a combination of a revolver and a term loan in a deal package) and they are priced separately. This study is at the facility level. We define a facility as a tranche if the facility amount is smaller than the deal amount. We define a facility as a syndicated loan if the number of lenders

exceeds one in the loan deals. The facilities' origination dates in our base sample range from 1990 to 2010 (inclusive).

We further merge borrowers with Compustat to collect the financial information and S&P long term issuer credit ratings, using the link table that Chava and Robert (2008) provide and supplement it with manual checks. Our sample contains only U.S. borrowers and U.S. dollar dominated syndicated loans; we exclude financial and regulated borrowers.[5] We also exclude private placements, public underwritings, retails, and bond syndications.

Dealscan provides information about syndication members for each facility. To measure interbank relationships in the syndicated loan market, we create a variable, *Lead Network*, that measures the number of participants in the deals that a specific arranger underwrote in the previous five years. For example, in year 1990, we have to go back until year 1985 to obtain the information for the deals of previous five years that the same arranger underwrote. If a lender joined in several deals with the same lead arranger, we count this lender only once in the lead arranger's network. Any lender who was in syndicate with the lead arranger in this previous 5-year period we refer to as in-network lender for this lead arranger. We take the logarithm value of one plus the number of in-network lenders as the measure for variable, *Lead Network*. To measure the participation of in-network lenders in the loan syndications, we create a variable, *Lead Related Ratio*, the ratio of lead arrangers' in-network lenders to the total participants in the loan syndication. A high ratio indicates a strong interbank relationship in the syndications. We create the variable, *Borrower Related Ratio* in a similar way by calculating the ratio of participants who had lent to the specific borrower in the previous five years.

In the event study, we use the FirstCall database to collect the information about real time

[5] The SIC code begins with 6 or 9

analyst recommendation revisions on lead arrangers in the syndicated loan market. We drop redundant recommendation revisions and conflict recommendations, i.e. we keep only one recommendation for one lead arranger on the same trading day. Finally, we obtain the stock information from CRSP.

[Insert Table 1]

Table 1 shows the summary statistics for the key variables that our study uses. In our sample, the statistics for the lead arrangers' interbank networks range from a minimum of zero to a maximum of 2,628 in-network lenders. To differentiate the interbank networks from the market shares that the literature usually uses as proxy for banks' reputations in the financial market, we create a variable, *Rank of Reputation*, that is the logarithm value of the rank for the total deals' dollar amount in descending order that the specific bank underwrote in the previous five years. So, by definition, the greater the value of *Rank of Reputation*, the lower the market share is for the lead arranger, i.e. the lower the reputation.

Table 1 shows that, on average, about 86% of participants in loan syndications are in-network lenders of the lead arrangers, which is significantly higher than the ratio of participants who relate to the borrowers, which is only 25%. As the data indicate, the interbank relationships seem to be very important determinants for loan syndications. Although not many participants had lent to the borrowers, about 50% of lead arrangers relate to the borrowers in the previous five years by leading loan syndications. All the other variables in Table 1 are self-explanatory.

3 Empirical models and results

3.1 Interbank relationships and borrowing costs

The summary statistic results show that in-network lenders are the majority participants in loan syndications (they account for 86% of the participants in loan syndications). A big candidate pool, i.e. a large interbank network, should add great value because lead arrangers have great flexibility and freedom in selecting appropriate lenders as participants in loan syndications. Similar to the book-building practices in the equity IPO process, established relationships provide lead arrangers some private information about in-network lenders' lending capacities and preferences in the loan market. The information about the lenders in lead arrangers' networks allows lead arrangers' search for potential participants relatively inexpensive and also offers better matches between borrowers and lenders in the loan syndications. For example, lenders may have expertise in investing in certain industries, or need the diversification effects in certain industries or business sectors, or investors may have different levels of risk tolerance. These different lender and borrower characteristics make the matching important and thus, a large candidate pool makes the syndications more efficient.

