# THREE ESSAYS IN FINANCE

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## ABSTRACT

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There are three individual chapters in this dissertation. The first chapter studies the effect of monitoring by the lenders of a syndicated loan on the borrowing firm's ex post performance. In the syndicated loan market, the lead bank has an advantage on information collection. For that reason, participant lenders of the syndicate demand the lead bank to hold a larger share of the loan or form a concentrated syndicate structure in order to increase monitoring efforts by the lead bank or collectively by the lenders. As a result, the share held by the lead bank or the concentrated syndicate structure is used as a proxy for monitoring efforts in the literature. Also, it is commonly accepted that the monitoring by the lead bank or the syndicate members has a positive effect on the borrowing firm. Thus, we empirically test whether or not the monitoring has a positive effect on the borrowing firm's performance. We use instruments—including deregulation, lender's reputation and lender's influence variables—to run two-stage least-squares regressions since the monitoring proxies have the endogeneity problem. Our regression results confirm that the literature's assumption is valid since we find that a higher level of monitoring leads to a higher level of firm performance ex post.

The second chapter examines the effects of borrowing firms' financial opacity on the structuring of financial instruments used by the firm, focusing on the decision whether to use a syndicated loan or a single-lender loan. Previous work had found that borrowers' repu-

tations, lead banks' reputations and the informational advantage of the lead bank decreased the percentage of a syndicated loan that the lead bank would hold, and that the opacity of the borrowing firm would reinforce this effect. This chapter extends that work to include the effect of opacity on the choice between making a single-lender loan and a syndicated loan. Contrary to the previous work, I find that opacity increases the probability a loan is syndicated and has little effect on the share of a syndicated loan that the lead bank holds. Also, when the borrower is opaque and the lead bank who was a former lead bank of the borrower, the share held by the lead bank decreases. Overall, this results suggest that risk-sharing and diversification are more important to lenders than asymmetric information.

The third chapter investigates the extensive literature of syndicated loans. Syndicated loans have grown in popularity since the 1980's as the dominant financial instruments for corporations to get funding from various financial institutions. There have been many studies regarding these loans, and I explore them and summarize the findings in this paper. The main difference of syndicated loans from traditional single-lender loans is the extra layer of asymmetric information problems between the lead bank and the participant lenders of the loan. This asymmetric information affects the structure of the syndicate and also the pricing.

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## 1.1 Introduction

### 1.1.1 Syndicated loan market

Loan syndication is described by Ivashina (2009) as "a process whereby a lead bank initiates a loan and then sells shares of that loan to other financial institutions." This syndication process is particularly interesting to researchers looking into asymmetric information. Traditionally in a lending market, there exists an agency problem between the lender and the borrower; that is, it is difficult for a lender to observe whether the borrower behaves well (e.g., following covenants, making safe investments, etc). However, since syndicated loans have been introduced, there have been additional agency problems between the lead bank and the syndicate participants. It is because of that, "before and after the syndication, the lead bank acts as an agent for the lending syndicate by collecting and processing information about the borrower (Ivashina (2009))." This informational inequality between the lead bank and the participants brings about two common problems regarding asymmetric information,

which are adverse selection and moral hazard.

Adverse selection and moral hazard happen in different points of the syndication. According to Ivashina (2009), "prior to syndication, the lead bank conducts due diligence on the borrower and presents a confidential memorandum to potential buyers, summarizing its assessment of the borrower's quality. After syndication, the lead bank is in charge of monitoring the borrower. Therefore, before the loan is syndicated, then there is an adverse selection problem because the lead bank has an incentive to syndicate loans of lower quality. After the loan is syndicated, there is a moral hazard problem because the lead bank only retains part of the loan, so its incentives to monitor the borrower are reduced. Both adverse selection and moral hazard imply that syndicate participants are exposed to the risk of wrongdoing by the lead bank." This extra layer of agency problems makes investigating syndicated loans much more interesting due to the complexity of the problem.[1]

According to Sufi (2007), there is another reason that examining syndicated loans for asymmetric information is valuable. That is, unlike most financial products, firms with various credit qualities (privately held, unrated, high yield, and investment grade) take advantage of this form of finance. As a result, the knowledge regarding asymmetric information we get from analyzing syndicated loans can be easily generalized since the sample contains various types of firms from the market. This helps researchers to understand the asymmetric information problem in a more inclusive way by having a more diversified sample.

[1]Theoretically, this complexity comes from the fact that participants monitor not only the lead bank, but also the borrower. However, this is less likely in a real life situation, since participants join the syndicate based on the reputation of the lead banks (Dennis and Mullineaux (2000)). However, if participants lose confidence in the lead banks, monitoring both the lead bank and the borrower by the participant lenders is likely to happen after the deal is originated.

### 1.1.2 Literature Review

There are three major mechanisms identified through the literature of the syndicated loan market, which could reduce the cost of agency problems between the lead bank and the syndicate participants. These three are the reputation of the borrower, the reputation of the lead bank, and the share held by the lead bank.

#### 1.1.2.1 Reputation of the borrower

The reputation of the borrower can reduce the need for monitoring of the loan; therefore, reducing participants' needs for monitoring the monitor as the lead bank carries out its responsibilities as an agent. A theory paper, Diamond (1991), discusses that the borrower's reputation, measured in terms of a credit rating, affects when borrowers borrow from public debt or bank loan with monitoring. He describes that borrowers with a high reputation usually do not need monitoring, so they borrow using public debt. Borrowers with a low reputation are considered as if they do not have incentive to behave well, so they do not get loans from any lenders. Only borrowers with an intermediate reputation need monitoring, so they get loans from banks. He also states that there is a "life cycle" effect for borrowers when they borrow through intermediaries such as banks. At first, new borrowers may have to borrow from banks due to their lack of reputation, but eventually they may be able to borrow from the public debt. Getting monitored by a bank gives a new borrower a chance to build their reputation. Future lenders will perceive the borrower's payment history while being monitored as a forecast of the future actions of the borrower when not being monitored.

Dennis and Mullineaux (2000) empirically show that as the information about the bor-

rower becomes more "transparent"[2], a loan is more likely to be syndicated. They use several different measures of the information quality, such as the existence of a public bond rating (BONDRATE), and whether the borrower is a publicly listed firm (TICKER), to represent availability of public information regarding borrowers. They conclude, "the better the quality of the information about the borrower as reflected in either credit ratings or listing on a stock exchange, the more likely the loan will be sold and in larger proportions [in syndication]". This conclusion also supports the idea from Diamond (1991) that when firms require less monitoring, a loan becomes more attractive to participants who lack resources to gather private information. Thus, from these two papers we can deduce that reputation of the borrower mitigates the agency problems by reducing information inequality regarding the borrower.

#### 1.1.2.2 Reputation of the lead bank

The reputation of the lead bank is helpful to relieve some of the doubts that participants hold regarding whether or not the lead bank would perform proper due diligence and monitoring of the loan. Using bank examiner ratings collected by the Shared National Credit Program for a sample of syndicated loans, Simons (1993) finds that the lead bank syndicates a larger percentage of an individual loan as an examiner rating, a proxy for the riskiness of the loans in the study, improves.[3] From this finding, he argues that there is no sign of "opportunistic"

[2]According to Dennis and Mullineaux (2000), "transparent" means information is 'easy to access, process, and interpret', and "opaque" means information is 'fuzzy, incomplete, difficult to observe and interpret'.

[3]Simons' (1993) study has a problem that could be subject to a criticism. As he points out in his paper, the examiner rating is "an ex post measure of credit quality rather than an ex ante measure of risk. It reflects outcomes rather than risks as they were perceived at the time the loans were made." Thus, using this measure may not capture the asymmetric

behavior since the lead bank holds a larger share of riskier and lower-quality loans. Simons suggests two possible explanations regarding this. First, potential participants might find those loans as unattractive investment options even before getting evaluated by examiners. The lead bank might have difficulty attracting participants, resulting in the lead bank being forced to hold a larger share of the loan. Second, the lead bank may not want to promote risky loans in order to maintain their reputation in the market.

Based on these suggestions by Simons (1993), Dennis and Mullineaux (2000), using a volume of repeat business between the lead bank and a participant as a reputation of the lead bank, show that as the syndicate's lead bank becomes more "reputable" a loan is more likely to be syndicated. From these results, we conclude that the reputation of the lead bank reduces the agency problem since the lead bank fears that failing to perform properly in the eyes of the participants will lead to reduction of its own reputation, followed by loss of future business, which in turn resulting in the loss of future income.

#### 1.1.2.3 The lead bank's share

The lead bank's share in a syndicated loan helps reduce problems regarding informational asymmetry due to adverse selection by signaling and due to moral hazard by increasing monitoring efforts. Akerlof (1970) uses used cars as an example of the problem of quality uncertainty, arguing that markets tend to shrink due to adverse selection problems when there is quality differences and uncertainty of the quality. The reason is that buyers can only learn the average quality of the commodity and not the quality of the specific item they purchase. Consequently, sellers have incentive to promote poor quality merchandise. As a

information problems between the lead bank and participant lenders.

result, the average quality of goods and also the size of the market decrease.

Based on Akerlof's idea, Leland and Pyle (1977) describe a solution to the market failure problem in financial markets due to the informational asymmetries between informed agents, such as the lead bank, and uninformed agents, such as participants in syndicated loan market. The lead bank has inside information about the quality of the loan that would be beneficial for participants to know. However, the lead bank would gain by exaggerating the quality, so participants need a tool to distinguish bad projects from good projects. Without the tool, the market would collapse, as the case of Akerlof (1970) demonstrates. Leland and Pyle (1977) suggest that "projects of good quality to be financed, information transfer must occur" in the form of observable actions of informed agents. They claim that "the willingness of the person(s) with inside information to invest in the project or firm" is one such action that could signal the quality of the project to uninformed agents. As a result, participants will put more value on a project when the lead bank invests a larger amount in the project.

Holmstrom and Tirole (1997) also find that if intermediaries, such as the lead banks, are allowed to vary the intensity of monitoring, then an increase in capital invested by the monitoring intermediaries (monitoring capital) relative to the borrowing firm's capital leads to more intensive monitoring of the loan.[4] These theory papers imply that a lead bank's

[4]Holmstrom and Tirole (1997) use a model where the net worth of a firm decides the ability to borrow. In their model, lenders prefer firms with high net worth relative to the size of investment projects. This happens because firms with a high level of debt will not have high stakes in the outcome of the projects; thus, they will not act with diligence. Assuming that all investment projects are the same size, firms with high net worth will be able to fund their investments without intermediaries. However, firms with low net worth will not be able to fund their investments without intermediaries due to lack of collateral. Since monitoring by intermediaries can reduce the demand for collateral, firms with low net worth has to borrow from intermediaries. In order for intermediaries to act as reliable monitors, they have to also invest in the projects as well as firms; thus, in equilibrium not all firms

larger share reduces moral hazard and adverse selection by making the lead bank's payoff highly correlated with the loan's performance, thus, aligning their payoff with participants'.

#### 1.1.2.4 Advanced research

Based on the basic three mechanisms that reduce asymmetric information problems between the lead bank and the participants within a syndicate, Sufi (2007) combines all three of them and tests whether these three mechanisms work with each other and how they work with each other.

His empirical study finds some evidence that supports the theory of Holmstrom and Tirole (1997), which argues that when there is more need for rigorous due diligence and monitoring, measured by either reputation or availability of public information of the borrower, the lead bank retains a larger share of the loan and forms a more concentrated syndicate.[5] Also, he explains that these findings could be understood in the view of Diamond's (1991) model where borrowers gradually move away from bank loans to public debt while building a reputation of being reliable borrowers. With a good reputation, borrowers do not need intermediaries' monitoring them to help raise funds for their projects. From these findings, we can conclude that borrowers' reputation and monitoring, measured by a larger share retained by the lead bank or concentrated syndicate structure, are substitutes for each other when it comes to lessening asymmetric information problems.

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can be monitored.

[5]Sufi (2007) uses "a Herfindahl index as a measure of the concentration of holdings within a syndicate. The Herfindahl is calculated using each syndicate member's share in the loan; it is the sum of the squared individual shares in the loan, and varies from zero to 10,000, with 10,000 being the Herfindahl when a lender holds 100% of the loan." Thus, a higher value of the measure means the syndicate is more concentrated.

Sufi also finds that the lead bank reputation can reduce the asymmetric information problems to a certain extent. He discovers that when the borrower meets the conditions which call for vigorous due diligence and monitoring, the lead bank holds a larger share of the loan; however, when the lead bank has a well-established reputation, calculated using previous year's market share, the need for holding a larger share of the loan is much less. Although a lead bank with a good reputation, that is, having larger market share, reduces the portion of the loan that it needs to hold, only the lead banks in 99th percentile in market share, that is, a proxy for reputation, can entirely remove the impact of information asymmetry. We can say that the lead bank reputation and borrower reputation work together to reduce the agency problems.

Another interesting finding that Sufi discovers is that past relationships between the borrower and syndicate participants matter. When the borrower does not have enough public information such as SEC filings or credit ratings, participant lenders tend to be close to the borrowing firm, both physically and relationship-wise. This could be interpreted as the lead bank trying to find participants who have already gathered information about the borrower so that the lead bank can save its own efforts. He also finds that past relationship between the lead bank and a potential participant strengthen the possibility that the participant takes part in the syndicate lending, but this effect is much less important compared to the past relationships between the borrower and the participants.

#### 1.1.2.5 Motivation of this paper

Previously mentioned papers throw light on many questions regarding what reduces agency problems between the lead bank and participants in syndicated loan markets. Sufi (2007)

has empirically answered the question of whether or not a larger share of the loan that the lead bank retains reduces asymmetry information problems between the lead bank and participants.

Leland and Pyle (1977), and Holmstrom and Tirole (1997) show us theoretically why the lead bank's share plays an important role in lessening the agency problems, and Sufi (2007) empirically demonstrates that it is in fact important. However, the reason of the importance is not really studied. One can question whether the lead bank holds a bigger share of the loan just to signal its commitment like claimed by Leland and Pyle (1977), or holding a larger share of the loan actually works as a means of monitoring as suggested by Holmstrom and Tirole (1997). That is, whether the lead bank holding a larger share actually reduces adverse selection or moral hazard. Although there are two different explanations why the lead bank's share matters, this paper will focus on the moral hazard problem. Due to the fact that the size of monitoring capital could be affected by either adverse selection or moral hazard, there exists endogeneity problem. For that reason, we use instrumental variables for monitoring capital.

In this paper, we examine whether larger monitoring capital, such as the lead bank's share, actually increases ex post performance of a borrower by decreasing moral hazard. Theoretically, based on Holmstrom and Tirole (1997), we expect that the bigger the size of the monitoring capital relative to firm capital, the higher the level of monitoring intensity of the loan, and the better the ex post performance of the borrower. However, to the best of my knowledge, the theory has not been tested empirically.

## 1.2 Empirical model and data

### 1.2.1 Empirical model

#### 1.2.1.1 Assumptions regarding monitoring responsibility

Our question in this paper is whether monitoring increases or decreases ex post performance of a borrower. Complicated structure of syndicated loans makes us question who performs the monitoring of the borrower: whether it is only the lead bank, or if it includes both the lead bank and participants.

The most common assumption is that participants delegate monitoring to the lead bank in order to reduce duplicate monitoring efforts and potential free-riding problems (Holmstrom (1982), and Diamond (1984)). This assumption seems very natural since the lead bank has more prior information on the borrower and expertise on monitoring than participants (Pavel and Phillis (1987)). However, the participants' inability to observe monitoring efforts creates moral hazard problems, resulting in participants demanding the lead bank to retain a larger share of the loan (Leland and Pyle (1977), and Holmstrom and Tirole (1997)). If the lead bank holds a larger percentage of the loan, it mitigates such incentive issues. However, the lead bank's increased exposure to a single borrower is costly for the lead bank because the lead bank loses an opportunity to diversify its loan portfolio and its regulatory taxes (e.g., reserve requirements, capital requirements, and deposit insurance premiums) increase (Pavel and Phillis (1987), Penacchi (1988), and Simons (1993)).

