Monitoring, Financial Distress, and the Structure of Commercial Lending Syndicates

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We examine the size and composition of commercial lending syndicates. Syndicates are smaller and more concentrated when there is little information about the borrower, when credit risk is relatively high, and when a loan is secured. This suggests syndicates are structured to enhance monitoring efforts and to facilitate renegotiation if borrowers become financially distressed. Since loan sales can change a syndicate's structure, lead banks often constrain such activity. Limiting resales results in larger, more diffuse syndicates at the loan origination stage, however. Syndicates also grow larger and more diffuse when arrangers are more reputable, when loans have longer terms to maturity, and when borrowers hold more growth options. Our results are robust in a sample restricted to borrowers with traded equity or with credit ratings. The findings for composition likewise are robust when we control for potential endogeneity bias and for the influence of syndicate size on composition.

The syndicated loan market has become the largest source of firm financing worldwide. And with only a few exceptions, academic researchers have ignored this important market. Simons (1993), Dennis and Mullineaux (2000), and Jones, Lang, and Nigro (2000) examine the factors that influence banks to engage in syndication, while Altman and Suggitt (2000) study default rates on syndicated loans. Panyagometh and Roberts (2002) examine the techniques lead arrangers use to control agency problems within syndicates.

A syndicate represents a team or alliance formed to provide finance to a particular borrower. Several studies of the impact of loan announcements on firm value focus on the syndication market, including Megginson, Poulsen, and Sinkey (1995) and Preece and Mullineaux (1996). There is virtually no published research on the size and structure of commercial lending syndicates, however. Esty and Megginson (2003) examine the market for project finance, an interesting but very small segment of the syndicated loan market, focusing primarily on the impact of political risk on syndicate structure in global banking markets.

We analyze the factors that influence commercial loan syndicate size and composition more generally. Syndicated loans are interesting because they represent a hybrid of traditional bank loans and capital market instruments, or, in the language of Boot and Thakor (2000), a mix of "relationship loans" and "transactions loans." Syndication also involves elements of commercial and investment banking; syndicated loans are sold in a process similar to bond underwriting. While a high percentage of individual syndicated loans have come to be rated by Moody's or Standard and Poor's, evidence provided by Dennis and Mullineaux (2000), Jones et al. (2000), and Panyagometh and Roberts (2002) indicates there is a significant relationship aspect to syndicated lending.

The size and structure of syndicates also involve issues addressed in organization theory since syndication amounts to outsourcing the financing component of a loan transaction.[1]

[1]Barzel, Habib, and Johnsen (2000) describe a syndicate as an "ad hoc firm."

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Arrangers can influence syndicate structure in a number of ways. Because the lead arranger typically holds a portion of the loan in its portfolio, it has concerns about the monitoring efforts and resale activities of the group members after the loan is distributed. The structure of a syndicate will be an issue particularly if the borrower becomes financially distressed, as any resolution must be approved by the entire lending group. The prospects for agreement will depend on the size and composition of the syndicate.

The actions of the lending group before and *after* the loan closes are a key part of the overall monitoring process. We study how originators control the monitoring incentives of syndicate members. Our models are intended to address questions as follows:

1. What factors influence the size and composition of a group formed to provide funds to a corporate customer?
2. Are syndicates structured *ex ante* to facilitate monitoring and efficient resolution of the problems of financially distressed borrowers?
3. When arrangers take actions to control syndicate structure after the loan closes (by constraining resales), how is the original structure of the syndicate affected?

The equilibrium structure of a syndicate reflects the outcome of a complex set of negotiations and actions involving the borrower, the arranger, and the participants. Smaller and more concentrated lending groups allow arrangers to minimize the costs of managing a group lending process, to prevent free riding, and to resolve problems of financial distress more efficiently.[2] Lead banks cannot precisely control syndicate size or composition, however, since participant and borrower behavior also influence the structure of a lending group. For example, if syndicate members primarily prefer small to large pieces of a loan, a syndicate will be larger and more diffuse.

We initially estimate models that explain syndicate size as reflected in the number of lending institutions. We examine the respective roles of information and agency costs, credit risk, the arranger's reputation, and the relevance of certain loan characteristics such as maturity and collateral. We also study a phenomenon that is unique to loan syndications—restrictions on loan resale activity. Public debt underwritings never include restrictions on subsequent sales of the issues purchased. The fact that loan syndications commonly do is consistent with the relationship aspect of bank lending.

We also estimate a model of the determinants of the proportional holdings of the syndicate members as reflected in the Hirschman-Herfindahl index (HHI) for the lending group. Incentives to monitor within the lending group depend on proportional holdings of the members, and the HHI by construction captures both elements. While the syndicate participants have delegated certain monitoring functions to the arranging bank, little is known about the extent of group monitoring after a loan has been made. Carey, Prowse, Rea, and Udell (1993) contend there is little *ex post* monitoring in the bond market, no doubt because the representative bond is diffusely held.

The syndication market may differ. Syndicate participants holding large and similar loan portions have stronger incentives to monitor, while members holding small and dissimilar stakes may engage in free riding or become hold outs in the event of renegotiation. Evidence that syndicate structure responds systematically to information or agency costs and to

[2]There is a potential trade-off with respect to fee income, however. The lead bank shares some loan fees with syndicate participants. Since higher fees are paid to banks taking larger portions of the loan, arrangers can enhance their own fees by offering only relatively small pieces of the loan to potential participants. Esty (2001) provides an example of how fees are allocated in syndications.

prospects of default would imply that group monitoring matters in the loan market.

We find that syndicate structure responds in predictable ways to the quality of information about the borrower. Credit risk is also an important influence on syndicate organization. Syndicates are smaller and more concentrated when there is a greater prospect of borrower default, presumably to facilitate the resolution of problems associated with financial distress.

A novel result is that actions by arrangers to restrict participant loan resales are associated with larger and more diffuse syndicates at the loan origination stage. To gain more control over post-closing changes in lending group structure, arrangers must accept an original syndicate structure more inimical to the efficient resolution of borrower distress.

Loan characteristics also affect syndicate size and composition, typically in ways consistent with the relevance of credit risk and the attendant prospects for financial distress. The arranger's reputation plays a systematic role too, but the results imply free riding may be an implicit cost borne by highly regarded institutions.