Nevertheless, some equity IPO studies also document that lead arrangers may favor relationship investors by underpricing equity IPOs at issuers' costs (e.g., Loughran and Ritter (2002), Ritter and Welch (2002), Loughran and Ritter (2004), Reuter (2006), and Binay, et al. (2007)). To investigate the pricing issue in the syndicated loan market, we measure loan costs by using the All-in Drawn Spread (*AIS*), that is the base points of interest rates borrowers pay over the LIBOR plus annual fees. *AIS* is the standard measure for loan pricing in the bank loan literature. A high *AIS* indicates the loan is priced relatively low, and vice versa. In this section, we examine how lead arrangers' interbank networks potentially affect syndicated loans' pricing, AIS. We

specify the OLS model to examine loan costs as follows:

$$E(AIS_i) = f(\text{Lead Network}_i(\text{or Lead Related Ratio}_i), \text{Syndication Structure Characteristics}_i, \text{Borrower Characteristic}_i, \text{Lender Characteristics}_i, \text{Loan Characteristics}_i, \text{Fixed Effects}_i) \quad (1)$$

where the variables of interest are the measures for interbank relationships: *Lead Network* and *Lead Related Ratio*. We also add some interaction terms of interbank relationship measures with borrower characteristics to gain insight on how the inter- bank relationships help syndicate the informationally problematic loans. The fixed effects include year, industry, S&P credit rating, and loan purpose effect. These four fixed effects present in all the models that specify the fixed effects.

[Insert Table 2]

Table 2 reports the relationship between syndicated loan costs, *AIS*, and the participation of in-network lenders in loan syndications. The dependent variable is *AIS* in all of the linear regressions that use the maximum likelihood estimation approach. Table 2 column (1) illustrates that lead arrangers' interbank networks significantly lower borrowers' costs.[6] The impacts from interbank networks are independent of bank reputations that measure market shares in the syndicated loan market and that also lower the borrowing costs.[7] Consistent with the existing literature, we also find evidence that relationships between lead arrangers and borrowers lower the interest rates.

To examine the value source of the Lead Network, Table 2 column (2) adds the variable,

[6] If multiple lead arrangers lead the same loan syndication, the lead arrangers' networks are combined.

[7] If multiple lead arrangers lead the same loan syndication, we create the variable Rank of Reputation, using the lead arranger with the highest reputation.

Lead Related Ratio, as an extra regressor and this variable yields a highly significant negative coefficient estimate. The variable, *Lead Network*, loses significance after we add the variable, *Lead Related Ratio*. The results indicate that the value of the lead arrangers' networks comes from the capacities to invite in-network lenders in the loan syndications. Different from *Lead Network*, the variable, *Rank of Reputation*, remains significant when we add the variable *Lead Related Ratio*, which indicates that the certification effect from bank reputations does not depend on the participation of in-network lenders in the syndication. Our results suggest that *Lead Network* and *Rank of Reputation* are two variables that convey different economics meanings.

Table 2 column (3) adds the variable, *Borrower Related Ratio*, that measures the percentage of participants who relate to borrowers, and the results remain the same. Both the relationships between borrowers and lenders and the relationships between participants and lead arrangers lower borrowing costs, but the interbank relationships have much more significant impact than the relationships between lenders and borrowers.

We further investigate the value creation of participation of in-network lenders in the loans that are relatively difficult to syndicate. We use borrowers' size and issuers' credit rating status as proxies for the difficulty of loan syndications. If the interbank network allows lead arrangers to find better matches for informationally opaque borrowers, the participation from in-network lenders should further lower the borrowing costs for these informationally problematic loans. Table 2 column (4) presents the results for the size effect and we find that the borrowing costs are lower for small borrowers when the *Lead Related Ratio* is high. Table 2 column (5) shows that borrowers with no credit ratings benefit much more from the participation of in-network lenders than rated borrowers do. The evidence shows that the relationships between participants and lead arrangers not only potentially lower the search costs, but also allow for good matches between

borrowers and lenders.

To sum up, lead arrangers' interbank networks lower borrowing costs by inviting in-network lenders to participate in loan syndications. Furthermore, the participation of in-network lenders adds more value when borrowers are smaller in asset value and have no credit rating histories.

3.2 Bank networks and syndicate structures

In this section, we investigate whether lead arrangers with large interbank networks will take advantage of network functions by inviting in-network lenders into loan syndications. We run the following Tobit regression, with the dependent variable, *Lead Related Ration*, and have the lead arrangers' interbank networks at the right hand side of the equation.

$$E(\text{Lead Related Ratio}_i) = f(\text{Lead Network}_i, \text{Borrower Characteristics}_i, \text{Lender Characteristics}_i, \text{Loan Characteristics}_i, \text{Fixed Effects}_i) \quad (2)$$

where the variable of interest is Lead Network. We add some interaction terms of Lead Network and borrower characteristics to address the Lead Network value for informationally opaque borrowers.