Another assumption is that the incentive to monitor within a syndicate depends on the structure of the proportional shares held by individual lenders, including both the lead bank

and the participants. Syndicate members who hold large shares have stronger incentives to monitor compared to members with small shares. There are two reasons why the lenders with small shares monitor less. First, they have weaker incentives since they have less of a stake in the loan than the lenders with large shares. Thus, they make less of an effort to monitor the borrower. Second, there is a free-riding problem in the monitoring because the lenders with smaller shares expect the lenders with larger shares to do the monitoring, which causes small lenders to put less effort into monitoring (Lee and Mullineaux (2004)). As a result, when there are many lenders with small shares within a syndicate, the monitoring efforts by the syndicate members are smaller than if there are few lenders with large shares. Thus, as a group, the syndicate monitors less. This method of group monitoring is costly compared to delegation, since there are duplicate monitoring efforts by individual lenders, but this may be preferred because it decreases risk regarding moral hazard. The Hirschman-Herfindahl index (HHI) is used by Lee and Mullineaux (2004) to measure the degree of "concentration" within a syndicate.[6] This concentration measure captures the proportional holdings of the members of the syndicate. The incentives to monitor within the lending group are also captured since the incentives to monitor depend on proportional holdings of the members. They show how monitoring needs for a syndicated loan affect its structure (proportional holdings of the members). For example, when there are potential adverse selection problems due to a lack of information on a borrower or there is a greater chance of the borrower

[6]In order to calculate the HHI, we take the percentage share of each participant, square it, and then sum the squared shares. The HHI for a syndicate of 10 banks—with each holding 10% shares—would be 1,000, which would be a fairly diffuse syndicate. If, in the same example, one bank held a 91% share and the remaining banks held 1% each, the HHI would be 8,290, a highly concentrated syndicate (Lee and Mullineaux (2004)). Thus, when the HHI gets close to 10,000, the loan is similar to a sole lender loan, and when the HHI gets close to zero, the loan gets close to a public debt.

defaulting, the more concentrated syndicates form to enhance incentives to monitor. Sufi (2007) also used the HHI to capture any effects of "joint" monitoring.[7] Based on these two assumptions, we use the summation of the lead bank's percentage shares held and the HHI as proxies for monitoring efforts.[8]

#### 1.2.1.2 Endogeneity problems

Unfortunately, the two monitoring effort measures have endogeneity problems in which the lead bank's share and the concentrated structure could be affected by three different incentives. The first one is the need for monitoring as was mentioned above. When the borrower is expected to perform poorly or fail to pay the loan, the syndicate members may request the lead bank to retain a larger share of the loan and form a more concentrated syndicate in order to increase monitoring intensity. The second one is the incentive to make profit. When the borrower is expected to make a large profit, the lead bank and other lenders may try to hold a larger share, expecting that it will be profitable for them. Finally, there could be 'positive selection' by the lead bank: the lead bank syndicates (sells) a larger share of the loan when the lead bank has an inside information indicating the loan's quality is high. Aforementioned paper by Simons (1993) shows that the lead bank holds a larger share of the loan when the loan is riskier, suggesting that it may be because the lead bank wants to

[7]Sufi (2007) uses an example where both the lead bank and one participant lender holds 40% of the loan, and two other participant lenders hold 10%. He claims that the Herfindahl index does a better job of explaining the "concentration" effect among the two dominant lenders compared to the share held by the lead bank because it ignores the effect of the share held by a participant lender.

[8]Sufi (2007) uses the average of the lead bank's percentage shares instead of the summation. However, this does not make a big difference in the regression results since more than 97% of the our regression samples have only one lead bank.

protect its reputation. The endogeneity comes from the fact that the lead bank's and other lenders' choice of how much share they hold is correlated with the borrower's performance and it also depends on the shares held by the lead bank and the other lenders.

These three different incentives cause different relationships between the performance of the borrower and the monitoring capital—percentage held by the lead bank or the concentration of the syndicate. First, if the monitoring capital increases based on the need for monitoring, the higher level of monitoring would increase the performance of the borrower. Second, the lead bank's making profit is the reason for the increased monitoring capital, the higher expected performance of the borrower would increase the monitoring capital. Third, if positive selection by the lead bank is driving the increased monitoring capital, the poor expected performance of the borrower would increase the monitoring capital.

From these, we can see that first two incentives would lead to a positive relationship between the monitoring capital and the borrower's performance; however, the cause of this relationship is different for each case. However, the third incentive will lead to a negative relationship between the monitoring capital and the borrower's performance. As a result, if there are all three incentives working together to decide the equilibrium level of monitoring capital, some of the effects would be offsetting each other.

To study the effect of monitoring on the performance of the borrower, we need to remove the other two effects mentioned above. Using instrumental variables (IVs) that are directly related to the monitoring capital, but not to the borrower's firm performance, we can solve the endogeneity problem.

#### 1.2.1.3 Deregulation as an Instrument

We use the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 (IBBEA) as an IV for the monitoring capital variables.[9] This deregulation is exogenous to the borrower's performance in a sense that this change does not affect the borrower's performance directly but only through changes in monitoring capital. According to Dick (2006), IBBEA permitted nationwide branching as of June 1997, and the act became effective gradually among the U.S. states throughout 1994–97. Table 1.1 shows the different timing of the change in each state.

According to Dick (2006), IBBEA had two major effects on the banking industry. First, IBBEA allowed banks to expand their branches across different states. As a result, banks can increase the number of branches they have in different regions, increasing their geographical market coverage. Second, the deregulation permitted interstate mergers between banks, reducing the number of banks in the market and increasing the size of the banks. After this deregulation, the banking market structure became more concentrated with larger-sized

[9] According to Dick (2006): "Prior to the 1970s, all U.S. states forbade interstate branching; intrastate branching was highly restrictive, with some states operating under the system of unit banking, which permitted banks to have no more than one full-service office. Deregulation of unit banking and limited branch banking occurred gradually throughout 1970–94 in most states. Intrastate branching deregulation began in some states even before the 1970s, whereas interstate banking started as early as 1978. Note that much of interstate banking permitted only out-of-state bank holding companies to acquire in-state banks. That is, it did not allow them to operate through their out-of-state bank name and branches.

The process of deregulation of geographic expansion culminated in 1994 with the passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act, which permitted nationwide branching as of June 1997 ... States had the option to pass legislation to "opt in" earlier than the June 1997 federal deadline; as a result, the act became effective gradually among the U.S. states throughout 1994–97. States were also allowed to pass legislation to opt out of the provisions for interstate branching, with Texas and Montana being the only states to do so."

banks, which had more branches across different states.

These two major changes in the banking industry have influenced the syndicated loan market. IBBEA allowed for larger branch networks across different states, which gave more opportunities for lenders to diversify their loan syndication. Sufi (2007) shows that if lenders are in the same region as the borrower, it increases the probability of being a participant lender. Thus, when lenders have more branches in various states, they have a higher chance of participating in the syndication process from diverse regions. Also, due to the reduced number of banks, there are a smaller number of lenders who may be willing to participate in the syndication process. As a result, this could lead to more concentrated syndicate structure and allow the lead bank to syndicate a smaller portion of the loan ceteris paribus after the deregulation. We expect this IV, as a dummy variable, would capture how the monitoring capital's structure changes after the deregulation. Considering lag effects of the deregulation, we also use an additional five lagged dummy variables for each year after the deregulation.

One possible problem with using this IBBEA as an IV is that it may not be exogenous. The deregulation changes how banks operate regarding branches, but there are other effects. IBBEA allowed banks to diversify their branches to different states and merge with each other. This change may have increased the efficiency on some part of their operations. This is due to several factors, such as reduced operating costs, improved diversification, strengthened bank-customer relationships, and increased market power. If this is the case, the increased efficiency in other areas could also affect their efficiency of monitoring loans as well, due to internal resource reallocations. The increased monitoring efficiency would mean that, even with the same level of effort, the results would be better than before. Thus,

assuming that when the lead bank holds the same percentage share of the loan, they put the same amount of efforts as before; the performance of the borrower may increase due to the increased efficiency of monitoring. This increased monitoring efficiency would affect the borrower's performance. In order to solve the problem, in un-reported regressions, we control for the market share of the lead bank as a proxy for the level of efficiency since a lot of the efficiency gain is related to mergers and comes from economies of scale.[10] The addition of the market share variable does not change the results significantly.

#### 1.2.1.4 Instruments for the lead bank's characteristics

There are three extra IVs we use to account for the lead bank's characteristics that could affect the monitoring capital without impacting borrower's performance directly.

One of the IVs is measuring of how much the lead bank lent during the previous three years of a loan, without considering whether the bank was lending as a lead bank or not.[11] This variable captures how influential and active the lead bank has been in the syndicated loan market within the previous three years of the loan origination.[12] It could be explained

[10]We use the market share measure developed by Sufi (2007). He uses the summation of the syndicate amount by the lead bank divided by the total market amount in a given year, as a measure of a lead bank's market share each year. He divided the amount "equally over all lead arrangers when there are multiple leads."

[11]We also use similar IVs, which measures the amount that the lead bank lent during the previous three years, restricting to only when it was a lead bank, and restricting to only when the loan has more than one lender (e.g., syndication). We use those variations to see if the slightly different definition would change our regression results, but the results are similar.

[12]According to Ivashina (2009), "loans are often refinanced before the maturity date" and the median maturity of the syndicated loans are three years, so we use the previous three years of data to account for loans that are likely to stay on the lead bank's books at the time of the loan origination.

as how much capacity or ability the lead bank has to raise funds and invest in the syndicated loan market. We expect that a lead bank with a higher capacity is likely to invest more on a loan than without it. It is different from the lead bank's reputation measure since it includes all the syndication deals that the bank participated in, not only as a lead bank, but also as a participant lender.

Another IV is a measure of transaction frequency between the lead bank and participant lenders following Ivashina (2009). The measure—which is the lending frequency between the lead bank and the member of the syndicate with which the lead bank lends most often, divided by the total number of deals arranged by the lead bank—is calculated using the previous three years of the origination of the loan.[13] When the lead bank has repetitive transactions with the same lenders, the information asymmetry between the lead bank and participant lenders can be relieved; thus, it is expected that the size of the monitoring capital will be reduced ceteris paribus.

The last IV is a reciprocal relationship reputation measure following Ivashina (2009). This dummy variable is one if, during the previous three years, the lead bank was participating in a loan syndication that was organized by one of the current participant lenders, which was acting as a lead bank. The reciprocal relationship works as an implicit threat that reduces asymmetric information problems due to the fact that misconducting itself in the business relationship results in mutual loss of business from each other. Therefore, the reciprocal relationship is supposed to reduce monitoring capital.

[13] "To illustrate, assume that for a given syndicate loan, A is the lead bank and banks B and C are the participants. If bank B and bank C participated in 10% and 20%, respectively, of the deals underwritten by bank A over the past three years, the reputation measure for this loan would be 20%". (Ivashina (2009)) Also, the reason that the previous three years' data is used is that the maturity of the median syndicate loan is three years.

#### 1.2.1.5 The model

Using the branching deregulation dummy variables, the two relationship variables, and one capacity variable as the instruments, the borrowing firm's performance is estimated in two stages. Eqs.(1) and (2) correspond to the first and second stages, respectively. A fitted value of the monitoring variable, computed from the first-stage regressions, is used to replace the endogenous monitoring variable in the second stage.

$$Monitoring = \alpha_1 + \alpha_2 Instruments + \alpha_3 controls + \varepsilon \tag{1.1}$$

$$Performance = \beta_1 + \beta_2 \widehat{Monitoring} + \beta_3 controls + \upsilon \tag{1.2}$$

The main reason behind using the bankruptcy probability and return on asset measure as performance measures of the borrower is that stock prices are the performance measure for stockholders, not lenders. Stock prices affect only stockholders as long as the company is solvent, so its loan obligations can be fully met. Thus, we focus our attention on those measures instead of stock market prices.[14]

[14]Stock market prices do not necessarily represent the interests of the lenders in our research question. Black (1976) pointed out that "there is no easier way for a company to escape the burden of a debt than to pay out all of its assets in the form of a dividend, and leave the creditors holding an empty shell." This extreme statement clearly tells us that measuring the firm's performance in terms of stock prices would not represent the desired outcome that creditors want out of monitoring since what makes stockholders happy does

Other than monitoring efforts exerted by the lead bank, we control for factors that might affect the borrowing firm's performance. We especially control for the borrower's characteristics before the origination of the loan to make cross-firm comparisons possible, since different firms have very different starting conditions. Table 1.3 explains all the variables used in this model.

## 1.2.2 Overview of data and main variables

### 1.2.2.1 Data overview

In this paper, the two main data sets comes from Dealscan and Compustat. For the borrowing firm's characteristics, we use Standard & Poor's Compustat North America. The Compustat database contains market and fundamental information about publicly held firms in the U.S. and Canada. For this paper, the Compustat database provides the characteristics of the borrowing firms dating back to 1962. For our purposes, we have to merge the Compustat database with the Dealscan database, which provides information about loan data, using the linking table provided by Chava and Roberts (2008).[15]

Our sample of syndicated loans comes from Loan Pricing Corporation's (LPC) Dealscan database covering dollar-denominated private loans made by bank and nonbank lenders during the period 1982 to 2011. According to Carey and Hrycray (1999), the database contains between 50% and 75% of the value of outstanding commercial and industrial loans in the U.S. during the early 1990's. From 1995 onward, Dealscan covers an even greater part

not necessarily make creditors happy.

[15]The Roberts linking table links the data from 1982 to 2003. The linking table after 2004 was provided by Youngjoo Choi.

of the loans. According to LPC, approximately half of the loan data comes from SEC filings (13Ds, 14Ds, 13Es, 10Ks, 10Qs, 8Ks, and registration statements). The other half of the data comes from contacts within the credit industry and directly from the borrowers and lenders.

There are two ways of defining a single unit of loans on Dealscan. One measure of a unit is a 'Package' (or Deal) which is a contract signed between a borrower and a lender (or lenders) at a particular date, and another unit is 'Facility' (or Tranche). Each package may consist of one or more facilities, which could be term loans, bridge loans, line of credit, leases, etc. You can see from Table 1.4 that the average number of facilities within a package is 1.32 for the final sample. Dealscan provides specific details about loans such as facility amount, currency, facility start date, loan type, lenders' name, and percentage shares held by each lenders as of their date of origination.[16]

In this paper, we consider a package as a unit of observation following Sufi (2007) and Ivashina (2009). Sufi (2007) explains in his paper why he chose to use deal-level analysis. "A deal-level analysis, as opposed to a tranche-level analysis, is appropriate for two reasons. First, the actual syndicated loan contract is drafted at the deal level, and covenants and all lenders are listed together on this contract, even if a lender loans only on one tranche. While the maturity and pricing of the loan tranches can vary within a syndicated loan deal, there is one contract, and all lenders are chosen on the tranches collectively, not independently.

[16]This means that we do not know what fraction of the loan is sold in the secondary loan market after syndication, which could be problematic for our research. If lead banks can sell their shares after syndication, we cannot use the size of the share the lead bank holds as a proxy for the bank's monitoring effort. However, Ivashina and Sun (2007) show that the lead banks tend to keep their shares of the loan, despite the fact that within the two years after loan origination, approximately half of the participants in syndicates sell their shares on the secondary loan market. Thus, we can argue the monitoring measure is somewhat reliable.

Second, because multiple tranches on the same syndicated loan deal cannot be treated as independent observations, such an analysis produces standard errors that are improperly small. ...the results are very similar quantitatively and significance levels are actually stronger in the tranche-level analysis." Following Ivashina (2009), for deals with more than one facility, we look at the largest facility that starts at the loan origination for the loan characteristics.[17]

#### 1.2.2.2 Sampling Bias

The starting sample from the Dealscan 2010 version includes 156,514 packages between 1981 and 2010, involving 59,536 borrowers excluding financial industries and utility industries defined as SIC 60–69 and 49. Several of the variables in the analysis are only partially available. Due to missing variables in our data, we need to address the potential bias of the final sample. Table 1.2 looks at the data availability of the variables for each year, as compared to the unconstrained and starting sample. Sample (1) from the table has only 156,358 facilities due to the fact that there are 156 observations with missing facility amount information. As you can see from sample (3) on Table 1.2, we end up with a smaller sample size after matching Compustat data to Dealscan data and dropping observations with missing borrowers' control variables. Also, in sample (3), we dropped all firms with only one observation since they will be dropped later in our borrowing firm fixed effect regressions. The final sample includes 2,251 packages between 1988 and 2008 involving 723 borrowers with bigger median and mean of the loan sizes compared to the starting sample.

[17]This classification does not significantly affect the distribution of loan type in the final sample. (Ivashina (2009))

There are possible explanations for the sample bias that comes from the loan sizes. First, sample (2) is constrained to observations in which there exists at least one lead bank, the number of lead banks is less than 10, the number of lenders is bigger than one (syndicated loan), and the summation of percentage shares of individual lenders is 100.[18] Using the starting sample, we compared the size of loans with a single lender and multiple lenders. Single lender loans have mean of 110 million USD and median of 30 million USD, and multiple lender loans have mean of 305 million USD and median of 110 million USD. Thus, we can conclude that some part of the bias comes from dropping single lender loans from our sample.