I. Lending Syndicates in the Literature

Dennis and Mullineaux (2000) analyze when there might be multiple lenders rather than one. They find loans are more likely to be syndicated as information about borrowers becomes more transparent. This result is consistent with the so-called life-cycle model of borrowing propounded by Diamond (1991) and Carey et al. (1993).

Borrowers shift from private sources of funds (such as venture capital, commercial banks, and commercial finance companies) to public debt markets as they grow larger, disseminate higher-quality information, and develop a reputation by consistently repaying their debt obligations. Syndicated loans are a hybrid of private and public debt, and Dennis and Mullineaux (2000) suggest that a loan becomes more marketable as adverse selection problems become less severe.

They also find that certain loan characteristics influence salability. Longer-term loans are more likely to be syndicated than shorter-term financing, for example. Given that an originating bank has decided to syndicate a loan, a larger portion can be sold to syndicate participants if the loan is unsecured.

A significant literature argues that the seller's reputation can mitigate agency problems in loan sales or syndications (see Gorton and Pennachi, 1995, and Pichler and Wilhelm, 2001). Dennis and Mullineaux (2000) confirm this view, finding that a loan is more likely to be syndicated when the originating institution has a longer history of repeat transactions with particular participants in a syndicate. They also find that reputable arrangers sell off larger portions of the loans they syndicate.

Panyagometh and Roberts (2002) note that lead banks take steps to resolve conflicts of interest in lending syndicates. They demonstrate that performance pricing covenants and lender reputation enhance the salability of loans and that arrangers retain greater portions of loans to borrowers that are subsequently downgraded in their portfolios. Like Esty and Megginson (2003), Panyagometh and Roberts focus on the proportional holdings of the lead institution. Our focus is instead on the ownership of all the members of the lending group.

Altman and Suggitt (2000) present the first systematic study of default rates on large syndicated loans over 1991-1996. They find mortality rates on bank loans are quite similar to those on corporate bonds measured cumulatively over a five-year period, but syndication default rates are relatively higher in the two years following issuance. As the average effective maturity on a syndicated loan is 18 months, the greater apparent credit risk on syndicated

credits is highly relevant to lenders and regulators.

While researchers have turned some attention to this important source of finance, little systematic work addresses the structure of loan syndicates themselves. By structure, we mean the size of the syndicate (number of participants) and its composition (relative share holdings).

As Pichler and Wilhelm (2001) note, a syndicate is a unique construct as it is a group formed to carry out a well-defined function that is by nature a temporary alliance; a syndicate disbands when a loan is repaid. A large literature addresses agency costs in a team production setting, but these problems are likely to be even more severe when the team is an ephemeral creation. Pichler and Wilhelm (2001) provide a formal analysis of how a syndicate's organizational structure can develop as a contractual response to the relationship-intensive nature of finance. They focus on investment bank underwriting syndicates, but the logic applies to commercial lending syndicates as well.

In fact, the lead arranger in a lending group typically holds a portion of the credit in its portfolio (as do other participants), while investment bank underwriters do not. Consequently, relationships are potentially more relevant to lending syndicates than to underwriting groups.[3]

Syndication bears many similarities to debt underwriting, but also some critical differences. In both cases, a corporate borrower seeking to raise a relatively large amount of funds approaches one or more financial institutions to commit for the full amount.[4] This lead institution then negotiates the terms of the transaction, prepares a memorandum with descriptive and financial information, and meets with prospective participants in the lending or underwriting group. The loan arranger acts as book runner for the deal, and with borrower input identifies the institutions invited to participate. The lead bank also establishes the bracket amounts, indicating, for instance, that it seeks interests in amounts of $10, $25, or $50 million. Participants taking larger pieces of the transaction receive more prestigious titles (manager and co-manager are more impressive than participant, for example). Esty (2001) provides an overview of the syndication process, focusing on a large transaction led by Chase Manhattan (now JP Morgan Chase).[5]

The sense in which loan syndications differ from underwritings reflects the relationship aspect of bank loans. The borrower can play a significant role in identifying and selecting members of the lending group, for instance, depending on past or potential banking relationships. Borrowers also have concerns about lender identities because each participant has complete contractual rights and responsibilities and consequently is a full partner in any significant loan restructurings. Since post-closing sales of the loan affect lender identities, borrowers sometimes require consultation and/or consent for loan resales.

The arranger likewise has concerns about the identities of the group members, especially in the case of financial distress, and also can act to influence resale activities. Unlike a lead investment bank, which distributes securities to participants for the purpose of resale to capital market investors, loan syndicate arrangers often require consent for subsequent sales or establish minimum size requirements for any resales. We investigate whether constraints that let the manager influence the structure of the syndicate after the loan closes influence the initial composition of the syndicate.

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[3]Lerner (1994) studies the role of syndicates in venture capital funding.

[4]Loans, like bonds, can be syndicated on a "firm commitment" or "best efforts" basis. Likewise, a borrower can seek bids from a set of potential lenders or negotiate the deal with a relationship lender or investment bank. Firm commitments and negotiated deals are the norms in both markets.

[5]Rhodes (1996) also provides an extensive institutional discussion of the syndication process.

II. What Determines Syndicate Size and Concentration?

The size and composition of a syndicate involve explicit and implicit cost/revenue trade-offs. From a cost viewpoint, arrangers should prefer small to large groups, as management expenses increase with number of syndicate participants. Banks specializing in syndication, however, may be able to exploit scale economies in managing the menu of expenses and consequently structure larger lending groups. And institutions seeking to develop or maintain a reputation in syndication presumably seek to form larger groups, since reciprocity and repeat dealing are critical components of reputation formation. Arrangers can enhance their fee income by forming a large lending group with relatively small proportional holdings.