[Insert Table 3]

Table 3 demonstrates how lead arrangers' networks determine participants' structures. Table 2 column (1) shows that large lead arrangers' interbank networks result in a high Lead Related Ratio in loan syndications. We further add interaction terms of *Lead Network* and proxies for the borrowers' informational opaqueness - size and credit rating - in the regressions. The results in Table 2 columns (2) and (3) show that the impact of interbank networks is even more prominent for small and unrated borrowers than large and rated borrowers. The evidence shows that lead arrangers use their networks by selecting in-network lenders in loan syndications to lower the

costs, especially for the loans that are difficult to syndicate.

We also find that more reputed lead arrangers are more likely to select in-network lenders as participants in loan syndications. This finding seems counter-intuitive be- cause strong reputations may give the lead arrangers flexibility in selecting participants who are out of their networks. However, lead arrangers' strong reputations may also associate with large interbank networks and lead arrangers' strong reputations may enjoy strong signaling effects to in-network lenders and thus attracting the participation of in-network lenders in loan syndications. These factors may drive a higher ratio of in-network lenders to participate in the syndications where lead arrangers are more reputed. Again, the lead arrangers' network functions are independent of lead arrangers' market reputations in determining the participants' structures in loan syndications.

One potential problem for these tests is that in-network lenders account for a greater ratio of participant candidates when lead arrangers have large networks. This fact will mechanically result in a higher ratio of in-network lenders in the syndications where the lead arrangers have large networks. In previous study, Sufi (2007) also addresses this issue. In the following tests, instead of examining the ratio of in- network lenders in the syndications, similar to Sufi (2007), we will investigate how the relationships between lenders and lead arrangers increase the lenders' probability of participation in loan syndications.

3.3 The choice of syndication participants

To model how lead arrangers select participants in loan syndications based on lenders' characteristics of interest, we have to determine the participant candidates for each syndication.[8]

[8] See more at Corwin and Schultz (2005), Sufi (2007), and Huang, et al. (2008). We use approaches similar to those that these papers adopt in modeling the syndication member selection.

In each year, we select the top 20 lenders who lend most in dollar amount as participants in that specific year. As a result, each loan has 20 potential participant candidates. Each syndication may have multiple participants. Thus, 18,314 syndicated loans create a number of observations equaling 366,280. We adopt the multivariate Probit models using the generalized estimating equations (GEE) method to model the selection of candidates as participants in loan syndications and allow for error correlation within each loan syndication. We specify the model as follows,

$$Pr(Slected_{i,j}) = f(Lender\ Characteristics_{i,j}, Lender\ Characteristics_{i,j} * Borrower\ Characteristic_i, Borrower\ Characteristic_i) \quad (3)$$

The baseline model estimates the probability of candidate i to participate in syndicated loan j. The dependent variable indicates whether the lender participates in the loan syndication. We add some interaction terms of interbank relationships and borrower characteristics to further investigate the interbank relationship advantage in allocating informationally opaque loans.

[Insert Table 4]

Table 4 reports the results from model (3). We multiply the coefficient estimates by 100. Table 4 column (1) shows that relationships with lead arrangers and relationship with borrowers both increase the chances for lenders to participate in loan syndications. The relationships with borrowers receive a marginal probability of 34% that is much higher than the marginal probability that the relationships with lead arrangers receive, which is 11%. Although the participants who relate to lead arrangers account for a much higher ratio in the loan syndications than the participants who relate to borrowers, the marginal effect of participating in the loan syndications for lenders who relate to lead arrangers is much smaller than for lenders who relate to borrowers. Table 4 column (2) adds the interaction term of the relationships with lead arrangers and the relationships with borrowers. The results show that as lenders that are related to both lead arrangers

and to borrowers increases, their chances of participating in the syndications are 11% higher than when they relate to borrowers alone, and the marginal probability for relationships with borrowers alone drop to 18%, which is almost a half value of 34%.

We further examine the impact of relationships on syndicating informationally opaque loans. Table 4 columns (3) and (5) demonstrate that for smaller and unrated borrowers, lenders who relate to either lead arrangers or borrowers are more likely to participate in loan syndications. Again, the marginal effect is much higher for relationships with borrowers than for relationships with lead arrangers. This finding is similar to Sufi's (2007) work, in which he finds that relationships with borrowers matter more in solving information asymmetry problems in loan syndications. However, in Table 4 columns (4) and (6), when we add the interaction term of these three variables - relationships with borrowers, relationships with lead arrangers, and borrower characteristics - we find that lenders have greater chances to join in the information- ally problematic loan syndications only if they relate both to lead arrangers and to borrowers.