Second, sample (3) removes all the observations that do not have information on all the control variables and also drops firms with a single observation. This process removes about 88% of sample (2) and increases the mean and median as well. Since most of the control variables come from Compustat, we can assume that the borrowers' information from Compustat is biased toward bigger companies. To see whether the bias is coming from matching Dealscan with Compustat, we divide sample (1) into Compustat matched and not matched. The difference between the means of the loan sizes is noticeable: 210.33 million USD for loans not matched and 289.37 million USD for loans matched with Compustat. Also, the difference is statistically significant with p-value of 0.00. Dropping firms with a single observation has an additional effect on the size of loans in the sample since the average size in sample (1) for the single-observation firms is 99.07 million USD compared to 245.21 million USD for the firms with more than one observation. The difference is statistically

[18]We assume the loans are outliers when there are more than ten banks listed as lead banks. Also, there are cases where the summation of percentage shares is not 100, so we removed loans where the percentage is not between 99 and 101.

significant with p-value of 0.00 as well. Thus, we can conclude that at least some part of the bias of the sample comes from the availability of the borrowers' information and other part from using fixed effect regressions.

Third, the sample (4) has only observations with the percentage share information which is used to calculate monitoring variables. In the sample, monitoring variables, the center of our analysis, is available about 29% of cases without conditioning, 41% of cases with conditioning, on the availability of other variables.[19] As you can see from the Table 1.2 and as Ivashina (2009) mentioned, the availability of the lead bank's share information seems to drop over time and the size of the loans in the sample also gets bigger over time. A possible explanation, she suggests, is that the market expanded too rapidly to collect all the information; instead the focus of collecting data was on the largest loans. We conjecture that this bias comes from the fact that Dealscan's data collection was mostly focused on bigger sized loans since both sample (3) and (4) shows this tendency of progressive bias over time toward the largest loans in the sample. To make sure that the bias in the data collection does not affect the results, we use year fixed effects in all the regressions.

Another point worth mentioning is that the final sample consists of only loans that have the borrower's data at the maturity of the loan. We removed all observations with missing variables, especially O-score maturity and ROA maturity, which require the value of O-score and ROA at the maturity of the loan. Thus, if the firm dropped out of the Compustat dataset before the maturity of the loan, the value of O-score and ROA at the maturity would not be available. The possible reasons for firms being dropped include being liquidated or

[19] According to Ivashina (2009), there seems to be no systematic bias in the characteristics of the companies that have the lead bank's share information from Dealscan data.

restructured due to bankruptcy, getting acquired by another firm, or going private. These reasons may have different effects on the sample selection bias. In particular, removing bankrupt firms from the sample would remove some of the weakest firms. Thus, the final sample only represents the firms that 'survived'.

#### 1.2.2.3 Overview of Variables

In our regressions, we use four performance variables: O-score average, O-score maturity, ROA average, and ROA maturity. O-score is a bankruptcy probability measure constructed by Ohlson. Appendix A explains how we formulated the O-score measure based on Ohlson (1980). When O-score has a higher value, the bankruptcy probability is higher. ROA is measuring the profitability of a firm considering its own total assets. Higher ROA means the firm is more efficient at managing their business.

In order to make ex post performance measures using the two variables—O-score and ROA, we use two types of formula. First one is using the average of the variable over the maturity of the loan and subtract the value of the variable at the loan origination. Using this method tells us the average performance of the firm over the maturity of the loan compared to the begining of the loan. The second method is to use the value at the maturity of the loan subtracted by the value at the origination since using the value at the maturity date instead of the average will allow for all the effects of the loan to be fully realized by the firm.

Following the literature, we use the Hirschman-Herfindahl index (HHI) and percentage share held by the lead bank as proxies for monitoring efforts by the syndicate. As mentioned above, the HHI measures joint monitoring efforts by the lenders within a syndicate because the HHI depends on the proportional holdings of the loan. On the other hand, the lead

bank's percentage share measures the intensity of monitoring incentive the lead bank has.

We use ten instrumental variables in this paper. The three of them are related to the lead bank's reputation and capacity measures. There are a total of seven deregulation instruments, and all of them are dummy variables. 'Branch' is coded as one if the loan originated after the date the law was put into place in the state the loan originated in, and zero otherwise. The additional six branch variables—from 'Branch zero' to 'Branch five'—correspond to a specific year between zero and five years after the law was implemented, and are coded as one if the loan originated in that year, and zero otherwise. These branch variables allow for the effects of the law to vary over the first five years of implementation in our regression results.

The 'Comovement' variable was constructed by Guiso and Minetti (2010) to capture the liquidation value of the firm's assets in the secondary market. To calculate this variable, they use firm level data from Compustat between 1950 and 2000 in 64 industries categorized using the two-digit standard industrial classification system (SIC). Then they regress normalized annual growth rate of firms' sales on dummy variables of every year for each industry to get an $R^2$ as a comovement measure. When the $R^2$ is high, the year dummy variables explain a lot of the sales fluctuations within the industry; thus, the firms within the industry comove noticeably. According to Shleifer and Vishny (1992), a positive correlation of the change in sales between the firms in an industry implies that asset redeployability in the industry is low. They explain that when assets are industry-specialized to the point where outsiders have difficulty using them, the assets are valued the most within that industry. Thus, when there is industry-wide distress, the assets become very difficult to sell and are likely to be sold at a lower price. As a result, the correlation of firms' sale conditions within an industry could

be a proxy for liquidity of the secondary market. The liquidity value of assets matters for our regressions since firms with higher liquidation value have easier time borrowing money due to the better quality of their collateral (i.e. assets) in case of default.

We included control variables that explain the borrower's characteristics and the loan characteristics. Table 1.3 describes how we constructed our variables and what their sources are.

#### 1.2.2.4 Summary Statistics

Table 1.4 shows summary statistics for the final sample that we use for running regressions. The sample is constructed so that there are no missing control and dependent variables.

As seen on Table 1.4, 67% of the loans in the sample are originated after the deregulation went into effect in their own state. In this sample, 88% of lead banks switched its role with one of the participant lenders within a syndicate, the average maturity of the loans is three and half years, and the average number of facilities within a syndicate is 1.3.

#### 1.2.2.5 Defining a lead bank

Defining a lead bank among lenders within a syndicated loan is somewhat challenging due to a number of lender titles that are vaguely defined. According to Standard & Poor's (2011), prior to the 1990s, "there was usually one agent that syndicated each loan." Also, 'lead manager' and 'manager' titles were given out to the syndicate members with large commitments. As league tables were gaining popularity, 'co-agent' titles were given to lenders with large commitments or lenders who had an actual role in the syndication process.[20]

[20]According to LSTA (2006), "Market share in the syndicated loan market is quoted in league tables published by several companies, including Loan Pricing Corporation (LPC),

However, during the 1990s, the league tables became extremely popular as a marketing tool. Consequently, lender title inflation increased substantially. In many cases, significant-sounding titles, including 'co-agent', were given out to attract large commitments from lenders. Since the league tables prohibit more than two banks within the same syndicate from acquiring the same title, it appears that the main purpose for using multiple titles was to give out league table credits to as many lenders as possible.

Following Standard & Poor's (2006) and LSTA (2006) definitions, Ivashina (2009) came up with a method for singling out a lead bank. If there is an administrative agent in a syndicate, the administrative agent is designated as the lead bank since it is the bank that handles all interest and principal payments and monitors the loan. Lenders that act as the agent, arranger, bookrunner, lead arranger, lead bank, or lead manager are designated to be lead banks, if there is no administrative agent. As a result, in our final sample, 68% of the time the lead bank is titled as administrative agent, 28% of the time as agent, and the rest of the time as other titles. To see whether the different titles have any significant meaning, we added title dummy variables to our un-reported regressions, but these titles turn out to be jointly insignificant and do not make notable changes in our results qualitatively.

After using the method described above for identifying the lead bank, we found that about 3% of the deals in the final sample have more than one lead bank, including cases with more than one administrative agent. When there are multiple lead banks in a syndicate, we use the sum of the shares of these banks to calculate the percentage share retained by the lead bank. We chose the one with a bigger lead bank share in the syndicate to account for the lead bank's characteristics such as the reputation and branch deregulation instruments. Like

Bloomberg, and Thomson Financial."

Ivashina (2009) mentions, loans with multiple lead banks have much larger average facility amount and have borrowers with larger assets than loans with a single lead bank. However, in our final sample (the regression sample) those trends almost disappear. Ruling out loans with multiple lead banks changes our regression results to make them both economically and statistically more significant.

## 1.3 Results

### 1.3.1 First stage regressions

Table 1.5 shows the results for the first-stage regressions. We use the 'Profitability' variable for the O-score regressions and not for the ROA regressions because ROA is similar to the profitability measure. For this reason, we ran two regressions for each monitoring variable—the Lead Share/100, and the HHI/10,000—with or without 'Profitability'. To enable easier understanding of the regressions results, we divided the HHI by 10,000 and the Lead Share by 100 to make the variables more comparable. From the F-test results, our instruments are jointly significant, and especially the syndicate reputation variables are the most significant instruments. Also, all standard errors are heteroskedasticity robust and clustered at the borrowing firm level.

From the 'Branch' variable, we can see that the deregulation increases the concentration of the syndicate in the long-run. This is most apparent when HHI is used as the proxy for syndicate concentration, as the coefficient is statistically significant. When the lead share is used as the proxy for the concentration, the coefficient is positive as well for the long-

term effect; however, this is statistically insignificant. Additionally, it is shown that the effect of deregulation was relatively small in the short-run, as the 'Branch zero' to 'Branch five' coefficients are negative, suggesting that it took a few years for the full effect of the regulations to be fully realized.

We also see that the reputation instrumental variables reduce the level of concentration of the syndicate, as illustrated by Sufi (2009). They are statistically significant and negative for every specification of the first-stage regression, suggesting that higher reputation of the lead bank causes them to be able to sell more of the loan to the particapant lenders.

### 1.3.2 Identification

Our model satisfies the order condition in which the number of instrumental variables has to be no less than the number of endogenous variables because there are ten instrumental variables. Since our model is overidentified, we test for overidentification restrictions. Overidentification is not rejected with p-value equal to 0.1826, 0.2120, 0.3056, and 0.3104 for O-score regressions (1), (2), (3), and (4) and for ROA regressions with p-value of 0.3187, 0.3415, 0.5007, and 0.5893. This further shows that our model is reliable and our instruments are not invalid.

### 1.3.3 Second stage regressions

Table 1.8 and Table 1.9 show the main result of this paper using instrumental variables, and Table 1.6 and Table 1.7 show the OLS regression results for the corresponding regressions. All standard errors are heteroskedasticity robust and clustered at the borrowing firm level.

The dependent variable for O-score regressions (1) and (2) is the 'O-score average' and for regressions (3) and (4) is the O-score maturity'. For the ROA regressions, 'ROA average' is the dependent variables for regressions (1) and (2), and 'ROA maturity' for regressions (3) and (4). Our main focus is on the coefficients of monitoring capital (the Lead Share and the HHI) to see whether monitoring reduces the asymmetric information problems between the lenders and the borrower.

The coefficients on monitoring capital variables in both regressions have the same sign for each monitoring capital variable. For the O-score regressions, the coefficients are negative, telling us that a higher level of monitoring capital reduces bankruptcy probability of the borrower. For the ROA regressions, the positive sign of the monitoring capital variables means that the higher level of monitoring capital increases the profitability of the borrowing firm. These results show us that a higher level of monitoring capital increases the borrowing firm's performance.

One of the differences between the OLS and 2SLS regressions is that the magnitude of the coefficients of monitoring capital in the OLS regressions are much smaller than in the 2SLS regressions. This tells us that there exists an endogeneity problem with the monitoring variables, and that we need to account for the effect of the joint determination of the monitoring capital and borrowing firm's performance. Especially, there seems to exist a positive selection process: the lead bank holds a smaller share of the loan when the borrower is expected to perform well. This would explain the endogeneity which has a negative effect on the performance of the borrower when the lead bank holds a larger share of the loan.

Our coefficients also have a large economic significance. When we increase monitoring capital 10% from its mean, the O-score decreases by between 0.020 and 0.039 from its mean,

and ROA increases by between 0.003 to 0.006. For the ROA, this means when the monitoring efforts increases by 10% from its mean, the profitability of the firm increases by about a half cent for one dollar invested in the firm.

There are other interesting findings regarding the signs of control variables' coefficients from the 2SLS regressions. The sign of the coefficients for 'Book Leverage' is the same as the monitoring capital.[21] This implies that the borrower successfully improves their performance when the borrower is risky due to its heavy debt level. It is possible that borrowing firms in bad shape work harder than firms in good shape to improve their performance.

### 1.3.4 Robustness Test

We test for the robustness of our model because 67% of the loans in our final sample originated after the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 (IBBEA).[22] In order to see that the deregulation instrumental variables are not determining our results, we ran un-reported regressions without the deregulation variables. The results with the new set of instruments are quite similar to our original regression results. Thus, we can conclude that the reputation instruments are driving the results.

## 1.4 Conclusion

It is implied through the literature that the monitoring helps the borrower to improve their performance by reducing asymmetric information problems such as moral hazard. It is widely accepted that without monitoring the managing agents are likely to prioritize personal

[21] See Table 1.3 for the definition of variables.

[22] You can see this from Table 1.4 where the 'Branch' variable's mean is 0.67.

benefits from their work over the stockholders' and creditors' benefit. Thus, monitoring is likely to reduce this behavior and improve the function of the borrowing firm's work.

Based on the literature, in this paper, we examined the implicit assumption used by many research papers regarding the monitoring effect of the syndicate, especially by the lead bank, on the borrower. There is an endogeneity problem in our main regressions because the monitoring capital variables—the lead bank's share and the HHI—and the borrowing firm's performance affect one another. In order to capture the effect of monitoring on the borrower's performance, we use intrumental variables, including deregulation, lead bank's reputation, and lead bank's capacity variables.

Using the 2SLS regressions, we find that monitoring the borrowing firm, either by the lead bank or collectively by lenders, increases the borrower's ex post performance as expected from the literature. Thus, we conclude that the information asymmetry within a lending syndicate decreases when the lead bank holds a larger share of the loan or structures the syndicate to be more concentrated. That is, a higher level of monitoring capital leads to a higher level of monitoring efforts by the syndicate, resulting in an improved performance of the borrower ex post.

This finding tells us that perhaps there is an agency problem within these borrowing firms. The managers' incentives may not be appropriately aligned with the best interests of the firm, so having more rigorous oversight from lenders causes the managers to behave more in the firm's best interest. Thus, this confirms the banking literature that having a loan provides more than just additional capital to the firm; it can also increase firm performance through proper monitoring.