A. Theory

The composition of a lending syndicate becomes especially important in the event the borrower becomes financially distressed. Asquith, Gertner, and Scharfstein (1994) note that banks can respond to distress in different ways. They can relax financial constraints on the borrower by waiving covenants or deferring interest or principal payments. Or they can tighten these constraints by accelerating principal payments, reducing lines of credit, or seeking additional collateral. Banks can also decide to do nothing.[6]

In a syndication setting, distress is more complicated because the lending banks must reach a collective decision. The process for resolving distress is specified in the syndication agreement. The typical mechanism involves majority voting in response to technical defaults and decisions to waive or alter covenants, but unanimous consent for any changes to loan rate, maturity, collateralization, or amortization schedules in the restructuring process (see Hurn, 1990).[7]

Bolton and Scharfstein (1996) observe that the outcome of negotiations in debt restructurings is affected by the number of creditors, by the allocation of security among the set of creditors, and by the character of the stringency of the voting roles among the creditors. In a syndicate setting, all the participants are either fully secured or unsecured and the voting rules in distress typically are conditioned on the nature of the default. The Bolton-Scharfstein (1996) model predicts that firms with high credit risk will borrow from fewer lenders. We test this hypothesis in the syndication context. They also note that it is easier to renegotiate with a bank or a small syndicate of banks.

Hart (1995) emphasizes the problem of hold-ups in debt renegotiation. The prospect of hold-ups increases with the number of creditors and with the extent of disparities in their ownership positions. As an extreme case, consider a syndicate lender holding only 0.0001% of a loan. This bank has strong incentives to free ride, but also holds a very strong bargaining position in the case of financial default, since a unanimity requirement makes all the parties critical in renegotiation. This lender is a likely candidate as a hold-out in any renegotiation of the loan's terms.

James (1990) observes the "exploitation of the large by the small" (p. 329) in the case of the extensive restructurings of international debt in the 1980s. Small participants pressured

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[6]Chen, Weston, and Altman (1995) survey the theoretical literature on financial distress and discuss the importance of recontracting as a strategy for resolving distress.

[7]Norton (1997) makes a similar observation about when unanimous agreement is required. We confirmed the unanimity requirement in conversations with lending officers at Bank of America, Bank One and National City Bank. Hurn (1990) also emphasizes that when disagreements arise, the lead bank typically seeks the advice of the legal counsel that drew up the loan agreements.

larger ones to effectively buy out their positions. When the syndicate partners have very similar loan pieces, the differential incentives to hold-up any renegotiation are lessened.

The prospects for hold-ups may be exacerbated when participants sell portions of the loan they purchased at origination. The lead bank may want to control such activity, especially if there is some likelihood of borrower distress.

We argue that syndicates are likely to be more concentrated, as reflected by a high value of the Hirschman-Herfindahl index, when prospects for financial distress are high, since such a structure facilitates renegotiation. We also hypothesize that arrangers will be more likely to limit reselling in such circumstances.[8]

The arranging bank can influence the size and composition of the syndicate in several ways. First, it decides on the institutions it will invite to participate. Rhodes (1996) estimates that roughly a third of the invited banks will participate in a syndicate.

Second, the arranging bank chooses the initial menu of designated amounts for participation, the dollar size of each bracket, and the fees to be paid for participation in each bracket. Depending on the loan amount, syndicate size will increase and concentration decline if the lead bank offers relatively small bracket sizes.

Third, the lead bank reserves the right to close the syndication at any time prior to the designated end of the offering period. Fourth, the lead bank can adjust its own portion of the loan.[9]

The arranger cannot precisely control the size of the syndicate, however, because it cannot be certain of participant demands for the relative amounts offered. If total demand for the loan exceeds its size (and the borrower chooses not to increase the loan amount), the lead bank typically will allocate the loan, with implications for the size and degree of concentration in the syndicate. If a loan is oversubscribed, syndicate size will increase and concentration decline.[10]

B. Model Development

We estimate models that relate the size and concentration (as reflected in the HHI) of loan syndicates to various proxies for adverse selection and moral hazard. Adverse selection problems are presumably more relevant in the due diligence phase of monitoring, while agency problems are primarily post-closing phenomena. We also examine whether contractual restrictions on the resale behavior of the syndicate participants influence syndicate structure. Secondary market sales by participants can alter the identities and proportionate holdings of the lending group. If participants resell loans in smaller pieces than they purchased, for example, the lending group will become larger and more diffuse over time, with potentially adverse effects on both incentives to monitor and the prospects for efficient resolution of financial distress. The reputation of the arranger is also a variable in our models.

The models take the general form:

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[8]This implies the lead bank's decision to restrict loan sales is not strictly exogenous. We examine whether endogeneity bias affects our results in the robustness analysis.

[9]The lead bank does not decide on and announce its own position prior to syndication. It is realistic to view the arranger's portion of the loan as dependent on the decisions of the other group members, although somewhat controllable since the arranger can close the syndication at its discretion. An implication is that it is not appropriate to include the lead bank's share in either the syndicate size or composition models as it is not an exogenous variable. Dennis and Mullineaux (2000), Jones et al. (2000), and Panyagometh and Roberts (2002) implicitly treat the arranger's decision about the proportion of the loan it holds in its own portfolio as independent of the purchase decisions by participants.

[10]The data do not allow us to see the number of institutions invited to participate or whether a loan is under- or over-subscribed. Nor can we observe whether the deal is a firm commitment or not.

Syndicate Size/Concentration = f(Information Variables, Credit Risk Variables, Loan Characteristics, Agency Variables, Control Variables)

Table I describes the variables used in the estimations. We use the Herfindahl-Hirschman Index (HHI) to measure the degree of concentration within a syndicate. The HHI takes the percentage share of each participant, squares it, and then sums the squared shares. It takes account of all syndicate participants and their proportionate holdings. The value increases as the number of members declines, *ceteris paribus*, and as the share of any single participant increases.

The HHI for a syndicate of 10 banks 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 1% each, the HHI would be 8,290, a highly concentrated syndicate.

1. Information Variables

The information-related variables serve as proxies for the quantity and quality of information about the borrower. Dennis and Mullineaux (2000) and Panyagometh and Roberts (2002) find that loans are likely to be syndicated in larger proportions as more information about the borrower is available. Either larger or smaller syndicates may form when information is less problematic. If the lead bank offers relatively small pieces of loans with high information content and there is great interest in subscription, syndicates will be larger and less concentrated. Finance theory predicts, however, that information-problematic firms require more due diligence to resolve potential adverse selection problems, so lead banks should offer larger portions of such loans to enhance lender incentives to monitor.[11]

The first proxies for information are RATING, a dummy variable equal to one if the borrower has a credit rating and zero otherwise, and TICKER, a dummy equal to one if the borrower has a ticker symbol and zero otherwise. The logic is that higher-quality information is available about firms that have credit ratings or whose equity trades.