Our results show that relationships with borrowers alone do not increase chances for lenders to participate in informationally problematic loans, and the combination of relationships with lead arrangers and borrowers helps solve information asymmetry issues in the loan market. One potential explanation is that the search costs for the lenders who relate to borrowers but are outside of lead arrangers' networks may be too costly for the lead arrangers to invite to join in the syndications.

One more interesting finding is that lead arrangers tend to rely more on lenders who relate to borrowers than on their own in-network lenders when lead arrangers have small market shares in the market. Based on the findings in table 4 column (7), lead arrangers are less likely to choose in-network lenders and more likely to choose lenders who relate to borrowers when the lead

arrangers have weak reputations in the loan market. If lenders relate to both borrowers and lead arrangers, they have smaller chances of joining in the syndications when lead arrangers have weak reputations in the market. Our results show that lead arrangers with weak reputations in the loan market and thus weak certification effect will syndicate loans with lenders who are familiar with borrowers and thus, the interbank networks will be less valuable to lenders that are in the network of less reputed lead arrangers. Our results also suggest that interbank relationships is less valuable for in-network lenders if lead arrangers have weak reputations in the syndicated loan market.

3.4 The choice of lead arrangers

Because banks' networks potentially lower borrowers' costs by selecting in-network lenders and increasing in-network lenders' participation in loan syndications, we expect borrowers to prefer banks that have large networks to underwrite their loan syndications. In this section, we will examine how banks' large networks increase the likelihood of leading loan syndications. Similar to the participant selection model, for each year, we also identify the top 20 lead arranger candidates who have underwritten deals with the greatest total dollar amount in that specific year. Each syndicated loan select lead arrangers from these 20 candidates, and multiple banks may lead a syndicate jointly. Our 18,314 syndicated loans create 366,280 observations. We use the same model specification as in model (3) and the dependent variable is the indicator whether the bank leads the loan syndication.

[Insert Table 5]

Table 5 presents the selection of lead arrangers in loan syndications. Table 5 column (1) shows that the larger the networks, the more likely the banks will lead the loan syndicate, and the more reputed the banks are, the more likely the banks will lead the loan syndicates. Table 6 column (2) shows that the interbank networks have a stronger marginal effect when borrowers have small

asset value. Interestingly, in contrast to banks that have large networks, more reputed banks are more likely to lead loans issued by big borrowers. Table 5 column (3) also shows that unrated borrowers also prefer banks with large interbank networks and banks that have strong reputations are more likely to lead the syndicated loans that rated firms borrow. In fact, reputable lead arrangers tend to underwrite high quality loans, which consistent with the matching theory between borrowers and lead arrangers (Fernado, et al. (2005)). Consistent with the previous literature, we also find that their relationships with borrowers increase banks' chances of leading loan syndications.

Another interesting finding is that the interaction term of a bank's network and the bank's reputation shows that these two variables are complementary to each other. A weak reputation weakens the network's impact on the selection of lead arranger. The evidence is consistent with our previous finding that lead arrangers' reputations matter for in-network lenders. A weak lead arranger's reputation will make interbank relationships less valuable to in-network lenders because less reputed lead arrangers rely more on lenders who relate to borrowers than on their own in-network lenders.

In the following section, we will investigate the value creation by interbank relationships to in-network lenders and examine how the changes of lead arrangers' reputations affect the market values of in-network lenders.

4 Market value of interbank relationships for in- network lenders

4.1 Lehman Brother collapse and in-network lenders' returns

Fernando, et al. (2012) find that the Lehman Brothers' collapse caused a 5% market value loss in seven days to the firms that had prior underwriting business with Lehman Brothers. Their study demonstrates the importance of bank relationships to equity issuers. The Lehman Brothers'

collapse provides a good natural experiment to investigate the impact of terminating interbank relationships on in-network lenders. With the loss of the interbank relationships, in-network lenders lost opportunities to participate in future lending business that Lehman Brothers would underwrite. Given the large market share of Lehman Brothers, the interbank relationships should be very valuable to in-network lenders. Hence, the market reactions of in-network lenders should be significantly negative upon news of Lehman Brothers' bankruptcy announcement.

We examine the (-2, 2) window, five days' returns for the in-network lenders around Lehman Brother's bankruptcy announcement on September 14, 2008. In this event study, we only focus on lending relationships in the syndicated loan market. The in-network lenders are the ones who joined in the loan syndications that Lehman Brothers had led in the previous five years.