Table 1.1: Date of Passage of Riegle-Neal Act of 1994, by State

| State | Date | State | Date |
|---|---|---|---|
| Alabama | 5/31/97 | Montana | 3/21/97 |
| Alaska | 1/1/94 | Nebraska | 5/31/97 |
| Arizona | 8/31/96 | Nevada | 9/28/95 |
| Arkansas | 5/31/97 | New Hampshire | 6/1/97 |
| California | 10/2/95 | New Jersey | 4/17/96 |
| Colorado | 6/1/97 | New Mexico | 6/1/96 |
| Connecticut | 6/27/95 | New York | 2/6/96 |
| Delaware | 9/29/95 | North Carolina | 6/22/95 |
| District of Columbia | 6/13/96 | North Dakota | 5/31/97 |
| Florida | 5/31/97 | Ohio | 5/22/97 |
| Georgia | 6/1/97 | Oklahoma | 5/31/97 |
| Hawaii | 6/1/97 | Oregon | 2/27/95 |
| Idaho | 7/1/95 | Pennsylvania | 7/6/95 |
| Illinois | 6/1/97 | Rohde Island | 6/20/95 |
| Indiana | 3/15/96 | South Carolina | 7/1/96 |
| Iowa | 3/27/96 | South Dakota | 7/1/96 |
| Kansas | 6/1/97 | Tennessee | 6/1/97 |
| Kentucky | 6/1/97 | Texas | 8/28/95 |
| Louisiana | 6/1/97 | Utah | 6/1/95 |
| Maine | 1/1/97 | Vermont | 5/30/96 |
| Maryland | 9/29/95 | Virginia | 7/1/95 |
| Massachusetts | 8/2/96 | Washington | 6/6/96 |
| Michigan | 11/29/95 | West Virginia | 5/31/97 |
| Minnesota | 6/1/97 | Wisconsin | 6/1/97 |
| Mississippi | 5/1/97 | Wyoming | 5/31/97 |
| Missouri | 6/1/97 | | |

Source - "Nationwide Branching and Its Impact on Market Structure, Quality, and Bank Performance" by Dick, A. (2006)

Table 1.2: Sample Comparison

| Year | Unconstrained sample (1) | | |
|---|---|---|---|
| | Obs. | Median | Mean (A) |
| 1981 | 1 | 122.00 | 122 |
| 1982 | 4 | 707.50 | 647.5 |
| 1983 | 1 | 600.00 | 600 |
| 1984 | 9 | 1600.00 | 3308.33 |
| 1985 | 28 | 815.00 | 1240.32 |
| 1986 | 162 | 95.00 | 328.58 |
| 1987 | 971 | 36.00 | 156.55 |
| 1988 | 1895 | 30.00 | 164.55 |
| 1989 | 1925 | 35.00 | 176.91 |
| 1990 | 2021 | 38.00 | 139.38 |
| 1991 | 2067 | 40.00 | 133.26 |
| 1992 | 2899 | 49.38 | 136.65 |
| 1993 | 4094 | 52.00 | 151.98 |
| 1994 | 5127 | 65.00 | 171.64 |
| 1995 | 5927 | 75.00 | 201.06 |
| 1996 | 7973 | 70.00 | 178.23 |
| 1997 | 10438 | 85.00 | 201.92 |
| 1998 | 8320 | 80.00 | 200.73 |
| 1999 | 8123 | 90.00 | 231.15 |
| 2000 | 8789 | 85.00 | 256.98 |
| 2001 | 8727 | 76.63 | 239.25 |
| 2002 | 8535 | 73.00 | 216.32 |
| 2003 | 9295 | 70.00 | 213.32 |
| 2004 | 10138 | 90.00 | 252.4 |
| 2005 | 10918 | 100.00 | 293.9 |
| 2006 | 11429 | 90.00 | 304.96 |
| 2007 | 10897 | 100.00 | 365.4 |
| 2008 | 8621 | 97.87 | 311.44 |
| 2009 | 6324 | 94.92 | 288.11 |
| 2010 | 700 | 129.14 | 362.55 |
| Total | 156358 | 79.36 | 242.06 |

Table 1.2 (cont'd)

| Year | Constrained sample (2) | | | | |
|---|---|---|---|---|---|
| | Obs. | Median | Mean (B) | Diff. (A−B) | |
| 1982 | 3 | 690.00 | 613.33 | 34.17 | |
| 1983 | 1 | 600.00 | 600 | 0 | |
| 1984 | 5 | 1500.00 | 3505 | −196.67 | |
| 1985 | 18 | 1175.00 | 1726.67 | −486.35 | |
| 1986 | 67 | 250.00 | 577.71 | −249.13 | ** |
| 1987 | 334 | 150.00 | 304.99 | −148.44 | *** |
| 1988 | 662 | 145.00 | 360.67 | −196.12 | *** |
| 1989 | 682 | 130.00 | 322.72 | −145.81 | *** |
| 1990 | 866 | 102.84 | 213.55 | −74.17 | *** |
| 1991 | 836 | 85.00 | 214.46 | −81.2 | *** |
| 1992 | 1267 | 84.00 | 187.95 | −51.3 | *** |
| 1993 | 1992 | 90.00 | 213.01 | −61.03 | *** |
| 1994 | 2664 | 100.00 | 225.33 | −53.69 | *** |
| 1995 | 3232 | 100.00 | 241.21 | −40.15 | *** |
| 1996 | 4349 | 100.00 | 229.89 | −51.66 | *** |
| 1997 | 5545 | 120.00 | 253.78 | −51.86 | *** |
| 1998 | 4422 | 130.00 | 277.18 | −76.45 | *** |
| 1999 | 4939 | 130.00 | 288.33 | −57.18 | *** |
| 2000 | 4934 | 125.00 | 301.46 | −44.48 | *** |
| 2001 | 5029 | 121.90 | 287.56 | −48.31 | *** |
| 2002 | 5551 | 100.00 | 249.71 | −33.39 | *** |
| 2003 | 6011 | 96.70 | 234.92 | −21.6 | ** |
| 2004 | 7186 | 102.66 | 261.7 | −9.3 | |
| 2005 | 7899 | 110.00 | 299.99 | −6.09 | |
| 2006 | 6510 | 140.00 | 386.35 | −81.39 | *** |
| 2007 | 5933 | 164.33 | 480.03 | −114.63 | *** |
| 2008 | 3907 | 135.00 | 398.16 | −86.72 | *** |
| 2009 | 2496 | 113.00 | 325.88 | −37.77 | * |
| 2010 | 245 | 158.00 | 357.11 | 5.44 | |
| Total | 87585 | 115.00 | 295.91 | −53.85 | *** |

Table 1.2 (cont'd)

| Year | Sample with all controls (3) | | | | |
|---|---|---|---|---|---|
| | Obs. | Median | Mean (C) | Diff. (A−C) | |
| 1986 | 1 | 200.00 | 200 | 128.58 | |
| 1987 | 1 | 500.00 | 500 | −343.45 | |
| 1988 | 46 | 352.50 | 734.61 | −570.06 | *** |
| 1989 | 73 | 200.00 | 426.13 | −249.22 | *** |
| 1990 | 165 | 105.00 | 248.22 | −108.84 | *** |
| 1991 | 174 | 70.00 | 172.53 | −39.27 | |
| 1992 | 225 | 120.00 | 220.95 | −84.3 | *** |
| 1993 | 291 | 130.00 | 253.9 | −101.92 | *** |
| 1994 | 448 | 140.00 | 311.57 | −139.93 | *** |
| 1995 | 443 | 140.00 | 292.68 | −91.62 | *** |
| 1996 | 529 | 175.00 | 365.32 | −187.09 | *** |
| 1997 | 727 | 175.00 | 351.6 | −149.68 | *** |
| 1998 | 672 | 187.50 | 343.2 | −142.47 | *** |
| 1999 | 618 | 200.00 | 362.26 | −131.11 | *** |
| 2000 | 692 | 200.00 | 362.06 | −105.08 | *** |
| 2001 | 729 | 225.00 | 436.28 | −197.03 | *** |
| 2002 | 797 | 170.00 | 347.4 | −131.08 | *** |
| 2003 | 780 | 200.00 | 349.24 | −135.92 | *** |
| 2004 | 849 | 246.25 | 460.58 | −208.18 | *** |
| 2005 | 823 | 275.00 | 510.19 | −216.29 | *** |
| 2006 | 686 | 300.00 | 710.42 | −405.46 | *** |
| 2007 | 586 | 400.00 | 856.5 | −491.1 | *** |
| 2008 | 299 | 300.00 | 708.7 | −397.26 | *** |
| 2009 | 188 | 301.71 | 776.33 | −488.22 | *** |
| Total | 10842 | 200.00 | 434.3 | −192.24 | *** |

Table 1.2 (cont'd)

| Year | Sample with controls and monitoring (4) | | | | |
|---|---|---|---|---|---|
| | Obs. | Median | Mean (D) | Diff. (A−D) | |
| 1986 | 1 | 200.00 | 200 | 128.58 | |
| 1987 | 1 | 500.00 | 500 | −343.45 | |
| 1988 | 19 | 325.00 | 1073.89 | −909.34 | *** |
| 1989 | 43 | 120.00 | 305.65 | −128.74 | |
| 1990 | 78 | 100.00 | 173.1 | −33.72 | |
| 1991 | 105 | 50.00 | 125.92 | 7.34 | |
| 1992 | 125 | 85.00 | 159.7 | −23.05 | |
| 1993 | 133 | 100.00 | 215.49 | −63.51 | * |
| 1994 | 210 | 125.00 | 239.89 | −68.25 | ** |
| 1995 | 202 | 125.00 | 246.34 | −45.28 | |
| 1996 | 223 | 165.00 | 342.95 | −164.72 | *** |
| 1997 | 263 | 175.00 | 337.7 | −135.78 | *** |
| 1998 | 203 | 175.00 | 302.65 | −101.92 | *** |
| 1999 | 187 | 200.00 | 345.19 | −114.04 | ** |
| 2000 | 178 | 192.00 | 383.96 | −126.98 | |
| 2001 | 207 | 200.00 | 402.63 | −163.38 | *** |
| 2002 | 211 | 175.00 | 355.54 | −139.22 | *** |
| 2003 | 237 | 200.00 | 340.74 | −127.42 | *** |
| 2004 | 220 | 250.00 | 608.96 | −356.56 | *** |
| 2005 | 215 | 277.50 | 495.4 | −201.5 | *** |
| 2006 | 137 | 300.00 | 831.92 | −526.96 | *** |
| 2007 | 125 | 350.00 | 750.29 | −384.89 | *** |
| 2008 | 91 | 250.00 | 763.3 | −451.86 | *** |
| 2009 | 56 | 257.15 | 1007.62 | −719.51 | *** |
| Total | 3470 | 180.00 | 398.45 | −156.39 | *** |

Table 1.2 (cont'd)

| Year | Sample with all variables (5) | | | | |
|---|---|---|---|---|---|
| | Obs. | Median | Mean (E) | Diff. (A−E) | |
| 1988 | 10 | 150.00 | 424.7 | −260.15 | |
| 1989 | 33 | 91.50 | 303.94 | −127.03 | |
| 1990 | 57 | 100.00 | 160.2 | −20.82 | |
| 1991 | 78 | 55.68 | 119.3 | 13.96 | |
| 1992 | 98 | 100.00 | 158.71 | −22.06 | |
| 1993 | 100 | 100.00 | 238.61 | −86.63 | ** |
| 1994 | 133 | 125.00 | 249.53 | −77.89 | ** |
| 1995 | 148 | 130.00 | 262.35 | −61.29 | |
| 1996 | 166 | 200.00 | 359.95 | −181.72 | *** |
| 1997 | 179 | 175.00 | 334.64 | −132.72 | *** |
| 1998 | 151 | 200.00 | 325.27 | −124.54 | *** |
| 1999 | 151 | 205.00 | 359.41 | −128.26 | ** |
| 2000 | 137 | 200.00 | 396.94 | −139.96 | |
| 2001 | 172 | 225.00 | 415.8 | −176.55 | *** |
| 2002 | 168 | 200.00 | 364.23 | −147.91 | *** |
| 2003 | 186 | 200.00 | 346.77 | −133.45 | *** |
| 2004 | 150 | 300.00 | 744.43 | −492.03 | *** |
| 2005 | 66 | 303.56 | 658.86 | −364.96 | *** |
| 2006 | 28 | 442.50 | 1741.7 | −1436.74 | *** |
| 2007 | 19 | 1000.00 | 1592.63 | −1227.23 | *** |
| 2008 | 21 | 500.00 | 1645.32 | −1333.88 | *** |
| Total | 2251 | 175.00 | 394.27 | −152.21 | *** |

Table 1.3: Definition of Variables

| | | | |
|---|---|---|---|
| **Dependent variables** | | | |
| Oscore | | Following Ohlson (1980) | Compustat |
| Oscore average | | (Oscore's average throughout the duration of the loan) − (oscore at the beginning of the loan) | Compustat |
| Oscore maturity | | (Oscore at the maturity of the loan) − (oscore at the beginning of the loan) | Compustat |
| ROA | Ratio | EBITDA (Earnings before interest, taxes, depreciation and amortization)/ lag(total asset) | Compustat |
| ROA average | | (ROA's average throughout the duration of the loan) − (ROA at the beginning of the loan) | Compustat |
| ROA maturity | | (ROA at the maturity of the loan) − (ROA at the beginning of the loan) | Compustat |
| **Monitoring proxies** | | | |
| HHI | | Sum of the squares of lenders' share percentages (maximum value is 10,000) | Dealscan |
| % share | % | sum of lead banks (following ivashina(2009)) % shares within a facility | Dealscan |
| **Instruments** | | | |
| Branch | Dummy | One if the loan is originated after branching law passed, zero otherwise | |
| Branch zero | Dummy | One if the loan is originated up to one year after branching law passed, zero otherwise | |
| Branch one | Dummy | One if the loan is originated between one and two years after branching law passed, zero otherwise | |
| Branch two | Dummy | One if the loan is originated between two and three years after branching law passed, zero otherwise | |

Table 1.3 (cont'd)

| | | | |
|---|---|---|---|
| Branch three | Dummy | One if the loan is originated between three and four years after branching law passed, zero otherwise | |
| Branch four | Dummy | One if the loan is originated between four and five years after branching law passed, zero otherwise | |
| Branch five | Dummy | One if the loan is originated between five and six years after branching law passed, zero otherwise | |
| Log (threesum) | | log (sum of money lent by the lead arranger during the previous three year of loan origination date) | Dealscan |
| Syndicate reputation: lead to participant | % | Following Ivashina (2009) : Maximum number of links between the lead bank and a member of the syndicate, scaled by the total number of deals arranged by the lead bank; this is a syndicate-specific measure calculated over a three-year horizon | Dealscan |
| Syndicate reputation: reciprocal | Dummy | Following Ivashina (2009) : One if over the past three years lead bank was a participant in a syndicate led by one of the current participants (i.e., lead banks and participant bank switched their roles), zero otherwise; this is a syndicate-specific measure. | Dealscan |
| **Controls** | | | |
| **Borrower characteristics** | | | |
| Comovement | | Degree of comovement between the sales of the firm and those of other firms in the same industry. | Guiso and Minetti (2010) |
| Zscore bad | Dummy | One if Altman's zscore is less than 1.81 (high chance of bankruptcy), zero otherwise | Compustat |
| Assets | Millions USD | Assets - Total | Compustat |
| Log (Assets) | | log (Assets) | Compustat |
| Book Leverage | Ratio | Book Leverage = (DLC + DLTT)/AT= (Debt in Current Liabilities + Long–Term Debt) / Assets | Compustat |

Table 1.3 (cont'd)

| | | | |
|---|---|---|---|
| Current assets / Assets | Ratio | ACT /AT = Current Assets Total / Assets - Total | Compustat |
| Profitability | Ratio | OIBDP / AT = Operating Income before depreciation / Total Assets | Compustat |
| Sales at close | USD | Borrower's sales at the loan origination | Dealscan |
| Log (Sales at close) | | Log (Sales at close) | Dealscan |
| **Loan characteristics** | | | |
| Facility amount | Millions USD | Amount of the largest facility within a loan package that starts at the loan origination date | Dealscan |
| Facility amount / assets | Ratio | Facility amount in millions / assets in millions | Compustat &Dealscan |
| Acquisition | Dummy | One if the loan is for acquisition purpose (Acquis. line, LBO, MBO, and Takeover), zero otherwise. | Dealscan |
| Backup | Dummy | One if the loan is for backup purpose (CP backup), zero otherwise. | Dealscan |
| Coporate & working capital | Dummy | One if the loan is for corporate purpose and working capital purpose (Corp. purposes, and Work. cap.), zero otherwise. | Dealscan |
| Refinancing | Dummy | One if the loan is for working capital purpose (Debt Repay., and Recap.), zero otherwise | Dealscan |