A positive coefficient on these dummies indicates that larger syndicates form when the borrower is a well-known firm. The coefficient of the information dummies should be negative in the syndicate HHI model. Such a finding would suggest that more concentrated syndicates serve to enhance incentives to monitor in the face of potential adverse selection problems.

When we focus on a subsample of borrowers for which we can access financial statement data, we take the logs of borrower asset size (ASSETS) and annual sales (SALES) as additional proxies for information availability.

2. Credit Risk Variables

The structure of the lending group should also depend on the prospects for default. If the lead bank successfully offers larger pieces of riskier loans to enhance group monitoring and increase the prospects of successful restructuring in financial distress or default, syndicate size should decline and concentration increase with credit risk. Participants might prefer to limit their exposures to loans with high default risk, however, by opting for relatively small portions. In this case, syndicate size would increase with credit risk, consistent with the classic diversification motive for syndication, and the syndicate would become more diffuse.

We use two measures of credit risk. One is the leverage ratio of the borrower (LEV), total debt as a proportion of assets, which Merton (1974) demonstrates is positively related to the loan's default risk. We use this variable in the estimations for a subsample of firms with

[11]While the lead bank undertakes some delegated monitoring on behalf of the participants, bank regulations require that each lender perform due diligence independently. We thank the referee for noting this point.

Table I. Description of Variables

Variable	Description
	Panel A. Information Variables
RATING	Dummy variable equal to 1 if the borrower has a senior debt rating and 0 otherwise.
TICKER	Dummy variable equal to 1 if the borrower has a ticker symbol and 0 otherwise.
ASSETS	Natural logarithm of the book value of assets at the end of the quarter prior to syndication.
SALES	Natural logarithm of the borrower's annual sales at the end of the quarter prior to syndication.
	Panel B. Credit Risk Variables
LEVERAGE	Ratio of the firm's total debt to total assets in book values at the end of the quarter prior to syndication.
S&P RATING	Borrower's senior debt rating from Standard & Poor's.
	Panel C. Agency Variables
MKBK	Ratio of the borrower's market value of assets to its book value of assets at the end of the quarter prior to syndication.
R&D	Ratio of the borrower's R&D expenditures (the sum of all costs related to the development of new products and services) to sales at the end of the quarter prior to syndication.
	Panel D. Loan Characteristics
MATURITY	Maturity of the loan in days.
SECURED	Dummy variable equal to 1 if the loan is collateralized and 0 otherwise.
MIN	Dummy variable equal to 1 if there is a minimum size requirement for resales and 0 otherwise.
CONSENT	Dummy variable equal to 1 if the consent of the lead bank is required for resale of the purchased component of the loan and 0 otherwise.
	Panel E. Reputation Variables
REPEAT	Number of repeat transactions between the agent and the participants in a given loan.
MKTSHARE	Lead bank's market share of originations in the year of syndication.
	Panel F. Control Variables
FACSIZE	Dollar value of the size of the loan facility.
TIME	Date of loan syndication

equity that trades. The second measure of credit risk is the senior unsecured debt rating of the borrower from Standard & Poor's. This measure is available for another subsample of the borrowers in the full sample, presumably those that have accessed the public debt markets.

3. Agency Variables

Agency costs can influence syndicate size and structure from two different perspectives. First, there are potential agency costs between the borrower and the set of lenders. Finance theory suggests that private lenders can manage agency problems better than public debt holders. Smith and Warner (1979) note the asset substitution and other moral hazard problems can be controlled by covenants, but only imperfectly.

Agency costs are difficult to measure directly. One common proxy for agency costs is the ratio of the market value of the borrower's assets to the book value of assets (MKBK). Another is the ratio of the borrower's R&D expenditures to its sales (R&D). These variables reflect growth options held by the borrower and the intuition is that agency costs increase

as there are more growth options.[12]

The impact of agency costs on syndicate size and composition again depends on how the arranger structures the offering and relative demands by potential participants. If the lead bank takes account of high agency costs by establishing smaller bracket amounts, syndicate size will increase and concentration decline with the agency proxy measures. If the syndicate manager attempts to enhance incentives to monitor by offering relatively sizable portions, smaller, more concentrated groups will result.

4. Reputation Variables

Dennis and Mullineaux (2000) find that the reputation of the lead arranger is the primary mechanism that attenuates shirking or other exploitative agency problems within the syndicate. We use REPEAT as a proxy for reputation in our model. It is a measure of repeat-transaction activity between the lead bank and the syndicate participants.[13]

We hypothesize that reputable banks will form larger syndicates, other things equal, so this coefficient should be positive. Well-known arrangers should prefer to form larger groups, as reputations are established by forming large networks of contacts, and reputational assets would be diminished if a bank failed to supply desired loan portions to willing participants. Reputable arrangers also may be better able to tolerate free riding by participants and consequently more likely to form diffuse lending groups. While diffuse syndicates could complicate restructuring the loan in the event of borrower distress, a well-known arranger may be better able to mitigate hold-up problems by threatening to withhold future business.

We take the lead bank's market share of originations during the syndication year (MKTSHARE) as another proxy for reputation in our estimations. The coefficients of REPEAT and MKTSHARE should be positive in the size model and negative in the concentration model to validate our logic.

5. Loan Characteristics

We include the loan's term (MATURITY) and an indicator indicating whether the loan is collateralized or not (SECURED). Maturity and security in Dennis and Mullineaux (2000) are significant determinants of whether a loan is syndicated or not (MATURITY) and of the proportion of the loan sold to participants (MATURITY and SECURED). Jones et al. (2000) also find that maturity positively affects the proportion of a loan sold in syndication. While Merton's (1974) model is consistent with a positive or negative relationship between credit risk and maturity, Flannery (1986) argues that lower-quality (higher-risk) firms are likely to issue longer-term debt.

Empirical evidence on this issue in the case of bank loans is mixed. Dennis, Nandy, and

[12]The R&D variable is also used in some empirical studies as a proxy for proprietary information. Yosha (1995) demonstrates that high-quality entrepreneurial firms will prefer bilateral to multilateral financing in order to avoid disclosing information to competitors. If borrowers with high R&D expenditures seek to protect proprietary information, the coefficient of this variable should be negative. Houston and James (1996) use this R&D variable as a proxy for agency costs.