[Insert Table 6]

Table 6 shows the results of market returns for Lehman Brothers' in-network lenders. We collect 53 in-network lenders who have stock market information avail- able. The average raw return for in-network lenders in the five-day window is -14.35% and the average of market adjusted return is -8.33%. Considering most of the lenders are in the financial sector, we adjust the returns with the financial sector returns, and the abnormal average return is -6.82%. All results are highly significant in economical and statistical values. Our results suggest that the termination of the interbank relationships is a great loss to in-network lenders, especially when lead arrangers have strong reputations in the market.

4.2 Lead arrangers' reputations and the value to in-network lenders

The Lehman Brothers' case shows that the relationship termination has a negative impact on in-network lenders in the syndicated loan market. In this section, we also find that banks' reputations play an important role for lead arrangers to take advantage of interbank networks. In

our earlier findings, for banks with weak reputations, the network functions have a small marginal effect on leading loan syndications, and when lead arrangers have weak reputations, in-network lenders are unlikely to participate in loan syndications. Hence, the banks' reputations enhance the value for the in-network lenders. Furthermore, the changes in lead arrangers' reputations should have an impact on in-network lenders and the greater the changes, the greater should be the impact.

We use financial analyst recommendation revisions as proxies for changes in the lead arrangers' reputations because analyst recommendations usually associate with informational news about the underlying firms (Altınkılıc and Hansen (2009)). We collect real time recommendations for lead arrangers from the FirstCall database from years 1997 to 2010. We separate the recommendations into upgrades for reputation gains and downgrades for reputation losses. We further collect the lead arrangers' market adjusted returns in the (-2, 2) window around the recommendation issuing dates to confirm the informational content of recommendation revisions. i.e. a down- grade with a negative market adjusted return indicates bad news and a upgrade with a positive market adjusted return indicates good news. Then, we collect the in-network lenders' stock returns in the (-2, 2) window around the recommendation issuing dates. We average the in-network lenders' stock returns for each recommendation revision event.[9] Finally, we report the mean of average returns for upgrade and downgrade events separately.

[Insert Table 7]

Table 7 Panel A shows that when analysts downgrade lead arrangers, and lead arrangers' market reactions are negative, in-network lenders also experience negative market reactions and the average market adjusted return is -0.43%. When market adjusted returns of lead arrangers are

[9] We keep only one recommendation for a lead arranger for each trading day.

less than -2% with a downgrade, in-network lenders' average market adjusted return also decreases to -0.75%. Finally, when lead arrangers' market adjusted returns fall below -5%, the average in-network lenders' market adjusted return drops to -1.35%. The results are robust for financial sector adjusted returns.

Table 7 Panel B presents the results for upgrades. The results show that the upgrades with positive market adjusted returns to lead arrangers result in a 0.84% average abnormal return for in-network lenders. Upgrades for lead arrangers that associate with market adjusted returns greater than 2% result in an average abnormal return of 1.23% for in-network lenders. Finally, upgrades for lead arrangers that associate with market adjusted returns above 5% result in an average abnormal return of 2.14% for in-network lenders. The results are robust to computing abnormal returns as financial sector adjusted returns.

The results again confirm our findings that changes of lead arrangers' reputations affect in-network lenders' market values because of the potential loss or gain from future business between lead arrangers and in-network lenders. A reputation gain for lead arrangers benefits in-network lenders because in-network lenders are more likely to participate in loan syndications when lead arrangers are more reputed. Moreover, a reputation loss for lead arrangers potentially damages interbank relationship values for in-network lenders because they are less likely to join in the loan syndications when lead arrangers have weak reputations.

Conclusion

Interbank relationships have a potential impact on and are of interest to all parties in the syndicated loan market including underwriters, syndicate participants, and borrowers. In this paper, we analyze the role of interbank networks on syndicate formation – both lead arranger selection and participant lender selection – in syndicate loans. We also examine the impact of

interbank networks on loan costs, and the incremental value created by lead arranger reputation to the participant lenders in the lead arranger's network.

Using a large sample of syndicated loans that originated between 1990 and 2010, we find that when the participating lenders in a loan are part of a prior syndicate with the lead arranger, the loan costs are significantly lower for the borrower even after controlling for a variety of other factors and issues. The evidence is consistent with the view that interbank relationships lower search costs in syndicate formation, result in more efficient information production, lower within-syndicate agency costs, and some of these savings accrue to the borrower.

Sufi (2007) finds that prior relationship with a borrower is more important than relationship with the lead arranger in participant lender selection. We find similar results, but we also find that when we analyze incremental probabilities, the likelihood of inclusion in a syndicate rises from 18.5% to 30% for borrower-related lenders who are also related to the lead arranger compared to those that are only related to the borrowers. These findings suggest that interbank relationships are important for lead arrangers in their search for lenders who are good matches with borrowers in loan syndications.