Table 1.4: Summary statistics

| Variables | mean | p50 | sd | min | max |
|---|---|---|---|---|---|
| Oscore | −1.13 | −1.21 | 1.25 | −4.68 | 4.03 |
| Oscore average | −0.03 | −0.05 | 0.72 | −4.65 | 4.21 |
| Oscore maturity | −0.05 | −0.07 | 0.95 | −5.21 | 5.87 |
| ROA | 0.18 | 0.17 | 0.11 | −0.37 | 1.18 |
| ROA average | −0.02 | −0.01 | 0.09 | −0.95 | 0.79 |
| ROA maturity | −0.02 | −0.01 | 0.11 | −0.96 | 0.89 |
| HHI | 2093.00 | 1528.00 | 1647.00 | 211.10 | 10000.00 |
| Fitted HHI | 2093.44 | 2014.61 | 1138.37 | −2580.58 | 5699.34 |
| % share | 26.52 | 20.00 | 19.05 | 0.00 | 100.00 |
| Fitted % share | 26.52 | 25.93 | 12.84 | −15.99 | 65.05 |
| Branch | 0.67 | 1.00 | 0.47 | 0.00 | 1.00 |
| Branch zero | 0.12 | 0.00 | 0.33 | 0.00 | 1.00 |
| Branch one | 0.12 | 0.00 | 0.33 | 0.00 | 1.00 |
| Branch two | 0.11 | 0.00 | 0.31 | 0.00 | 1.00 |
| Branch three | 0.10 | 0.00 | 0.31 | 0.00 | 1.00 |
| Branch four | 0.10 | 0.00 | 0.30 | 0.00 | 1.00 |
| Branch five | 0.10 | 0.00 | 0.30 | 0.00 | 1.00 |
| Log (threesum) | 22.77 | 23.18 | 1.62 | 15.42 | 25.21 |
| Syndicate reputation: lead to participant | 23.03 | 21.21 | 17.06 | 0.00 | 100.00 |
| Syndicate reputation: reciprocal | 0.88 | 1.00 | 0.32 | 0.00 | 1.00 |
| Commovement | 0.06 | 0.04 | 0.06 | 0.01 | 0.26 |
| Zscore bad | 0.07 | 0.00 | 0.25 | 0.00 | 1.00 |
| Assets (mil) | 3616.00 | 862.40 | 10536.00 | 32.87 | 275644.00 |
| Log (Assets) | 6.91 | 6.76 | 1.53 | 3.49 | 12.53 |
| Book Leverage | 0.30 | 0.28 | 0.19 | 0.00 | 1.75 |
| Current assets/assets | 0.39 | 0.38 | 0.22 | 0.01 | 1.92 |
| Profitability | 0.15 | 0.15 | 0.08 | −0.31 | 0.90 |
| Sales at close (mil) | 3579.00 | 919.10 | 8508.00 | 1.50 | 153270.00 |
| Log (Sales at close) | 20.73 | 20.64 | 1.59 | 14.22 | 25.76 |
| Facility amount / assets | 0.22 | 0.17 | 0.18 | 0.00 | 2.45 |

Table 1.4 (cont'd)

| Variables | mean | p50 | sd | min | max |
|---|---|---|---|---|---|
| Acquisition | 0.13 | 0.00 | 0.34 | 0.00 | 1.00 |
| Backup | 0.11 | 0.00 | 0.32 | 0.00 | 1.00 |
| Corporate & working capital | 0.44 | 0.00 | 0.50 | 0.00 | 1.00 |
| Refinancing | 0.28 | 0.00 | 0.45 | 0.00 | 1.00 |
| Maturity (year) | 3.48 | 3.01 | 1.94 | 0.50 | 18.87 |
| Number of facilities | 1.32 | 1.00 | 0.63 | 1.00 | 6.00 |

Table 1.5: First Stage Regressions

| | | Oscore regressions | | | | ROA regressions | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (1) | | (2) | | (3) | | (4) | |
| Variables | | % Share/100 | | HHI/10,000 | | % Share/100 | | HHI/10000 | |
| Branch | Z1 | 0.027 | | 0.047 | * | 0.024 | | 0.045 | * |
| | | (0.030) | | (0.024) | | (0.030) | | (0.024) | |
| Branch zero | Z2 | −0.012 | | −0.033 | * | −0.009 | | −0.031 | |
| | | (0.024) | | (0.019) | | (0.024) | | (0.019) | |
| Branch one | Z3 | −0.030 | | −0.040 | ** | −0.027 | | −0.038 | ** |
| | | (0.019) | | (0.016) | | (0.019) | | (0.016) | |
| Branch two | Z4 | −0.020 | | −0.030 | ** | −0.018 | | −0.029 | * |
| | | (0.017) | | (0.015) | | (0.017) | | (0.015) | |
| Branch three | Z5 | −0.039 | ** | −0.039 | *** | −0.037 | ** | −0.038 | *** |
| | | (0.016) | | (0.014) | | (0.015) | | (0.014) | |
| Branch four | Z6 | −0.042 | *** | −0.024 | ** | −0.040 | *** | −0.023 | ** |
| | | (0.014) | | (0.012) | | (0.014) | | (0.012) | |
| Branch five | Z7 | −0.017 | | −0.011 | | −0.017 | | −0.011 | |
| | | (0.013) | | (0.012) | | (0.013) | | (0.012) | |
| Log (threesum) | Z8 | −0.014 | *** | −0.009 | ** | −0.014 | *** | −0.009 | ** |
| | | (0.004) | | (0.004) | | (0.004) | | (0.004) | |
| Syndicate reputation: lead to participant | Z9 | −0.001 | *** | −0.001 | *** | −0.001 | *** | −0.001 | *** |
| | | (0.000) | | (0.000) | | (0.000) | | (0.000) | |
| Syndicate reputation: reciprocal | Z10 | −0.051 | *** | −0.085 | *** | −0.054 | *** | −0.087 | *** |
| | | (0.020) | | (0.017) | | (0.020) | | (0.017) | |
| Comovement | | −1.090 | *** | −0.829 | ** | −1.091 | *** | −0.830 | ** |
| | | (0.291) | | (0.325) | | (0.298) | | (0.327) | |
| Zscore bad | | 0.063 | *** | 0.056 | *** | 0.070 | *** | 0.060 | *** |
| | | (0.023) | | (0.020) | | (0.024) | | (0.021) | |
| Log (Assets) | | −0.053 | *** | −0.047 | *** | −0.051 | *** | −0.045 | *** |
| | | (0.010) | | (0.008) | | (0.010) | | (0.009) | |
| Book Leverage | | 0.005 | | 0.010 | | 0.021 | | 0.020 | |
| | | (0.040) | | (0.036) | | (0.039) | | (0.034) | |
| Current assets / Assets | | 0.007 | | 0.024 | | 0.009 | | 0.026 | |
| | | (0.032) | | (0.027) | | (0.033) | | (0.027) | |
| Log (Sales at close) | | −0.013 | ** | −0.007 | | −0.014 | ** | −0.008 | |
| | | (0.006) | | (0.005) | | (0.006) | | (0.005) | |
| Profitability | | −0.180 | ** | −0.118 | | — | | — | |
| | | (0.079) | | (0.073) | | | | | |

Table 1.5 (cont'd)

| | Oscore regressions | | ROA regressions | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Variables | % Share/100 | HHI/10,000 | % Share/100 | HHI/10000 |
| Facility amount / assets | −0.212 *** | −0.225 *** | −0.212 *** | −0.225 *** |
| | (0.041) | (0.042) | (0.041) | (0.042) |
| **Fixed Effects** | | | | |
| Fiscal year | Yes | Yes | Yes | Yes |
| Borrower (Gvkey) | Yes | Yes | Yes | Yes |
| Purpose | Yes | Yes | Yes | Yes |
| **Instruments** | | | | |
| F test: $(Z1 = ... = Z10 = 0)$ | 5.30 | 8.22 | 5.27 | 8.16 |
| $Prob > F$ | 0.00 | 0.00 | 0.00 | 0.00 |
| F test: $(Z1 = ... = Z7 = 0)$ | 1.91 | 1.39 | 1.82 | 1.30 |
| $Prob > F$ | 0.06 | 0.21 | 0.08 | 0.25 |
| F test: $(Z8 = Z9 = Z10 = 0)$ | 14.55 | 23.53 | 14.54 | 23.40 |
| $Prob > F$ | 0.00 | 0.00 | 0.00 | 0.00 |
| Observations | 2,251 | 2,251 | 2,251 | 2,251 |
| Number of gvkey | 723 | 723 | 723 | 723 |
| R-squared | 0.191 | 0.265 | 0.187 | 0.263 |

Table 1.6: OLS regressions: O-score

| Variables | O-socre average | | | | O-score maturity | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | |
| % Share/100 | −0.133 | | — | | −0.156 | | — | |
| | (0.136) | | | | (0.176) | | | |
| HHI/10000 | — | | −0.204 | | — | | −0.271 | |
| | | | (0.163) | | | | (0.207) | |
| Comovement | −2.581 | | −2.608 | | −1.520 | | −1.578 | |
| | (2.428) | | (2.420) | | (2.492) | | (2.478) | |
| Zscore bad | −0.177 | | −0.173 | | −0.261 | | −0.255 | |
| | (0.150) | | (0.150) | | (0.180) | | (0.180) | |
| Log (Assets) | −0.068 | | −0.071 | | −0.155 | | −0.160 | * |
| | (0.072) | | (0.072) | | (0.097) | | (0.097) | |
| Book Leverage | −1.494 | *** | −1.495 | *** | −1.763 | *** | −1.763 | *** |
| | (0.238) | | (0.238) | | (0.321) | | (0.321) | |
| Current assets/assets | 0.037 | | 0.042 | | −0.041 | | −0.034 | |
| | (0.234) | | (0.235) | | (0.293) | | (0.294) | |
| Log (Sales at close) | 0.060 | | 0.060 | | 0.126 | ** | 0.126 | ** |
| | (0.040) | | (0.040) | | (0.056) | | (0.056) | |
| Profitability | 1.032 | *** | 1.029 | *** | 0.953 | ** | 0.946 | ** |
| | (0.364) | | (0.365) | | (0.472) | | (0.475) | |
| Facility amount / assets | −0.083 | | −0.103 | | −0.257 | | −0.289 | |
| | (0.176) | | (0.177) | | (0.231) | | (0.232) | |
| **Fixed Effects** | | | | | | | | |
| Fiscal year | Yes | | Yes | | Yes | | Yes | |
| Borrower (Gvkey) | Yes | | Yes | | Yes | | Yes | |
| Purpose | Yes | | Yes | | Yes | | Yes | |
| Observations | 2,251 | | 2,251 | | 2,251 | | 2,251 | |
| Number of gvkey | 723 | | 723 | | 723 | | 723 | |
| R-squared | 0.173 | | 0.174 | | 0.152 | | 0.153 | |

Table 1.7: OLS regressions: ROA

| Variables | ROA average | | | | ROA maturity | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | |
| % Share/100 | 0.081 | *** | — | | 0.097 | *** | — | |
| | (0.019) | | | | (0.022) | | | |
| HHI/10000 | — | | 0.100 | *** | — | | 0.119 | *** |
| | | | (0.025) | | | | (0.028) | |
| Comovement | 0.610 | | 0.605 | | −0.089 | | −0.094 | |
| | (0.434) | | (0.437) | | (0.287) | | (0.293) | |
| Zscore bad | 0.024 | * | 0.024 | * | 0.014 | | 0.013 | |
| | (0.013) | | (0.013) | | (0.016) | | (0.016) | |
| Log (Assets) | 0.057 | *** | 0.057 | *** | 0.066 | *** | 0.067 | *** |
| | (0.012) | | (0.012) | | (0.013) | | (0.014) | |
| Book Leverage | 0.104 | *** | 0.104 | *** | 0.103 | ** | 0.103** | |
| | (0.038) | | (0.038) | | (0.044) | | (0.044) | |
| Current assets/assets | 0.064 | ** | 0.062 | ** | 0.090 | *** | 0.087 | *** |
| | (0.027) | | (0.027) | | (0.031) | | (0.031) | |
| Log (Sales at close) | −0.022 | *** | −0.022 | *** | −0.026 | *** | −0.026 | *** |
| | (0.008) | | (0.008) | | (0.008) | | (0.008) | |
| Facility amount / assets | 0.097 | *** | 0.103 | *** | 0.110 | *** | 0.117 | *** |
| | (0.035) | | (0.036) | | (0.033) | | (0.035) | |
| **Fixed Effects** | | | | | | | | |
| Fiscal year | Yes | | Yes | | Yes | | Yes | |
| Borrower (Gvkey) | Yes | | Yes | | Yes | | Yes | |
| Purpose | Yes | | Yes | | Yes | | Yes | |
| Observations | 2,251 | | 2,251 | | 2,251 | | 2,251 | |
| Number of gvkey | 723 | | 723 | | 723 | | 723 | |
| R-squared | 0.155 | | 0.157 | | 0.149 | | 0.150 | |

Table 1.8: Second stage regressions: O-score

| Variables | O-score average | | | | O-score maturity | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | |
| % Share/100 | −1.025 | ** | — | | −1.467 | ** | — | |
| | (0.493) | | | | (0.673) | | | |
| HHI/10000 | — | | −1.002 | ** | — | | −1.337 | ** |
| | | | (0.433) | | | | (0.576) | |
| Comovement | −3.562 | | −3.281 | | −2.961 | | −2.477 | |
| | (2.422) | | (2.383) | | (2.498) | | (2.427) | |
| Zscore bad | −0.115 | | −0.124 | | −0.170 | | −0.190 | |
| | (0.153) | | (0.152) | | (0.185) | | (0.183) | |
| Log (Assets) | −0.118 | | −0.111 | | −0.229 | ** | −0.215 | ** |
| | (0.079) | | (0.077) | | (0.104) | | (0.102) | |
| Book Leverage | −1.500 | *** | −1.498 | *** | −1.771 | *** | −1.768 | *** |
| | (0.239) | | (0.237) | | (0.326) | | (0.322) | |
| Current assets/assets | 0.046 | | 0.067 | | −0.028 | | −0.001 | |
| | (0.227) | | (0.230) | | (0.286) | | (0.289) | |
| Log (Sales at close) | 0.046 | | 0.053 | | 0.106 | * | 0.117 | ** |
| | (0.041) | | (0.040) | | (0.057) | | (0.056) | |
| Profitability | 0.862 | ** | 0.920 | ** | 0.703 | | 0.800 | |
| | (0.378) | | (0.376) | | (0.493) | | (0.493) | |
| Facility amount / assets | −0.291 | | −0.304 | | −0.563 | ** | −0.557 | ** |
| | (0.199) | | (0.195) | | (0.274) | | (0.265) | |
| **Fixed Effects** | | | | | | | | |
| Fiscal year | Yes | | Yes | | Yes | | Yes | |
| Borrower (Gvkey) | Yes | | Yes | | Yes | | Yes | |
| Purpose | Yes | | Yes | | Yes | | Yes | |
| Observations | 2,251 | | 2,251 | | 2,251 | | 2,251 | |
| Number of gvkey | 723 | | 723 | | 723 | | 723 | |
| R-squared | 0.142 | | 0.156 | | 0.113 | | 0.134 | |

Table 1.9: Second stage regressions: ROA

| Variables | ROA average | | | | ROA maturity | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | |
| % Share/100 | 0.164 | ** | — | | 0.205 | ** | — | |
| | (0.074) | | | | (0.087) | | | |
| HHI/10000 | — | | 0.155 | ** | — | | 0.201 | ** |
| | | | (0.066) | | | | (0.080) | |
| Comovement | 0.701 | * | 0.651 | * | 0.031 | | −0.025 | |
| | (0.358) | | (0.354) | | (0.335) | | (0.334) | |
| Zscore bad | 0.018 | | 0.020 | | 0.005 | | 0.008 | |
| | (0.015) | | (0.014) | | (0.017) | | (0.016) | |
| Log (Assets) | 0.061 | *** | 0.060 | *** | 0.072 | *** | 0.071 | *** |
| | (0.012) | | (0.012) | | (0.014) | | (0.014) | |
| Book Leverage | 0.103 | *** | 0.103 | *** | 0.102 | ** | 0.103 | ** |
| | (0.035) | | (0.035) | | (0.041) | | (0.041) | |
| Current assets/assets | 0.063 | ** | 0.060 | ** | 0.089 | *** | 0.085 | *** |
| | (0.027) | | (0.027) | | (0.031) | | (0.030) | |
| Log (Sales at close) | −0.021 | *** | −0.022 | *** | −0.024 | *** | −0.025 | *** |
| | (0.007) | | (0.007) | | (0.008) | | (0.008) | |
| Facility amount / assets | 0.116 | *** | 0.117 | *** | 0.135 | *** | 0.138 | *** |
| | (0.038) | | (0.038) | | (0.041) | | (0.041) | |
| **Fixed Effects** | | | | | | | | |
| Fiscal year | Yes | | Yes | | Yes | | Yes | |
| Borrower (Gvkey) | Yes | | Yes | | Yes | | Yes | |
| Purpose | Yes | | Yes | | Yes | | Yes | |
| Observations | 2,251 | | 2,251 | | 2,251 | | 2,251 | |
| Number of gvkey | 723 | | 723 | | 723 | | 723 | |
| R-squared | 0.141 | | 0.152 | | 0.131 | | 0.143 | |

# Chapter 2

# Informational asymmetry in the syndicated loans: examining intensive and extensive margin effects

## 2.1 Introduction

A syndicated loan is a loan that is jointly offered by a group of lenders and administered and managed by a bank called the 'lead bank'. A lead bank is in charge of the due diligence of the borrower before the syndication and is also in charge of monitoring the borrower after the syndication. As a result, the lead bank has an advantage on information collection, and this leads to asymmetric information problems between the lead bank and the participant lenders.