[13]To construct the REPEAT variable, we create a client list for each arranging bank and then count the number of times a given client appears in the arranger's deals. There are four steps: 1) Identify all institutions that acted as a lead bank at least twice; 2) for each lead bank, list all participants in its deals; 3) for each participant on the client list, count the number of deals arranged by the given lead institution in which the bank participated; and 4) sum the numbers from step 3 across participant banks on the client list, and then subtract the number of banks on the client list to get the value of REPEAT for the given lead bank. We subtract the number of banks on the client list because the first instance of participation by any bank does not represent repeat business, but rather establishes the relationship.

Sharpe (2000) find that credit spreads are narrower on longer-maturity loans, while Angbazo, Mei and Saunders (1998) report the opposite result. Both studies use the same database we do.

If credit risk is higher on longer-term loans, arrangers should attempt to concentrate the holdings of syndicate members, producing smaller, and more concentrated syndicates. This would imply a negative coefficient on maturity in the syndicate size model and a positive coefficient in the concentration equation. If credit risk declines with maturity, as the results of Dennis et al. (2000) imply, we should observe larger and more diffuse syndicates for longer-term loans.

The likely impact of loan collateral on syndicate structure is likewise ambiguous. Berger and Udell (1990), among others, present evidence that secured loans have higher default risk *ex ante* than unsecured loans. Smaller and more concentrated syndicates would promote more effective monitoring and enhance the prospects of successful loan restructuring in the event of financial distress. Smith and Warner (1979) also note that secured loans require more monitoring than unsecured loans. This raises the prospect of increased duplicative monitoring of the collateral itself, which also argues for a smaller and more concentrated syndicate. The coefficients of the dummy for secured loans would be negative in the size model and positive in the concentration equation.

Rajan and Winton (1995) argue that banks will take collateral primarily in the "bad state" and since securing a loan is an observable event, this signals the lender's private information. If participants are reluctant to accept large positions of risky secured loans, syndicate size would increase and concentration decline.

We also take account of actions by the lead bank to restrict the loan resale activities of the participants, either by requiring arranger consent or by establishing a minimum size for subsequent loan sales. Such contract restrictions enhance the arranger's utility because they provide some control over the identities of the loan holders (the consent requirement) and over changes in lender group size and the nature of incentives to monitor (the minimum resale size requirement). These issues are most likely to concern the lead bank in cases of financial default, when the arranger would prefer a smaller and more concentrated syndicate.

Syndicate participants recognize that these contract constraints (analogous to covenants in a loan agreement) serve to make the loan less liquid and consequently may prefer smaller pieces of these loans, which would result in larger and more diffuse syndicates. The impact of these contract restrictions is accordingly ambiguous.

We take account of them using dummy variables with a value of one if there is a minimum resale requirement (MIN) or a requirement for agent consent to resell (CONSENT) and zero otherwise. If arrangers can successfully apply these constraints while keeping syndicates small and more concentrated, the coefficients of these dummies will be negative in the size model and positive in the concentration model. If the constraints discourage participants from bidding for large pieces of the loan, the coefficients would take the opposite sign in each case. The latter results would imply the lead bank faces a trade-off in its effort to gain control over syndicate structure over the life of the loan.

6. Control Variables

Control variables in the model are the size of the loan facility (FACSIZE) and a dummy for the year of the transaction (TIME). We initially included loan purpose dummies, but these were never significant factors and so were eliminated from the final estimations. We want to examine the influence of the operative variables given the size of the loan and abstracting from any potential trends in syndicate formation.

III. Estimates of the Model

We use data from the Dealscan database maintained by Loan Pricing Corporation. This database is frequently used in studies that require detailed transaction-specific data on loans, such as Angbazo, Mei, and Saunders (1998), Dennis and Mullineaux (2000), Dennis et al. (2000), Dichiv and Skinner (2001), and Hubbard, Kuttner, and Palia (2002).

LPC collects most of the data from commitment letters or loan agreements in filings with the Securities and Exchange Commission. Some data are also collected directly from the originating institution. LPC reports each transaction as fully confirmed, partially confirmed, or unconfirmed with the lending institution.

We assemble as a sample all non-private placement loans that are fully confirmed over the period 1987-1995. We obtain 3,410 transactions, 1,491 of them syndicated loans. Our data indicate the number of banks in the syndicate and the proportionate holdings of each participant.

Table II provides some descriptive statistics for the sample. The average number of syndicate lenders is 9, and the median is 5. Jones, Lang, and Nigro (2000) report a similar average of 8.7 for 1991-1995 and show that the mean lending group size varies little year-to-year over the 1990s. While some syndicates include over 100 banks, the distribution is concentrated at 20 banks and below. Only 1% of our sample represents syndicates of 50 or more, and about 5% are larger than 30.

Pichler and Wilhelm (2001) report that the average investment bank underwriting syndicate includes 18.2 members. The difference is not surprising, as the average bond issue is 2 to 4 times the size of the typical syndicated loan, depending on the time horizon of comparison.

The average HHI in our sample is 2270.3, but the sample range is wide, from a low of 14.4 to a maximum of 8313.0. We call syndicates with relatively high values of HHI concentrated, while low HHI value syndicates are diffuse.

The mean facility size in our sample is $221 million, somewhat higher than the various averages observed by Jones et al. (2000), which are in the $150-$205 million range. The mean share held by the arranger is 32.2%, very similar to the mean reported by Jones, Lang, and Nigro (2000), who observe little variability in this figure annually over the 1990s. The average piece of a syndicated loan is $24.5 million (median $12 million).

The mean maturity of our loans is 3.9 years, but the range of observed maturities is wide. About 74% of the syndicated loans in our sample are secured. Dennis and Mullineaux (2000) report that syndicated loans are less often collateralized than non-syndicated loans. A little over half the sample loans involve a restriction on the minimum size of future resales of the loan, and about 44% of the transactions require lead bank consent for loan resales. In most instances, when one resale constraint is applied, the other is as well.[14]

Borrowers are relatively large on average, with assets of $2.2 billion and sales of $1.8 billion. The medians are substantially smaller, though, and the range is quite wide. There is substantial variability in the R&D to sales ratio and the market-to-book ratio as well. About 28% of our sample firms have a credit rating, so the median firm is unrated, while 56% of the borrowers have equity that trades.