Our study also shows that banks' reputations play a complementary role in helping them take advantage of interbank networks. We find that banks with large interbank networks are more likely to lead loan syndications. And, even after controlling for the mechanical link between reputation and bank network size, lenders with a prior link to the lead arranger are more likely to be part of the syndicates of the more reputed banks. In this sense, being part of the network of a reputed lead arranger creates more value for banks. The strong relationships between lead arrangers and participants significantly lower the borrowing costs in syndicated loans. This finding is more prominent for borrowers who are small in asset values and have no credit rating

histories. Overall our evidence suggests that unlike in equity IPO underwriting, lead arrangers use interbank relationships to reduce borrowing costs and not to underprice the syndicated loans at the expense of the borrowers. Finally, our event study results show that when lead arrangers' reputations decline or when relationships terminate because of lead arranger bankruptcy, lenders in the lead arrangers' network lose market value and the decrease in market values are positively related to changes in lead arrangers' reputations.

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Table 1: Summary statistics for key variables

This table reports the summary statistics for the key variables used in this study. The sample includes the syndicated loans that originated between 1990 and 2010 (inclusive). We include only non-financial and non-regulated U.S. borrowers and U.S. dollar dominated loans. Private placements, public underwritings, retails, and bond syndications are excluded. Sample requires the major key variables to be available. All the variables are formally defined in the appendix.

VAR	MIN	MAX	MEAN	STD
N	18314	18314	18314	18314
Lead network	0	7.87	6.57	1.07
Reputation	0	6.18	2.68	1.51
Lead related ratio	0	1	0.86	0.27
Borrower related ratio	0	1	0.25	0.33
Lead before	0	1	0.49	0.50
# of Lead arrangers	1	9	1.34	0.61
# of Lenders	1	141	9.84	9.18
# of covenant	0	8	1.76	1.68
Guarantor	0	1	0.07	0.26
Secure	0	1	0.34	0.47
Dividendrestrictions	0	1	0.55	0.50
Log (amount)	12.57	24.12	18.86	1.38
Log (maturity)	0	5.62	3.66	0.71
Institution	0	1	0.10	0.29
Tranche	0	1	0.54	0.50
NR	0	1	0.36	0.48
Log (Total asset)	0.31	12.53	7.02	1.69
Debt	-6.91	10.96	5.35	2.28
Leverage	0	3.46	0.30	0.22
Revenue	0	11.62	1.17	0.80
Z score	-49.98	554.31	3.11	5.09

Table 2: Borrowing costs and interbank relationships

This table reports the interbank relationships' impact on the syndicated loan costs. The dependent variable is All-in Drawn Spread (AIS). The AIS is the basis points that the borrowers paid to the lenders over LIBOR plus any annual fees. All the tests are linear models with the ML estimation approach. Statistical significance at 10%, 5% and 1% levels are denoted by "*","**" and "***", respectively.

	(1)	(2)	(3)	(4)	(5)
Intercept	779.75***	752.5***	752.48***	770.72***	729.92***
Lead network	-8.68***	-1.83	-2.04	-1.81	0.1686
Lead related ratio		-48.26***	-47.06***	-73.45***	-28.22***
Lead related ratio*TA				4.24***	
Lead related ratio*NR					-32.26***
Borrower related ratio			-6.5***	-6.92***	-7.08***
Reputation	1.36**	1.78***	1.76***	1.89***	1.94***
Lead before	-3.05**	-1.79	-0.76	-0.78	0.5591
# of Lead arrangers	12.02***	7.84***	7.68***	7.61***	7.47***
# of Lenders	-0.18	-0.14	-0.14	-0.16	0.4188
# of covenant	-2.93***	-2.78***	-2.77***	-2.75***	-2.71***
Guarantor	4.69**	4.34**	4.22**	4.35**	4.43**
Secure	45.06***	44.55***	44.45***	44.46***	44.12***
Dividend restrictions	3.46***	3.28***	3.27***	3.25***	3.23***
Log (amount)	-22.72***	-21.49***	-21.33***	-21.22***	-21.14***
Log (maturity)	-14.65***	-14.06***	-14.41***	-14.44***	-14.49***
Institution	76.05***	72.41***	71.91***	72.04***	72.04***
Tranche	20.45***	20.57***	19.64***	19.45***	19.38***
Speculative grade	192.13***	189.96***	189.44***	190.31***	193.09***
NR	69.09***	68.31***	68.29***	68.9***	97.56***
TA	0.46	0.37	0.39	-3.18*	0.0529
Debt	-3.99***	-3.92***	-3.89***	-3.87***	-3.81***
Leverage	68.63***	68.39***	68.66***	68.87***	68.4***
Revenue	-3.17***	-3.26***	-3.26***	-3.24***	-3.3***
Z score	-2.01***	-1.98***	-1.98***	-1.97***	-1.96***
Fixed effects					
Year	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes
S&P rating	Yes	Yes	Yes	Yes	Yes
Loan purpose	Yes	Yes	Yes	Yes	Yes
Pseudo R	0.06	0.06	0.06	0.06	0.06
N	18314	18314	18314	18314	18314