The asymmetric information problems are adverse selection and moral hazard. The adverse selection problem comes from the fact that the lead bank may use the private information, to which the participant lenders do not have access, to syndicate low quality loans to participant lenders. This causes the participant lenders to be reluctant to participate in syndication unless the lead bank shows its commitment to the quality of the loan by holding

a large share of the loan (Leland and Pyle (1977)). On the other hand, the moral hazard is caused by not being able to observe the monitoring efforts by the lead bank. When the lead bank sells a large share of the loan, the participant lenders feel unsure of how much effort the lead bank would put into monitoring. Without commitment to the monitoring efforts, shown by how much share the lead bank holds or how concentrated the lead bank structures the syndicate, the participant lenders would not trust the lead bank to perform the monitoring duty (Holmstrom and Tirole (1997) and Lee and Mullineaux (2004)).

There are other mechanisms that relieve the asymmetric information problems within a syndicate other than the structure of the syndicate, and these mechanisms are the most important when the asymmetric information problem is severe (Sufi (2007)). The lead bank's reputation, a borrower's reputation, and relationship lending are the ones that are well-known in the literature as these mechanisms (Simons (1993), Dennis and Mullineaux (2000), Diamond (1991), and Sufi (2007)). Using these three measures, I test what are the effects of these when there are acute asymmetric information problems.

## 2.2 Motivation

In the literature, there are three identified factors that influence the structures of the syndicate and the likelihood of a loan being syndicated. First, there are the self-interested motivations of the lead bank. The lead bank wants to hold a larger share of a loan that is expected to be successful, have safe prospect of its return, or is from a reputable borrower. This could lead to adverse selection problems since the lead bank only wants to syndicate large portions of loans to relatively poor performing borrowers.

Second, the lead bank's capital constraints and diversification incentives affect the syndicate structure (Simons (1993)). The lead bank wants to diversify its loan portfolio in order to reduce its idiosyncratic credit risk; thus, the lead bank would like to hold less of a loan when adding the loan into its own portfolio increases the credit risk of it. Also, the lending limit to how much a bank can lend to a single borrower affects the lead bank's desire to sell a certain portion of the loan. This could lead to large banks having less need to syndicate a given loan than smaller banks since a large bank can diversify through holding a larger number of single-lender loans than a smaller bank could.

Third, the lead bank behaves to reduce asymmetric information in order to satisfy the requirements from the participant lenders (Sufi (2007)). When there is little information about the borrower (the asymmetric information is very severe), the participant lenders require the lead bank to hold a larger share of the loan and form a more concentrated syndicate structure. It is because the lead bank holding a larger share of the loan acts as a signal for the quality of the loan or as a commitment to the monitoring of the borrower.

Several papers in the literature show that the third factor is dominant in most cases (Dennis and Mullineaux (2000), and Ivashina (2009)). That is, the syndicate structure is more concentrated and the lead bank holds a larger share of the loan when the borrower needs extra monitoring due to lack of information available about the borrower.

Sufi (2007) empirically tests how the informational quality of a borrower affects the syndicate structure in order to solve the asymmetric information problems. He uses three mechanisms that reduce asymmetric information—borrower's reputation, lead bank's reputation, and relationship lending—to see how these work with the 'opacity' of the borrower (bad quality of information regarding the borrower). He finds that these three mechanisms

work to solve the problems especially when the borrower is 'opaque'.

However, Sufi uses Ordinary Least Squares (OLS) for his model specification, which seems inappropriate considering the characteristics of the dependent variables, percentage share held by the lead bank and Herfindahl-Hirschman Index (HHI) are bounded between 0 and 100 or 0 and 10,000. If the decisions of the lead bank regarding whether to choose to syndicate and how to structure the syndicate are driven by different incentives, the model specification may not be correct.

Following Sufi's (2007) paper, I explore the effect of a borrower's informational quality on the structure of a syndicate and the decision of syndication using tobit, logit and probit models additional to OLS models. My contributions to the literature are that I use better model specification for the syndicate structure analysis and add the analysis for the decision of whether to syndicate or not considering the quality of a borrower's information.

## 2.3 Data

### 2.3.1 Syndicated loan data

For this paper, the Loan Pricing Corporation's (LPC) Dealscan database is used to provide the sample of syndicated loans from 1982 to 2011. The Dealscan database contains dollar-denominated private loans that were issued by both bank and non-bank lenders. Between 50% to 75% of the value of outstanding commercial and industrial loans from the early 1990s are contained in the database (Carey and Hrycray (1999)), and an even higher percentage of loans are covered in the later period. The Dealscan database was complied in two primary

ways, with about half of the loans coming from SEC filings and the other half either being directly reported by the borrowers and lenders or indirectly through LPC's credit industry contacts.

The data in Dealscan provide for two main ways of defining an observational unit for a loan. The first of these is the 'package' level (also referred to as the 'deal' level), and the other possible unit is the 'facility', or 'tranche' level. The package is a more aggregated level of observation, as each package can contain multiple facilities. The facilities are the different types of loans that make up each package, such as bridge loans, lines of credit and leases, among others. In the Dealscan data, the average package contains roughly 1.34 facilities. For each facility, the Dealscan data provide detailed information about the loans, including the facility start date, loan type, lender's name, facility amount, and the share of the loan held by each lender in the syndicate at the origination, though the data do not contain information about any trading of the loan on the secondary market.

For the main unit of observation in this paper I use the package level data, following both Sufi (2007) and Ivashina (2009). Using the package as the unit of observation provides several advantages over using the facility level data. The primary reason is that loans are made at the package level, not the facility level, so each facility within a single loan contains many similarities. The lenders in the syndicate jointly decide how to invest in each facility within a package simultaneously. It is not credible to think that multiple facilities within the same package are independent observations, so using the facility level would only serve to increase the number of observations and artificially increase the statistical significance of the results. For packages with multiple facilities, I use the largest facility with an origination data the same as the overall package origination to provide the loan characteristics for my

sample, following Ivashina (2009).

### 2.3.2 Defining a lead bank

Determining which lender in a syndicate is the lead bank is difficult in the data because many of the lender titles in a syndicate are ill-defined. Most of the lenders in the sample have relatively meaningless titles that appear to have been given out so that league table credit could be awarded to as many lenders in the syndicate as possible. I follow Ivashina's (2009) method to determine the lead bank among the lenders within a syndicate with different titles. If a bank is designated as the administrative agent for the syndicate, then I consider that bank to be the lead bank since the administrative agent is the bank that conducts the monitoring of the loan. If there is no administrative agent, then I use the bank designated as the agent, arranger, book-runner, lead arranger, lead bank or lead manager as the lead bank. In my sample, 77% of the lead banks are administrative agents and 22% are listed as agents.

Using this method, it is possible to have multiple lenders appear to be the lead bank, which occurs in about 2% of the sample. When this occurs, the sum of the shares of those banks designated as lead banks are used as the lead bank share, and the lender with the larger share is used to provide the lead bank characteristics for that loan. Dropping the loans with multiple lead banks from the regressions has little effect on the results.

### 2.3.3 Model

Using both syndicated and single lender loans, equations (1) and (2) give the Tobit specification used for the model of the intensive margin of how much of a syndicated loan is held by the lead bank and how much is held by the participant lenders. A single lender loan has a lead bank share of 100, and syndicated loans have an observed lead bank share between 0 and 100. The main reason for using the Tobit model is to acknowledge in the model that there is a maximum to the dependent variable and that there is a lot of pooling at the maximum, since all single lender loans are at that value.

$$y* = x\beta + \epsilon \tag{2.1}$$

$$y = min(y*, 100) \tag{2.2}$$

To examine the extensive margin, linear probability, probit and logit specifications, as given in equations (3), (4) and (5) are used to model the decision by the lead bank to syndicate the loan or hold it as a single lender loan. All three specifications are used in order to be relatively conservative about the exact shape of the error term, and all three should provide similar results unless the results are being driven by the distributional assumptions about the error term.

$$y = x\beta + \epsilon \tag{2.3}$$

$$P(y = 1|x) = \Phi(x\beta) \tag{2.4}$$

$$P(y = 1|x) = exp(x\beta)/[1 + exp(x\beta)] \tag{2.5}$$

In both sets of regressions, the main explanatory variables of interest are the opacity dummy variable and the opacity variable interacted with the former lead for the borrower dummy variable, the market share of the lead bank variable, and the number of previous loans lent to the borrower variable. The former lead variable serves as a proxy for the informational advantage for the lead bank. The market share of the lead bank and previous loans lent to borrower variables serve as proxies for the reputations of the lead bank and the borrower, respectively. The interaction of these with opacity will provide some insight into how opaque borrowers are treated differently in the market, and whether this is because opaque firms are seen as riskier by lenders or because the opacity of a firm increases the asymmetric information in the market.

In addition to the main variables of interest, a number of controls are included for other factors that might affect the borrowers performance. The main effect of the lead banks reputation, borrowers reputation, and informational advantage of the lead bank are controlled for, as are the size of the borrowing firm and the size of the loan. Additional characteristics of the loan that are controlled for include the number of tranches in the package, and whether the package includes a term loan. Table 2.5 explains the variables in detail.

## 2.4 Regression results

### 2.4.1 Extensive margin

Table 2.2 presents the results for the extensive margin in the loan market, the decision by the lead bank to syndicate the loan or issue it as a single-lender loan. The linear probability model was used for column (1), and the probit and logit probability models were used for columns (2) and (3), respectively. The dependent variable for each regression was a dummy variable for not being syndicated, so it is zero for a syndicated loan, and one for a non-syndicated loan. The standard errors are clustered at the borrowing firm level to correct for the correlation in the error term between loans made to the same borrower.

The theory predicts that the opacity of the borrower should make the lead bank more willing to syndicate because the lead bank wants to engage in more risk-sharing for loans to opaque firms. This prediction is confirmed by both the probit and the logit regressions. The linear probability model has the correct sign but is not statistically significant.

A lead bank that was a former lead bank of the borrower in the past is also more likely to syndicate a loan than a bank without the past relationship with the borrower, which is statistically significant in all three regressions. This effect is the similar for both opaque and non-opaque firms (though somewhat smaller for opaque firms), possibly because the reasons former leads are more likely to syndicate a loan are more related to their informational advantage that is accumulated through the past experience. This confirms Sufi's (2007) finding that participant lenders are more afraid of moral hazard than adverse selection when it comes to the lead bank's informational advantage. That is, the participant lenders trust the lead bank would use the information for reducing moral hazard problem instead of using

it for selling poor-quality loans to the participant lenders.

Table 2.2 also shows interesting results regarding the market share of the lead bank. The main finding is that larger lead banks are more likely to syndicate the loan, which is both expected and consistent across all three specifications. A larger lead bank has a higher reputation, generally speaking, in addition to more capacity to serve as a lead bank than a smaller bank, which would have less capacity to perform monitoring and other tasks the lead bank needs to perform. The higher reputation and capacity of the lead bank work in favor of syndication when the borrower's information is transparent.

The interaction between opacity and the market share of the lead bank is positive: loans to opaque firms are syndicated at a slower rate than loans to non-opaque firms as the size of the lead bank grows. It is important to note that magnitude of the interaction term is smaller than that of the main term, so loans to opaque firms are still more likely to be syndicated as the market share of the lead bank gets larger, simply at a slower rate than loans to non-opaque firms would be. This suggests that lead bank's reputation does not work well to reduce the asymmetric information problems when the information regarding the borrower is opaque. That is, the reputation of the lead is not sufficient to be a substitute for the lack of information of the borrower.

The number of previous loans by a borrower, which provides a measure of borrower reputation, tends to cause a loan to be less likely to be syndicated, though with a noticeably smaller effect for opaque firms. Both of these effects are significant, and once again the magnitude of the opacity interaction effect is smaller than the main effect. This suggests that lead banks feel less need to engage in risk-sharing for firms with experience in the credit markets; the lead bank may hold a larger share of the loan to increase its profit since

a borrower with a good reputation is likely to be successful. However, the effects on the opaque firms are far smaller than on the non-opaque firms. One reason for this could be that lead banks still feel the need to diversify their loans to opaque firms because even their past experience with the credit markets does not provide a good substitute for the types of knowledge that could be learned if they were non-opaque.

### 2.4.2 Intensive margin

Tables 2.3 and 2.4 present the results for intensive margin—how the lead bank structure the syndicate. Table 2.3 uses the percentage share held by the lead bank as the dependent variable, while Table 2.4 uses the Herfindahl-Hirschman Index (HHI) of the syndicate as the dependent variable. Both provide qualitatively similar results. All regressions use robust standard errors clustered at the borrowing firm level.

The main effect of borrower opacity on the syndicate structure is statistically insignificant in my preferred specifications, the Tobit regressions presented in column (3) of each table. This could be because the informational asymmetries in the syndicated loan market are not strongly affected by the information unavailable for opaque firms, so opaque borrowers are not treated differently in the market. Alternatively, it could be because the lead banks have both the desire to diversify by holding a smaller share of opaque borrowers loans, causing opacity to reduce the share held by the lead, and the need to hold a higher percentage of the loan as a signal to other lenders that they will engage in the appropriate level of monitoring, causing opacity to increase the share held by the lead. If these two effects are of relatively equal size, then the effect of borrower opacity would be small and insignificant.

The information advantage of the lead bank also appears to affect how opaque firms are treated. If the lead bank has previously been a lead bank for the borrower, the Tobit regression shows that the lead bank will hold a smaller share of the syndicated loan, and this effect is even stronger for opaque firms. This suggests that the informational advantage of the lead bank allows it to distribute more of the loan to the participant lenders, and that this informational advantage effect is particularly strong for opaque firms, about which the participant lenders may have very little data. This result confirms Sufi (2007)'s claim that moral hazard is a bigger concern for the participant lenders when the lead bank has informational advantage.

However, reputational effects of the lender and borrower appear to have relatively little difference between opaque and non-opaque firms. The reputational effect of the lead bank is measured by the market share of the lead, and this is negative in all regressions, indicating that lead banks with high reputation can gather more participant lenders to join the syndicate. The interaction effect with opaque firms is statistically insignificant in the Tobit regression, suggesting that opaque borrowers who borrow from a lead bank with a high reputation do not benefit more than non-opaque firms. This could be because participant lenders do not find that the lender's reputation serves as a good proxy for the information they lack about an opaque firm relative to a non-opaque firm.

The borrower's reputation, as measured by the number of loans previously borrowed by the borrower, has some interesting effects on the concentration of the syndicate. The main effect of prior loans by the borrower is to increase the percentage held by the lead bank, suggesting that the lead bank is voluntarily increasing the share because it expects a high return from the loan. For opaque firms, the point estimate of this effect is much smaller in

magnitude and the joint effect is statistically insignificant. This implies that the reputation of the borrower reduces asymmetric information problems between the borrower and lenders, leading to the lead bank holding a larger share to increase its own profit. However, when it is opaque, the effect is less strong since the lead bank perceives the borrower to be risky.

### 2.4.3 Interpretation

The results regarding extensive margin imply that risk-sharing (diversification) incentive is a motivation behind syndication. Additionally, the informational advantage the lead bank has and reputation of the lead bank increase the chance of a loan getting syndicated, but the effect is less strong when the borrower is opaque. Borrower's reputation decreases the chance of getting syndicated, possibly because the lead bank would like to be a single lender of the loan to maximize its own profit. However, when the borrower is opaque, the lead bank seems to focus on risk-sharing incentive, reducing the likelihood of a loan being syndicated.

In the intensive margin analysis, unlike Sufi's (2007) paper, the three mechanisms, informational advantage—lead bank's reputation and borrower's reputation—does not seem to have more intense effect when the borrower is opaque. Only the informational advantage of the lead bank has stronger effect of reducing asymmetric information problems with opaque borrowers. Also, the borrower's reputation seems to reduce asymmetric information problems especially between lenders and borrowers, not between the lead bank and the participant lenders. This could explain why the lead bank wants to hold a larger share of the loan.

## 2.5 Conclusion

I studied the effects of asymmetric information on the syndicate structure and the decision of syndicating a loan, especially associated with the information quality of a borrower following Sufi's (2007) paper. Sufi uses Ordinary Least Squares for his regressions for the syndicate structure. However, his model specification is inappropriate considering the fact that the dependent variables, percentage share held by the lead bank and Herfindahl-Hirschman Index (HHI), are bounded between 0 and 100 or 0 and 10,000 respectively.

Using a tobit model to explain what percentage share of the loan the lead bank holds, and OLS, probit and logit model for the decision of the syndication, I compare the effect of asymmetric information problems between the intensive and extensive margin. From the extensive margin regressions, it seems that risk-sharing and diversification incentive is the main drive for syndication. Also, I find that informational advantage of the lead bank, the lead bank's reputation, and the borrower's reputation seem to reduce asymmetric information problems, but when the borrower is opaque the effect seems to be less strong compared Sufi's (2007) findings. From the intensive margin regressions, in general opacity of a borrower does not have strong effect on the syndicate structure.