A. Full Sample Estimation Results

The dependent variable in the model we initially estimate is the total number of banks participating in the syndicate. Since this variable is discrete and non-negative, we use Poisson

[14]The average minimum requirement for loan resales when the constraint is present is $7.5 million, a little over 30% of the mean portion.

Table II. Descriptive Statistics for Model Variables

The sample is obtained from Loan Pricing Corporation's *Dealscan* database and covers the period 1987-95. Size is the number of institutions participating in a syndicate, including the arranging bank. HHI is the Herfindahl Hirschman Index for the syndicate, calculated as the sum of the squared percentage shares of all the syndicate members. SHARE is the portion of the loan retained by the arranger. Other variables are defined in Table I.

Variable	Mean	Median	Max.	Min.	N
RATING	0.278	0	1	0	1491
TICKER	0.563	1	1	0	1491
ASSETS ($, million)	2244.42	402.53	145826	8.484	689
SALES ($, million)	1877.88	427.43	95913	3.597	689
LEVERAGE (%)	36.03	34.42	161.456	0.093	689
MKBK	1.525	1.314	7.873	0.473	689
R&D (%)	3.633	2.264	33.650	0.049	689
MATURITY (years)	3.90	3.0	23.0	.016	1491
SECURED	0.737	1	1	0	1491
MIN	0.502	1	1	0	1491
CONSENT	0.4434	0	1	0	1491
REPEAT	31	18	98	0	1491
SHARE (%)	32.232	30.4	90.7	0	1491
FACSIZE ($, million)	221	60	8600	0.6	1491
SIZE	9.001	5	148	2	1491
HHI	2270.28	2500	8312.98	14.44	1491

regression as the estimation technique.[15]

We also estimate equations with the HHI for the syndicate as the dependent variable using Ordinary Least Squares and Tobit techniques, with a correction for heteroskedasticity. The HHI by construction is a function of syndicate size, so we also perform a sensitivity analysis to determine whether our concentration results are driven strictly by the size of the lending group or whether composition plays a role independent of size.

We first estimate the model for the full sample, and then for subsamples consisting of firms with a ticker symbol and with a credit rating. This allows us to specify some firm-specific variables as explanatory factors that we take from Compustat *Research Insight* database and to use the borrower's rating as a measure of credit risk in the model.[16]

The results for the syndicate size and concentration models are presented in Table III.[17] The numbers in parentheses are p-values. The coefficients of the information proxies (RATING and TICKER) are positive and significant in the size model. Syndicates are significantly larger when there is more information available about the borrower. This implies that arrangers

[15]Poisson regression assumes the data follow a Poisson distribution. The primary characteristics of this distribution are skewness, non-negative values, and variance that increases with the mean. Poisson regression is a special case of the generalized linear model. We also estimated a Tobit model for syndicate size with virtually identical results. We report the Poisson results, given the integer nature of the dependent variable.

[16]Dennis et al. (2000) demonstrate that loan contract terms are determined endogenously. This implies that factors like collateral, maturity, and credit risk are interrelated and an assumption of one-way causality is invalid. While it seems less likely that syndicate structure would affect loan contract terms like maturity, there is some prospect of endogeneity bias in our result. This would imply the coefficient estimates are biased and inconsistent. We can draw inferences about how the variables are associated in such cases, but causal inferences would not be valid.

[17]We report the results of the Tobit estimations for the concentration equations. We also estimated the equations by OLS with very similar results.

Table III. Results for Full Sample of Borrowers: Syndicate Size and Concentration Models

In Panel A, the dependent variable is the number of banks in the syndicate, including the lead bank. RATING and TICKER are dummy variables equal to 1 if the borrower has a credit rating or a ticker symbol respectively and 0 otherwise. MATURITY is the term to maturity of the loan. SECURED is a dummy equal to 1 if the loan is collateralized and 0 otherwise. MIN is a dummy equal to 1 if the arranger requires a minimum size for loan re-sales and 0 otherwise. CONSENT is a dummy equal to 1 if the arranger requires prior consent for re-sales and 0 otherwise. REPEAT is an index of repeat transactions between the lead arranger and syndicate members. MKTSHARE is the percentage of loans originated by the arranger in the year of syndication. FACSIZE is the dollar amount of the facility. TIME is an annual time trend. In Panel B, the dependent variable is the Hirschman Herfindahl index.

Panel A. Results of Poisson Regressions for Syndicate Size Model

CONSTANT	7.710	8.009	6.876	5.225	3.555	3.419
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RATING	0.534		0.573		0.603	
	(0.00)		(0.00)		(0.00)	
TICKER		0.054		0.072		0.072
		(0.00)		(0.00)		(0.00)
MATURITY	0.0001	0.0001	0.001	0.0001	0.001	0.0001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SECURED	-0.265	-0.386	-0.268	-0.411	-0.298	-0.440
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
MIN	0.362	0.385	0.411			
	(0.00)	(0.00)	(0.00)			
CONSENT				0.221	0.200	0.218
				(0.00)	(0.00)	(0.00)
REPEAT	0.006	0.008		0.009		
	(0.00)	(0.00)		(0.00)		
MKTSHARE			0.020		0.022	0.031
			(0.00)		(0.00)	(0.00)
FACSIZE	2.94e-10	2.96e-10	2.83e-10	3.01e-10	2.93e-10	2.90e-10
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
TIME	-0.0673	-0.069	-0.058	-0.038	-0.021	-0.173
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N	1491	1491	1491	1491	1491	1491
R-squared	0.36	0.32	0.36	0.31	0.34	0.29

establish smaller bracket amounts on loans to well-known borrowers or that such loans are heavily subscribed.

The coefficients of the information dummies are negative and significant in the concentration model. Syndicates are more concentrated when less information is available about the borrower, presumably to enhance incentives to monitor in the presence of potential adverse selection problems.