Table 3: Syndication structures and lead bank networks

This table reports the marginal effects from the Tobit regression modeling the ratio of lead rated lenders in the syndication. The dependent variable is the ratio of relationship participants in the syndication and it is truncated at 0 and 1. The marginal effects are multiplied by 100. The marginal effects are calculated as the mean of marginal effect for continuous variables and for a discrete change from 0 to 1 for dummy variables. Statistical significance at 10%, 5% and 1% levels are denoted by "*","**" and "***", respectively.

	(1)	(2)	(3)
Intercept	-48.07***	-63.65***	-48.86***
Lead network	10.31***	12.81***	10.15***
Lead network*TA	0***	-0.43***	0***
Lead network*NR	0***	0***	0.25
Rank of reputation	-0.53***	-0.66***	-0.54***
Lead before	2.56***	2.68***	2.58***
# of Lead arrangers	-6.21***	-5.93***	-6.17***
# of Lenders	-0.35***	-0.35***	-0.35***
# of covenant	-0.04	-0.03	-0.03
Guarantor	-1.45*	-1.43*	=-1.46*
Secure	-0.87**	-0.99**	-0.87**
Dividend restrictions	-0.57	-0.53	-0.58
Log (amount)	1.29***	1.27***	1.29***
Log (maturity)	0.61**	0.58**	0.61**
Institution	-5.04***	-5.05***	-5.02***
Tranche	0.89	0.91	0.9
TA	0.24	2.98***	0.23
Debt	-0.21	-0.21	-0.21
Leverage	0.98	0.9	0.97
Revenue	-0.44	-0.46	-0.44
Z score	0.11**	0.1**	0.11**
Fixed effects			
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
S&P rating	Yes	Yes	Yes
Loan purpose	Yes	Yes	Yes
R	0.17	0.17	0.17
N	18314	18314	18314

Table 4: Participant selection and interbank relationship

This table reports the marginal effect from multivariate Probit model with GEE estimation for the choice of participants. The dependent variable is the indicator whether the candidate is selected in the syndication as a participant. The model allows for the error correlation within facility level. The marginal effects are multiplied by 100. The marginal effects are calculated as the mean of marginal effect for continuous variables and for a discrete change from 0 to 1 for dummy variables. Statistical significance at 10%, 5% and 1% levels are denoted by "*","**" and "***", respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	-43.11***	-38.07***	-60.912***	-55.9***	-33.289***	-34.32***	-44.27***
Lead related	11.23***	9.02***	9.707***	6.75***	8.029***	8.63***	13.21***
Borrower related	34.32***	18.5***	41.414***	19.18***	13.001***	15.92***	12.47***
Lead related *Borrower related		11.52***	13.315***	35.87***	12.594***	9.73***	12.44***
Lead related *Borrower related*TA				-1.79***			
Lead related*TA			-0.5*	0.25			
Borrower related*TA			-2.255***	-0.54			
TA			3.632***	2.9***			
Lead related *Borrower related*NR						7.55***	
Lead related*NR					2.434**	-0.26	
Borrower related*NR					6.494***	-0.48	
NR					-8.897***	-6.51***	
Lead related *Borrower related*Rank of reputation							-1.39**
Lead related*Rank of reputation							-3.03***
Borrower related*Rank of reputation							2.55***
Rank of reputation							1.43***
QIC	247656.1468	247409.23	240442.2016	240424.231	244446.1	244398.3405	245787.1

Table 5: Lead arranger selection and bank network

This table reports the marginal effect from multivariate Probit model with GEE estimation for the choice of lead arranger. The dependent variable is the indicator whether the candidate is selected in the syndication as lead arranger. The model allows for the error correlation within facility level. The marginal effects are multiplied by 100. The marginal effects are calculated as the mean of marginal effect for continuous variables and for a discrete change from 0 to 1 for dummy variables. Statistical significance at 10%, 5% and 1% levels are denoted by "*","**" and "***" respectively.