There are several promising areas for future work on this topic. The variables used in this paper appear not to be ideal for measuring asymmetric information in the syndicated loan market and the reputation of the lender and borrower. The borrower's reputation, measured by the previous frequency of loans by a borrower, could mean that the borrower has very high need for borrowing money because it is risky. Also, the market share used as a reputation measure for the lead bank only care for the size of the lead bank instead of regarding its

relationship with other lenders. Finding a more direct proxy for these reputations could bring new insights into the syndicated loan market. Furthermore, examining other aspects of the decision to syndicate beyond the information asymmetries could bring a better understanding of the role of syndicated loans in financial markets.

Table 2.1: Summary statistics

| | Syndicated only | | | | |
|---|---|---|---|---|---|
| variables | mean | p50 | sd | min | max |
| number of lenders | 9.69 | 7.00 | 8.93 | 2.00 | 176.00 |
| number of lead | 1.05 | 1.00 | 0.41 | 1.00 | 9.00 |
| % held by lead | 28.82 | 22.50 | 20.80 | 0.00 | 100.00 |
| HHI | 2316.00 | 1713.00 | 1813.00 | 125.40 | 10000.00 |
| opaque | 0.51 | 1.00 | 0.50 | 0.00 | 1.00 |
| former lead | 0.47 | 0.00 | 0.50 | 0.00 | 1.00 |
| market share (mil) | 84695.00 | 19144.00 | 135775.00 | 0.25 | 795176.00 |
| previous loans by borrower | 4.20 | 3.00 | 4.45 | 0.00 | 46.00 |
| sales at close (mil) | 2921.00 | 672.40 | 10287.00 | 0.04 | 548957.00 |
| facility amount (mil) | 363.80 | 150.00 | 813.90 | 0.67 | 24000.00 |
| maturity, in days | 1382.00 | 1278.00 | 790.10 | 3.00 | 14610.00 |
| if # of tranche >1 | 0.26 | 0.00 | 0.44 | 0.00 | 1.00 |
| term indicator | 0.06 | 0.00 | 0.23 | 0.00 | 1.00 |

| | Full sample | | | | |
|---|---|---|---|---|---|
| variables | mean | p50 | sd | min | max |
| number of lenders | 6.68 | 3.00 | 8.32 | 1.00 | 176.00 |
| number of lead | 1.04 | 1.00 | 0.33 | 1.00 | 9.00 |
| % held by lead | 53.50 | 42.86 | 37.82 | 0.00 | 100.00 |
| HHI | 4980.00 | 3426.00 | 3940.00 | 125.40 | 10000.00 |
| opaque | 0.63 | 1.00 | 0.48 | 0.00 | 1.00 |
| former lead | 0.39 | 0.00 | 0.49 | 0.00 | 1.00 |
| market share (mil) | 59894.00 | 7426.00 | 118269.00 | 0.10 | 795176.00 |
| previous loans by borrower | 3.26 | 2.00 | 4.06 | 0.00 | 46.00 |
| sales at close (mil) | 2071.00 | 318.50 | 8546.00 | 0.04 | 548957.00 |
| facility amount (mil) | 245.40 | 75.00 | 678.80 | 0.08 | 24000.00 |
| maturity, in days | 1257.00 | 1096.00 | 862.70 | 3.00 | 14610.00 |
| if # of tranche >1 | 0.25 | 0.00 | 0.43 | 0.00 | 1.00 |
| term indicator | 0.09 | 0.00 | 0.29 | 0.00 | 1.00 |

Table 2.2: Extensive margin: the decision to syndicate or not

| | | Not syndicated | | | | | |
|---|---|---|---|---|---|---|---|
| | | OLS | | Probit | | Logit | |
| Dependent variable | | (1) | | (2) | | (3) | |
| opaque | | −0.095 | | −0.856 | ** | −1.648 | ** |
| | | (0.066) | | (0.421) | | (0.806) | |
| former lead | | −0.034 | *** | −0.359 | *** | −0.703 | *** |
| | | (0.008) | | (0.086) | | (0.166) | |
| opaque × former lead | X1 | −0.015 | | 0.034 | | 0.145 | |
| | | (0.013) | | (0.102) | | (0.195) | |
| ln[market share of lead] | | −0.011 | *** | −0.081 | *** | −0.144 | *** |
| | | (0.002) | | (0.017) | | (0.033) | |
| opaque × ln[market share of lead] | X2 | 0.006 | ** | 0.044 | ** | 0.083 | ** |
| | | (0.003) | | (0.019) | | (0.036) | |
| ln[1+ # previous loan by borrower] | | 0.023 | *** | 0.178 | *** | 0.313 | *** |
| | | (0.006) | | (0.060) | | (0.115) | |
| opaque × ln[1+ # previous loan by borrower] | X3 | −0.025 | *** | −0.159 | ** | −0.267 | ** |
| | | (0.009) | | (0.071) | | (0.134) | |
| ln[sales at close] | | 0.003 | | −0.001 | | 0.000 | |
| | | (0.004) | | (0.021) | | (0.040) | |
| ln[facility amount] | | −0.195 | *** | −1.122 | *** | −2.094 | *** |
| | | (0.006) | | (0.051) | | (0.093) | |
| ln[facility amount] × middle | | 0.112 | *** | 0.265 | ** | 0.370 | * |
| | | (0.014) | | (0.113) | | (0.222) | |
| ln[facility amount] × large | | 0.182 | *** | 0.766 | *** | 1.219 | *** |
| | | (0.007) | | (0.143) | | (0.341) | |
| ln[maturity, in days] | | −0.044 | *** | −0.273 | *** | −0.512 | *** |
| | | (0.005) | | (0.029) | | (0.054) | |
| if # of tranche >1 | | −0.027 | *** | −0.236 | *** | −0.424 | *** |
| | | (0.007) | | (0.051) | | (0.092) | |
| term indicator | | 0.048 | *** | 0.243 | *** | 0.460 | *** |
| | | (0.013) | | (0.076) | | (0.138) | |

Table 2.2 (cont'd)

| | Not syndicated | | |
|---|---|---|---|
| | OLS | Probit | Logit |
| Dependent variable | (1) | (2) | (3) |
| middle | −2.182 *** | −4.737 ** | −6.427 |
| | (0.266) | (2.059) | (4.045) |
| large | −3.494 *** | −14.070 *** | −22.100 *** |
| | (0.132) | (2.773) | (6.632) |
| **Dummy variables** | | | |
| Fiscal year | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes |
| Purpose | Yes | Yes | Yes |
| **Opaque interaction terms** | | | |
| F test: $(X1 = X2 = X3 = 0)$ | 4.930 | 9.670 | 9.170 |
| $Prob > F$ | 0.002 | 0.022 | 0.027 |
| F test: $(X1 = X2 = 0)$ | 2.530 | 5.790 | 6.330 |
| $Prob > F$ | 0.080 | 0.055 | 0.042 |
| F test: $(X1 = X3 = 0)$ | 6.720 | 5.160 | 4.050 |
| $Prob > F$ | 0.001 | 0.076 | 0.132 |
| Observations | 11,376 | 11,369 | 11,369 |
| R-squared | 0.634 | — | — |

Table 2.3: Intensive Margin: percentage share held by the lead bank

| | | % held by lead | | | | | |
|---|---|---|---|---|---|---|---|
| Dependent variables | | OLS (syndicated) (1) | | OLS (full sample) (2) | | Tobit (full sample) (3) | |
| opaque | | 3.162 | | −13.890 | *** | −2.571 | |
| | | (5.098) | | (5.172) | | (7.822) | |
| former lead | | −1.637 | *** | −3.788 | *** | −4.116 | *** |
| | | (0.603) | | (0.757) | | (0.879) | |
| opaque × former lead | X1 | −0.589 | | −0.253 | | −2.134 | * |
| | | (0.847) | | (0.977) | | (1.292) | |
| ln[market share of lead] | | −0.936 | *** | −1.523 | *** | −1.615 | *** |
| | | (0.195) | | (0.209) | | (0.279) | |
| opaque × ln[market share of lead] | X2 | −0.106 | | 0.735 | *** | 0.200 | |
| | | (0.219) | | (0.222) | | (0.327) | |
| ln[1+ # previous loan by borrower] | | −0.333 | | 1.184 | ** | 1.583 | ** |
| | | (0.448) | | (0.547) | | (0.654) | |
| opaque × ln[1+ # previous loan by borrower] | X3 | 0.521 | | −1.110 | | −0.966 | |
| | | (0.612) | | (0.683) | | (0.908) | |
| ln[sales at close] | | −1.161 | *** | −0.386 | | −0.764 | ** |
| | | (0.222) | | (0.254) | | (0.384) | |
| ln[facility amount] | | −5.849 | *** | −9.819 | *** | −33.440 | *** |
| | | (0.894) | | (0.384) | | (1.129) | |
| ln[facility amount] × middle | | −5.053 | *** | −5.660 | *** | 13.310 | *** |
| | | (1.059) | | (1.156) | | (1.487) | |
| ln[facility amount] × large | | 3.248 | *** | 5.323 | *** | 30.320 | *** |
| | | (0.982) | | (0.583) | | (1.209) | |
| ln[maturity, in days] | | −2.093 | *** | −3.669 | *** | −6.024 | *** |
| | | (0.380) | | (0.369) | | (0.610) | |
| if # of tranche > 1 | | −1.402 | *** | −2.313 | *** | −3.844 | *** |
| | | (0.511) | | (0.525) | | (0.780) | |
| term indicator | | 2.322 | ** | 4.373 | *** | 5.881 | *** |
| | | (1.179) | | (0.929) | | (1.743) | |

Table 2.3 (cont'd)

| | % held by lead | | |
|---|---|---|---|
| Dependent variables | OLS (syndicated) (1) | OLS (full sample) (2) | Tobit (full sample) (3) |
| middle | 87.650 *** | 86.200 *** | −240.600 *** |
| | (19.100) | (21.380) | (26.910) |
| large | −73.210 *** | −124.500 *** | −565.600 *** |
| | (17.710) | (10.980) | (21.520) |
| sigma | — | — | 26.940 *** |
| | | | (0.431) |
| **Dummy variables** | | | |
| Fiscal year | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes |
| Purpose | Yes | Yes | Yes |
| **Opaque interaction terms** | | | |
| F test: $(X1 = X2 = X3)$ | 0.350 | 4.020 | 1.790 |
| $Prob > F$ | 0.787 | 0.007 | 0.146 |
| F test: $(X1 = X2)$ | 0.410 | 5.530 | 1.440 |
| $Prob > F$ | 0.661 | 0.004 | 0.237 |
| F test: $(X1 = X3)$ | 0.450 | 1.700 | 2.680 |
| $Prob > F$ | 0.639 | 0.1836 | 0.068 |
| Observations | 7,402 | 11,330 | 11,330 |
| R-squared | 0.407 | 0.704 | — |

Table 2.4: Intensive Margin: concentration of the syndicate

| | | HHI/100 | | | | | |
|---|---|---|---|---|---|---|---|
| Dependent variables | | OLS (syndicated) (1) | | OLS (full sample) (2) | | Tobit (full sample) (3) | |
| opaque | | 0.205 | | −13.930 | *** | −4.420 | |
| | | (3.870) | | (4.861) | | (7.159) | |
| former lead | | −1.632 | *** | −3.906 | *** | −4.293 | *** |
| | | (0.475) | | (0.721) | | (0.826) | |
| opaque × former lead | X1 | −0.436 | | −0.176 | | −1.726 | |
| | | (0.686) | | (0.959) | | (1.250) | |
| ln[market share of lead] | | −0.749 | *** | −1.414 | *** | −1.485 | *** |
| | | (0.143) | | (0.193) | | (0.248) | |
| opaque × ln[market share of lead] | X2 | 0.008 | | 0.740 | *** | 0.270 | |
| | | (0.167) | | (0.208) | | (0.300) | |
| ln[1+ # previous loan by borrower] | | −0.121 | | 1.431 | *** | 1.813 | *** |
| | | (0.369) | | (0.533) | | (0.626) | |
| opaque × ln[1+ # previous loan by borrower] | X3 | 0.317 | | −1.516 | ** | −1.377 | |
| | | (0.508) | | (0.676) | | (0.884) | |
| ln[sales at close] | | −0.518 | *** | 0.029 | | −0.140 | |
| | | (0.180) | | (0.257) | | (0.371) | |
| ln[facility amount] | | −9.454 | *** | −11.830 | *** | −36.870 | *** |
| | | (0.748) | | (0.407) | | (1.128) | |
| ln[facility amount] × middle | | −1.477 | * | −3.522 | *** | 16.410 | *** |
| | | (0.882) | | (1.177) | | (1.481) | |
| ln[facility amount] × large | | 6.693 | *** | 7.147 | *** | 33.480 | *** |
| | | (0.802) | | (0.574) | | (1.196) | |
| ln[maturity, in days] | | −1.117 | *** | −3.444 | *** | −5.301 | *** |
| | | (0.325) | | (0.363) | | (0.574) | |
| if # of tranche >1 | | −1.191 | *** | −2.239 | *** | −3.812 | *** |
| | | (0.433) | | (0.525) | | (0.761) | |
| term indicator | | 1.067 | | 3.791 | *** | 4.630 | *** |
| | | (0.994) | | (0.928) | | (1.682) | |

Table 2.4 (cont'd)

| | HHI/100 | | |
|---|---|---|---|
| Dependent variables | OLS (syndicated) (1) | OLS (full sample) (2) | Tobit (full sample) (3) |
| middle | 23.230 | 45.510 ** | −296.800 *** |
| | (15.860) | (21.730) | (26.760) |
| large | −135.200 *** | −159.000*** | −622.800 *** |
| | (14.380) | (10.640) | (21.190) |
| sigma | — | — | 26.250 *** |
| | | | (0.413) |
| **Dummy variables** | | | |
| Fiscal year | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes |
| Purpose | Yes | Yes | Yes |
| **Opaque interaction terms** | | | |
| F test: $(X1 = X2 = X3)$ | 0.190 | 5.080 | 2.090 |
| $Prob > F$ | 0.901 | 0.002 | 0.100 |
| F test: $(X1 = X2)$ | 0.200 | 6.390 | 1.200 |
| $Prob > F$ | 0.817 | 0.002 | 0.301 |
| F test: $(X1 = X3)$ | 0.280 | 3.020 | 3.080 |
| $Prob > F$ | 0.754 | 0.049 | 0.046 |
| Observations | 7,448 | 11,376 | 11,376 |
| R-squared | 0.490 | 0.729 | — |

Table 2.5: Variable Description

| **Variable** | **Definition** |
|---|---|
| opaque | (dummy) 1 if the borrower firm is private or unrated |
| former lead | (dummy) 1 if the lead bank is a former lead of the borrower |
| ln[market share of lead] | lead bank's market share, by amount, in the previous year of the loan origination |
| ln[1+ # previous loan by borrower] | log(1+ number of previous loans by the borrowing firm) |
| ln[sales at close] | log(borrower's sales at the loan origination) |
| ln[facility amount] | log(amount of the largest facility within a loan package that starts at the loan orgination) |
| ln[maturity, in days] | maturity of the largest facility within a loan package that starts at the loan origination date |
| if # of tranche >1 | (dummy) 1 if the number of tranches is bigger than 1. |
| term indicator | (dummy) 1 if the deal includes term loan |
| middle | (dummy) 1 if the size of the facility is middle 1/3. |
| large | (dummy) 1 if the size of the facility is large 1/3. |
| % held by lead | percentage share held by the lead bank of the loan |
| HHI | sum of the squares of lenders' share percentages (maximum value is 10,000) |
| not syndicated | (dummy) 1 if the loan is a single lender loan instead of syndicated loan. |

# Chapter 3

# Survey of the syndicated loan market

## 3.1 Introduction

In this paper, I explain and explore the literature of syndicated loan market. First, I describe the theories regarding the syndicated loans and then summarize the empirical work done in this topic.

A syndicated loan is positioned between a traditional bilateral loan and a public debt. It is close to bilateral loan that banks are monitoring the borrowing firm due to asymmetric information problems. On the other hand, syndicated loans are close to public debt; there could be many lenders who share the risk of the debt, and as the number of lenders increase, the cost of renegotiating the debt contract increases.

The main focus of studies in the syndicated loan literature is regarding how to resolve asymmetric information problems between borrowers and lenders or between the lead bank and the participant lenders. The problems between a borrower and lenders are focused on how to screen borrowers using the borrower's reputation to reduce moral hazard problems. Also, the lead bank's reputation and its show of commitment to the loan are known to solve the problems between the lead bank and participants.