Syndicates increase significantly in size and become less concentrated as loan maturity lengthens. This supports the findings of Dennis and Mullineaux (2000) and Jones et al. (2000) that longer-term loans are more readily syndicated than short-term loans, but also implies that arrangers are more tolerant of diffuse syndicates and attendant free riding as loan term lengthens. This result also is consistent with the finding of Dennis et al. (2000) that credit risk declines as loan maturity increases. It also accords with the results of Yi and Mullineaux (2003), who find that credit ratings improve on syndicated bank loans as

Table III. Results for Full Sample of Borrowers: Syndicate Size and Concentration Models (*Continued*)

In Panel A, the dependent variable is the number of banks in the syndicate, including the lead bank. RATING and TICKER are dummy variables equal to 1 if the borrower has a credit rating or a ticker symbol respectively and 0 otherwise. MATURITY is the term to maturity of the loan. SECURED is a dummy equal to 1 if the loan is collateralized and 0 otherwise. MIN is a dummy equal to 1 if the arranger requires a minimum size for loan re-sales and 0 otherwise. CONSENT is a dummy equal to 1 if the arranger requires prior consent for re-sales and 0 otherwise. REPEAT is an index of repeat transactions between the lead arranger and syndicate members. MKTSHARE is the percentage of loans originated by the arranger in the year of syndication. FACSIZE is the dollar amount of the facility. TIME is an annual time trend. In Panel B, the dependent variable is the Hirschman Herfindahl index.

Panel B. Results of Tobit Regressions for Syndicate Concentration						
CONSTANT	-28.7	-4115.5	-4395.7	-323.75	165.31	-712.91
	(0.15)	(0.11)	(0.08)	(0.89)	(0.94)	(0.79)
RATING	-868.10		-970.72		-1021.75	
	(0.00)		(0.00)		(0.00)	
TICKER		-249.15		-249.06		-216.83
		(0.00)		(0.00)		(0.01)
MATURITY	-0.216	-0.217	-0.219	-0.246	-0.253	-0.255
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SECURED	440.6	548.14	450.55	571.25	475.10	625.19
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CONSENT				-479.77	-457.17	-509.18
				(0.00)	(0.00)	(0.00)
MIN	-737.25	-779.54	-843.56			
	(0.00)	(0.00)	(0.00)			
FACSIZE	-6.46e-7	-7.78e-8	-6.27e-7	-7.29e-7	-6.62e-7	-7.30e-7
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
REPEAT	-12.62	-16.01		-18.21		
	(0.00)	(0.00)		(0.00)		
MKTSHARE			-40.34		-45.67	-59.85
			(0.00)		(0.00)	(0.00)
TIME	79.60	85.47	89.00	49.94	37.61	45.41
	(0.00)	(0.00)	(0.00)	(0.00)	(0.18)	(0.10)
N	1491	1491	1491	1491	1491	1491
LR chi-square	616.6	544.0	574.5	498.4	509.1	407.8

maturity increases.[18]

The coefficient of the SECURED dummy indicates that arrangers form smaller and more concentrated syndicates when the loan is collateralized. This result is consistent with several studies demonstrating that credit risk is higher on secured loans. Lead banks consequently motivate participants to monitor and negotiate in good faith in the event of financial distress by offering these loans in relatively large pieces. Lenders may be willing to accept these larger concentrations since they also hold a claim on some designated assets of the borrower.[19]

The coefficients of the dummies that capture arranger constraints on loan resale activity are significant in both models. When the lead bank establishes a minimum size for trades in the secondary market or requires prior consent for such sales, syndicate size increases and

[18]These authors find an opposite result for bonds. Credit ratings deteriorate on bonds as maturity lengthens.

[19]Regulations require that each lender evaluate the collateral in a secured lending arrangement. This results in significant duplication of effort and is another reason syndicates are smaller in the case of secured loans.

concentration declines.[20] Participants prefer smaller pieces of these less liquid loans. The results suggest that arrangers bear a cost in restricting loan sales by the group members, since they must trade off a larger initial lending group to gain the benefits of control over subsequent shifts in syndicate structure.[21]

The coefficient of REPEAT is highly significant in both models, implying that reputable lead banks form larger and more diffuse syndicates. This result is consistent with the finding of Dennis and Mullineaux (2000) that reputation is the primary mechanism for controlling agency problems within the lending group. It also suggests that reputable banks may experience more free riding within the syndicate, representing an implicit cost of establishing and maintaining a reputation. The results are identical when we use the arranger's market share as a proxy for reputation.

Not surprisingly, we find that larger syndicates form around larger loans. While the result might be less obviously anticipated, syndicates also become more diffuse as loan size increases. The latter result implies that large loans may entail less default risk than smaller loans, since lead banks do not form more concentrated groups around larger loans to enhance incentives to monitor. Angbazo et al. (1998) report a negative relationship between loan rates and loan size.

The coefficient of the time trend variable indicates that syndicates are becoming smaller and more concentrated over time. This could reflect macroeconomic conditions during our sample period—an economic recession occurred in roughly the middle of our sample period and loan credit quality typically deteriorates for some period beyond the beginning of a recovery.

B. Subsample Results: Firms with a Ticker Symbol

We use financial statement data from Compustat's *Research Insight* to develop additional measures of information availability, agency costs associated with the borrower, and credit risk. The additional information-related variables are the book value of the borrower's assets (ASSETS) and its annual sales (SALES). These coefficients should have positive signs in the size model and negative signs in the HHI model to be consistent with the results based on the dummy variables for information availability.

We take the ratio of the borrower's market value of assets to book value (MKBK) as a measure of agency costs. This ratio is proxied by the borrower's market value of equity plus the book value of debt in the numerator divided by the book value of assets. If arrangers can structure syndicates to enhance incentives to monitor in the presence of high agency costs, the coefficient of this variable should be negative in the size equation and positive in the concentration model.

We include the borrower's leverage ratio (LEV) as a proxy for default risk. Dennis et al. (2000) find that rates charged on loans increase significantly with the borrower's leverage. If the lead bank offers credit-risky loans in larger bracket amounts to enhance incentives to monitor, then the coefficient of leverage should be negative in the syndicate size model and positive in the HHI equation. If participants are unwilling to hold large and concentrated pieces of loans with high credit risk, then the opposite signs would obtain. We continue to include constraints on loan resales as variables.