	(1)	(2)	(3)	(4)
Intercept	-12.53***	-39.38***	-8.79***	-33.41***
Lead network	0.11*	3.53***	-0.34***	3.12***
Rank of reputation	-0.84***	0.1143	-0.95***	4.15***
Lead network*TA		-0.5***		
Rank of reputation*TA		-0.1***		
TA		3.91***		
Lead network*NR			1.08***	
Rank of reputation*NR			0.13*	
NR			-8.54***	
Lead network*Rank of reputation				-0.72***
Lead before	34.95***	33.05***	33.96***	33.77***
QIC	101950.12	101309.29	101619.51	101347.35

Table 6: Lehman Brothers collapse and the in-network lenders stock market reactions

This tables report the average market adjusted return in (-2,2) window around Lehman Brothers' collapse on September 14, 2008, for the in-network lenders who joined in the syndicated loans deals underwritten by Lehman Brothers in the previous five years. Statistical significance at 10%, 5% and 1% levels are denoted by "*","**" and "***", respectively.

	Average return for in-network lenders (%)
Raw	-14.35***
Marker adjusted	-8.33***
Financial sector adjusted	-6.82***
N	53

Table 7: Reputation changes and in-network lenders' returns

This table reports the average abnormal return in (-2, 2) window around the analyst recommendation revisions for the lead arrangers, of the in-network lenders that joined in the syndicated loan deals underwritten by the lead arrangers in the previous five years. The scenarios are further broken down, conditional on the market adjusted returns of the lead arrangers. Statistical significance at 10%, 5% and 1% levels are denoted by "*","**" and "***", respectively.

Panel A: Downgrade

		Average returns for in-network lenders (%)	
Lead arranger return (%)	N	Market Adjusted	Financial Sector Adjusted
< 0	887	-0.43***	-0.49***
< -2	573	-0.75***	-0.95***
< -5	254	-1.35***	-1.78***

Panel B: Upgrade

		Average returns for in-network lenders (%)	
Lead arranger return (%)	N	Market Adjusted	Financial Sector Adjusted
> 0	332	0.84***	0.94***
< -2	216	1.23***	1.43***
< -5	95	2.14***	2.41***

Appendix

Variable	Definition
Panel A: Loan characteristics	
Lead network	The number of banks participating in the syndicated loans led by the lead arranger in the past 5 years plus 1. In Logarithm value.
Lead related ratio	The ratio of participators that are in lead arrangers' network.
Rank of reputation	Logarithm of the rank of total market share measured by dollar value of deals underwritten in the year t-5 to t-1. Ranked by descending value.
Borrower related ratio	The ratio of participators that are in borrower's network.
Institution	1, if the facility is term loans B-H; 0 otherwise
Log (amount)	Logarithm of total facility amount
# of Lead arrangers	Total number of lead arrangers
# of Lenders	Total number of lenders
log (maturity)	Logarithm of facility maturity (in months)
Tranche	1, if facility amount is less than deal amount; 0 otherwise
# of Covenant	Total number of covenants
Secure	1, if the facility is secured; 0 otherwise
Sponsor	1, if the facility has a sponsor; 0 otherwise
Guarantor	1, if the facility has a guarantor; 0 otherwise
Dividend restriction	1, if there is dividend payment restriction; 0 otherwise
AIS	All-in withdrawn
Panel B: Borrower characteristics	
Investment grade	1, if the issuer credit rating is BBB or above; 0 otherwise
Speculative grade	1, is the issuer credit rating is below BBB; 0 otherwise
NR	1, if the issuer is not rated by S&P; 0 otherwise
TA	Logarithm of total asset (,000,000)
Debt	Logarithm of total debt (,000,000)
Leverage	Total debt divided by total asset
Revenue	Total revenue scaled by total asset
Z score	Altman's Z score
Panel C: Underwriter characteristics	
IB	1, if lead arranger is an investment bank; 0 otherwise
Lead before	1, if the lead arranger led a deal before for the same borrower in year t-5 to t-1; 0, otherwise
Panel D: Loan purpose	
Restr	Loan purpose of 'Takeover', 'LBO', 'MBO', 'Spinoff', 'Debtor-in-poss.' and 'Stock buyback'
Budget	Loan purpose of 'Capital expend.', 'Proj. finance' and 'Acquis. line'
Ltfinancing	Loan purpose of 'Recap.' and 'Debt Repay.'
Stfinancing	Loan purpose of 'CP backup' and 'Work. cap.'