## 3.2 Theories

The syndicated loan market does not have its own unique theory literature. Instead, the syndicated loan literature draws from the theoretical literature on bilateral loans and public debts to serve as the theoretical foundations for many of its studies since syndicated loans contain many similarities to both bilateral loans and public debts.

Of particular importance to the syndicated loan market are theories about asymmetric information, moral hazard problems, and the monitoring of borrowers by banks. In the syndicated loan market, lenders are often faced with an informational asymmetry when dealing with borrowers since information regarding these borrowers is not transparent due to their limited experience with financial markets in general. Moral hazard problems also arise in syndicated loans since the lead bank has incentives to manipulate the syndicate structure for their own benefit. The lead bank has more information about the borrower than any of the other lenders in the syndicate, so the lead bank would want to hold a smaller share of loans to low-quality borrowers and a higher share of loans to high-quality borrowers to maximize efforts. Monitoring issues are important to syndicated loans since typically only the lead bank puts in effort to monitor the loan, so their incentives for effort could vary with the structure of the syndicate.

Diamond (1991) talks about how the borrower's reputation measured by credit ratings reduces the asymmetric information problems between the borrower and lenders. He analyzes the decision to borrow from public debt or from a bank that monitors to reduce moral hazard problem. He suggests that borrowing from a bank adds values to the borrower not only through getting financed but also by building its reputation. That is, when the

borrower is new to the market, it needs to borrow from a bank to build its reputation through accumulating credit records by getting monitored, and then later the borrower may be able to borrow directly through public debt.[1] The main result from Diamond's (1991) paper is that when the borrower has an intermediate level of reputation, it borrows from a bank, and a borrower with a high reputation borrows directly though a public debt. This is because that a borrower with a high reputation is afraid of losing its reputation, resulting in an increase to its cost of capital.

Adverse selection problems between the lead bank and the participant lenders can be resolved through signaling by the lead bank. Leland and Pyle (1977) explain that when there are asymmetric information problems, the informed agents should signal their commitment to the project by investing in the "project" (syndication). Without the information transfer by the informed agents, the market would collapse like the market for lemons (Akerlof (1970)). This theory paper's results are interpreted in the literature as the lead bank, which has more information about the borrower, should hold a larger share of the loan to signal the true quality of the loan.

The lead bank holding a larger share of the loan also works as to increase the intensity of the monitoring by the lead bank. Holmstrom and Tirole (1997) find that intermediaries' monitoring intensity increases when monitoring capital, which is capital invested by intermediaries who participate in monitoring activities, increases relative to the borrowing firm's capital. In the literature, the theory is used as a reason that the lead bank should hold a larger share of the loan in order to assure the participant lenders that it will do the appro-

[1]The reason for the need of a bank's monitoring is that delegated monitoring of the borrower by intermediaries is more efficient than individual lenders' effort to monitor (Diamond 1984).

priate level of monitoring of the borrower. That is, when the payoff of the lead bank is tied to the loan's performance, it will perform more monitoring than when it is not.

## 3.3 Empirical works

### 3.3.1 Incentives of the lead bank

The lead bank has a variety of incentives regarding how to syndicate a loan, so empirical work has examined how the lead banks choose to syndicate their loans. Adverse selection theory suggests that the lead bank would want to hold a small share of low-quality borrowers' loans and a high share of high-quality borrowers' loans in order to maximize their profits. On the other hand, moral hazard models would support a need for the lead bank to hold a large share of loans in order to increase their monitoring efforts. The need for diversifying their loan portfolio also plays a role in how the lead banks choose the share of the syndicated loan that they hold themselves. Empirical work has attempted to differentiate these effects and determine which play a large role in how the lead bank syndicates loans.

Using data from the Shared National Credit Program, Simons (1993) tests whether the lead bank exploits the participant lenders by syndicating a larger fraction of bad loans to the participant lenders or not. In 1977, the Shared National Credit program was formed by the Board of Governors of the Federal Reserve System, the Federal Deposit Insurance Corporation, and the Office of the Comptroller of the Currency to supply systematical and fair review and classification of syndicated loans of at least $20 million. Under the program, each syndicated loan was evaluated at the lead bank level once a year, and the same classification

was applied to the participant lenders.

She uses the loan classifications from the program as a proxy for the riskiness of the loan to test whether the lead bank takes advantage of the private information of the borrower. The measure is not perfect in the sense that it is ex post measure instead of ex ante, but there is not a better alternative measure that can capture the private information the lead bank has before the syndication. She claims that the ex post measure captures the private information about the loan that the lead bank had because the prediction about the loan is realized ex post.

The results of her regressions suggest that syndication activity is motivated by capital constraints and diversification rather than by exploiting uninformed participant lenders. That is, when the lead bank has more capital and is less constrained by the lending limit, the lead bank holds a larger share of the loan, and vice versa. Also, the lead bank does not take advantage of the participant lenders because the lead bank tends to hold a larger share of risky loans. She argues that perhaps that is because the lead bank is concerned about maintaining its reputation in the syndicated loan market.

Based on Simons' (1993) paper, Dennis and Mullineaux (2000) further investigate the decision to syndicate the loan and how much share of the loan the lead bank holds. Diamond (1991) claims that as the information regarding a borrower gets more available, the need for monitoring decreases and the loan becomes more marketable. Using that idea, they show empirically that when the information about the borrower is more "transparent" (there are credit ratings on the borrower, or the borrower is listed on stock exchange), the loan is more likely to be syndicated than compared to the when the information is "opaque". Also, as the information gets more transparent, the portion of the loan getting syndicated increases.

They also find that the lead bank's reputation, which is the frequency of the transaction between the lead bank and a participant lender, reduces agency problems and increases the likelihood of syndication and the portion of loan that is syndicated.

Panyagometh and Roberts (2002) support Dennis and Mullineaux (2000)'s findings and also finds that the existence of performance pricing reduces asymmetric information problems resulting in increases in the syndicated portion and the likelihood of syndication. Performance pricing is a pricing technique where the loan's spread, added to the prime rate or LIBOR rate, depends on the following borrower's performance, such as accounting measures or debt ratings. With it, participant lenders feel at ease when there is severe informational disadvantage for them since they will be compensated properly when the borrower's performance changes.

### 3.3.2 Syndicate structure

The structure of a syndicated loan can be influenced by a number of factors. The key components of a syndicated loan's structure are how concentrated it is—how much of the loan is held by a handful of large lenders—and how big it is—how many lenders are in the syndicate. A low level of concentration in a syndicate has the benefit of making it easier for a large number of lenders to diversify their loan portfolio, while a high level of concentration can provide benefits to the lenders by simplifying the administration of the loan and by increasing the level of monitoring of the borrower the syndicate does.

Preece and Mullineaux (1996) study the response to announcements of commercial and industrial loans in the marketplace and find that the positive response to loans are smaller

as the number of lenders within a syndicate increases. They test the hypothesis that the ease of renegotiating a private loan is a value to borrowing firms compared to public debt. It is known that as the number of lenders increase, the cost of renegotiating the loan in times of crisis increases as well. This structure of the loan is less valuable to the borrower as the structure gets more complex, so the response to the announcements of the loan should be negative. Their empirical results support this hypothesis, and they conclude that when there are announcements of a private loan, in addition to the positive effect of monitoring expertise provided by banks, there is another positive effect driven by the ease of renegotiating the loan if the loan structure is concentrated.

Esty and Megginson (2003) investigate how legal risk—the extent of the legal rights creditors have and how strong the local enforcement of those rights are—affect the concentration of syndicate structure. They argue that the legal risk should affect syndicate structure since syndicate structure is formed to improve corporate governance by banks.

An increase in legal risk could lead to three possible effects, driven by corporate governance incentives, on the syndicate structure. First, monitoring by banks becomes more important because managers of borrowing firm could misuse its cash flows for their own benefits. Second, the need for re-contracting may be more significant because economic defaults may increase. These two effects would increase the concentration of the syndicate structure when the legal risk is high. However, if banks want to prevent strategic default, they would decrease the syndicate concentration to make it more difficult for restructuring when the legal risk is high. By making the syndicate size larger and more spread-out, the lenders are causing strategic default to be not beneficial to the borrowing firm. It is because that the in case of default, the restructuring would be costly and the lenders who are wronged would

not lend to the firm in the future.

From the empirical research using international project finance loans, they conclude that the mentioned effects exist. That is, banks perform their role as monitors and helper in case of financial distress by reducing re-contracting cost when legal risk is low—when creditors have high level of protections from local legal enforcement. On the other hand, banks structure their syndicate so that the benefit of strategic defaults gets very low when the legal risk is high.

Lee and Mullineaux (2004) studies the systemic patterns of size and structure of syndicates. They find that syndicate structures are formed to increase monitoring efforts by the group of lenders and the speed of renegotiation when the borrower becomes distressed. When the syndicate is small and has a concentrated structure, there are less free-riding problems with monitoring efforts, leading to more efficient monitoring. Also, it leads to faster renegotiation of a distressed loan since syndicate contracts require majority voting or unanimous consent for restructuring the loan. According to them, the syndicate size is larger and the structure is more spread out when there are fewer worries regarding the borrower's performance. That is, when the lead bank has a good reputation, and the borrower is expected to be successful, the syndicate structure is more dispersed.

Sufi (2007) finds empirical results that support theories regarding asymmetric information and monitoring intensity. According to Diamond (1991), when the borrowing firm is not well-known in the market, it needs to be monitored by banks to reduce the asymmetric information problems. Using availability of SEC filings and credit ratings as a measure of information about the borrower that is known, Sufi shows that the lead bank tends to "hold a larger share of the loan and form a more concentrated syndicate" when the borrowing

firm is "opaque"—without SEC filings (private) and without credit ratings (unrated). This finding could be applied to the interpretation of Diamond (1991) paper; syndicated loans for borrowers with low reputation are similar to single-lender loans, but the loans for borrowers with high reputation are similar to public debt. He also finds that borrower and lead bank's reputation reduces the asymmetric information problems but cannot eliminate the problems entirely. Another important finding of his paper is that the lead bank chooses participant lenders who are close to the borrower, geographically and relationship-wise, to relieve the asymmetric information problems when information about the borrower is opaque.

### 3.3.3 Covenants

Many syndicated loans include covenants that provide additional conditions to the loan that the borrower must meet. These covenants can be used by the lenders to provide additional leverage over the borrower, especially in cases where the covenants are violated. How exactly the use of covenants affects the borrowing firm is an important empirical question.

Chava and Roberts (2008) explore the relationship between financing and investment, especially the relationship between covenant violations and investment. For their study, they use "technical defaults", violations of financial covenants such as minimum net worth or current ratio covenants. When a covenant is violated, control rights of the firm move to the creditor, and he can use this power to accelerate the loan. However, usually the creditor threatens the borrowing firm with accelerating the loan in order to make the borrower to choose the creditor's desired actions. They explain that in most cases covenant violations are not results of financial difficulty and do not lead to acceleration of the loan. Using the

discreet movement of the covenant violations, they use regression discontinuity design as their empirical method to discover the effect of control right transfer on investment.

From the regressions, they find that a covenant violation that leads to transfer of control rights reduces significant amount of investment. The reduction in investment could be interpreted as that the creditor is prohibiting the agent from making bad investments or punishing him for not behaving properly. They also find that borrowers with severe asymmetric information problems have a serious decline in their investment after covenant violations.

### 3.3.4 Pricing

The determinants of the loan spread for syndicated loans are another important area of research. The pricing of a loan is strongly related to the structure of the syndicate for a variety of reasons, caused by incentives of both the lead bank and participant banks.

Ivashina (2009) inquires regarding the effect of asymmetric information problems between the lead bank and participant lenders on the spread of the loan. It is implied in theory papers that the ownership of the lead bank reduces the asymmetric information between the lead bank and participant lenders. However, for the lead bank, holding a larger share of the loan gives it higher exposure of idiosyncratic risk, which makes their loan portfolio vulnerable and risky. As a result, higher level of ownership by the lead bank (higher share of the loan held by the lead bank) has two opposite effects on the spread of the loan. First, when the lead bank holds a larger share of the loan, it reduces asymmetric information problems, both moral hazard and adverse selection, reducing the premium demanded by the participant lenders. Second, the lead bank requests higher level of premium because holding a larger

share of the loan increase its credit-risk exposure. Thus, the loan spread is affected by the two opposite effects, driven by asymmetric information and diversification, simultaneously. Since the data only shows the equilibrium spread that is determined by these two effects, in order to identify the asymmetric information (adverse selection and moral hazard) effect, she uses instruments that are exogenous to asymmetric information.

Identifying the effect of asymmetric information problems on the loan spread is possible with an instrument that only affects the diversification effect of the lead bank. When drawing two graphs regarding the two opposing effects, the relationship between the spread and the lead bank's share has a positive sign when it comes to diversification. It is because as the lead bank holds a larger share, the lead bank requires higher spread to compensate it for doing so. One the other hand, the relationship has a negative sign when it comes to adverse selection and moral hazard, since the participants lenders would require less of the spread if the lead bank holds a larger share of the loan. By moving the diversification relationship curve up and down using an instrument, we can identify the equilibrium spreads and the shares as the instrument's value changes, which enable us to identify the adverse selection and moral hazard curve.

She uses the changes in the idiosyncratic risk of the lead bank's loan portfolio and lending limits as instruments and find that the share of the loan held by the lead bank effectively lowers the spread of the loan, cost of borrowing, because the ownership of the lead bank reduces asymmetric information problems. Her findings demonstrate that asymmetric information between the lead bank and the participant lenders affects the capital cost. Additionally, the results imply that banks with diversified loan portfolios are in an advantageous position because their superior ability to offer financing options with low cost to the borrower.

## 3.4 Conclusion

I examine and outline major studies in the syndicated loan literature in this paper. It is obvious that the effect of asymmetric information problems, both caused by adverse selection and moral hazard, are the main focus of the studies. A syndicated loan is different from a traditional bilateral loan in a sense that there are two layers of asymmetric information problems. The problems between the borrower and the lenders have been dealt with extensively by the main-stream banking literature. However, the additional layer of the problems between the lead bank and the participant lenders is still somewhat new and unexplored, and that is where the syndicated loan literature is focused.

The most unclear part of the syndicated loan is regarding how the lead bank behaves, especially regarding adverse selection and moral hazard. It is mainly due to a lack of data because no lead bank would admit to their wrongdoings while conducting their business. All we can do is find a pattern in the behaviors of lead banks, based on the data we have and theories in the banking literature. Although it may not be perfect, there have been many findings that help us to understand how lead banks make decisions, especially when the borrower has severe asymmetric information problems.

# APPENDIX

# Appendix A

# How to calculate O-score

We follow the method of Chen and Zhang's (2009) O-score calculation based on Ohlson (1980, Model One in Table 4) to construct the O-score, which is a measure of predicted bankruptcy probability:

$$O-score = -1.32 - 0.407log(MKTASSET/CPI) + 6.03TLTA - 1.43WCTA + 0.076CLCA - 1.72OENEG - 2.37NITA - 1.83FUTL + 0.285INTWO - 0.521CHIN \quad \text{(A.1)}$$

We use the Compustat quarterly data and make a quarterly O-score calculation then make an average for each fiscal year to make the yearly O-score. Table A.1 explains how the ratios are constructed using Compustat quarterly data.

Table A.1: O-score calculation

| Variable | Definition | Compustat quarterly item |
|---|---|---|
| MKTAS-SET | Total liabilities + Market Equity | LTQ + CSHOQ × PRCCQ |
| CPI | Consumer Price Index | |
| TLTA | Leverage Ratio = book value of debt/Market assets | (DLCQ + DLTTQ) / MKTAS-SET |
| WCTA | Working capital/market assets | (ACTQ − LCTQ)/MKTASSET |
| CLCA | Current liability/Current assets | ACTQ/LCTQ |
| OENEG | 1 if total liabilities > total assets or 0 otherwise | 1 if LTQ > ATQ or 0 otherwise |
| NITA | net income/market assets | NIQ/MKTASSET |
| FUTL | the fund provided by operations/liability | PIQ / LTQ |
| INTWO | 1 if net income < 0 for the last two years and 0 otherwise. | 1 if NIQ < 0 for the last two years and 0 otherwise. |
| CHIN | $(NIt - NIt - 1)/(\|NIt\|+\|NIt - 1\|)$, where NIt = net income for the most recent quarter | $(NIt - NIt - 1)/(\|NIt\|+\|NIt - 1\|)$ where NIt = NIQ, NIt-1 = previous quarter's NIQ |

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