The results for this subsample of firms appear in Table IV. We observe that the results for

[20]The borrower's consent is also sometimes required for re-selling a loan. When we include a dummy variable in the model for this type of constraint, the result is very similar to the result for the arranger-approval variable.

[21]We thank the referee for pointing out that this finding is also consistent with the prospect that resale constraints can force smaller participants to participate in loan restructurings.

Table IV. Results for a Sub-Sample of Borrowers with Ticker Symbols

In Panel A, the dependent variable is the number of banks in the syndicate, including the lead bank. ASSETS and SALES are the borrower's total assets (in book value) and annual sales in the year of syndication respectively. LEV is the ratio of the borrower's total debt to total assets (book values). MKTBK is the ratio of the market value of assets (proxied by the market value of equity plus the book value of debt) divided by the book value of assets. All other variables are identical to Table III(a). In Panel B, the dependent variable is the Hirschman Herfindahl index.

Panel A. Results of Poisson Regressions for Syndicate Size							
CONSTANT	7.105	8.771	6.745	8.457	3.665	1.399	2.758
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.039)	(0.00)
ASSETS	0.291		0.300			0.321	
	(0.00)		(0.00)			(0.00)	
SALES		0.223		0.239	0.224		0.255
		(0.00)		(0.00)	(0.00)		(0.00)
RATING	0.193	0.272	0.176	0.255	0.313	0.204	0.302
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
LEV	0.0002	0. 001	0.000	0.001	0.001	0.001	0.001
	(0.61)	(0.04)	(0.336)	(0.007)	(0.058)	(0.108)	(0.002)
MKBK	0.166	0.115	0.159	0.111	0.141	0.196	0.146
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
MATURITY	0.0001	0.000	0.000	0.000	0.000	0.000	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SECURED	-0.0005	-0.051	-0.012	-0.065	-0.080	-0.048	-1.101
	(0.984)	(0.07)	(0.655)	(0.022)	(0.005)	(0.092)	(0.00)
MIN	0.506	0.510	0.518	0.532			
	(0.00)	(0.00)	(0.00)	(0.00)			
CONSENT					0.156	0.199	0.145
					(0.00)	(0.00)	(0.00)
REPEAT	0.0028	0.003			0.005		
	(0.00)	(0.00)			(0.00)		
MKTSHARE			0.014	0.015		0.018	0.019
			(0.00)	(0.00)		(0.00)	(0.00)
FACSIZE	7.6e-11	1.1e-10	4.8e-11	8.4e-11	1.2e-10	4.7e-11	8.3e-11
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
TIME	-0.083	-0.095	-0.079	-0.093	-0.039	-0.022	-0.031
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N	689	689	689	689	689	689	689
R-squared	0.4550	0.4228	0.4586	0.4257	0.3969	0.4335	0.3975

all the variables in the full-sample estimation are robust to the inclusion of the additional variables. Almost all the coefficients continue to be highly significant. In particular, syndicates become larger and more diffuse when the lead bank takes steps to constrain loan sales by the participants.

The coefficients of the additional proxies for information availability and quality, asset size and annual sales, are all significant and positive in the size model and all negative in the concentration equation. The indicator variable for a credit rating remains a significant variable in both estimations. This provides additional evidence for the hypothesis that syndicates are structured to obtain more monitoring in the presence of adverse selection problems.

The coefficient of the borrower's leverage ratio is positive in the syndicate size model, but is significant only when sales is the proxy for firm size. The coefficient is never significant in any of the syndicate concentration equations. Syndicate structure is not systematically

Table IV. Results for a Sub-Sample of Borrowers with Ticker Symbols (*Continued*)

In Panel A, the dependent variable is the number of banks in the syndicate, including the lead bank. ASSETS and SALES are the borrower's total assets (in book value) and annual sales in the year of syndication respectively. LEV is the ratio of the borrower's total debt to total assets (book values). MKTBK is the ratio of the market value of assets (proxied by the market value of equity plus the book value of debt) divided by the book value of assets. All other variables are identical to Table III(a). In Panel B, the dependent variable is the Hirschman Herfindahl index.

Panel B. Results of Tobit Regressions for Syndicate Concentration							
CONSTANT	-1401.8	-5382.9	-1319.2	-5470.36	1487.97	5265.75	1623.37
	(0.657)	(0.102)	(0.67)	(0.09)	(0.65)	(0.09)	(0.623)
ASSETS	-603.9		-612.22			-649.38	
	(0.00)		(0.00)			(0.00)	
SALES		-427.7		-443.93	-437.53		-471.091
		(0.00)		(0.00)	(0.00)		(0.00)
RATING	-290.9	-525.7	-284.38	-526.48	-618.05	-365.57	-631.048
	(0.028)	(0.00)	(0.03)	(0.00)	(0.00)	(0.008)	(0.00)
LEV	-1.441	-2.017	-1.519	-2.206	-1.5618	-1.1998	-1.9276
	(0.508)	(0.38)	(0.485)	(0.34)	(0.514)	(0.595)	(0.422)
MKBK	-322.5	-232.4	-319.95	-233.62	-283.82	-380.54	-293.195
	(0.00)	(0.00)	(0.00)	(0.001)	(0.00)	(0.00)	(0.00)
MATURITY	-0.084	-0.100	-0.0845	-0.1028	-0.1145	-0.1266	-0.1473
	(0.166)	(0.11)	(0.16)	(0.109)	(0.03)	(0.043)	(0.03)
SECURED	132.0	203.6	13792	206.52	256.92	183.01	260.358
	(0.254)	(0.095)	(0.23)	(0.09)	(0.042)	(0.127)	(0.041)
MIN	-923.3	-977.3	-931.752	-997.672			
	(0.00)	(0.00)	(0.00)	(0.00)			
CONSENT					-415.03	-423.480	-418.150
					(0.00)	(0.00)	(0.00)
REPEAT	-2.642	-3.827			-6.783		
	(0.155)	(0.05)			(0.00)		
MKTSHARE			-13.150	-14.448		-20.672	-22.6819
			(0.10)	(0.09)		(0.012)	(0.01)
FACSIZE	-3.3e-08	-2.1e-07	5.5e-10	-1.7e-07	-2.3e-07	2.1e-09	-1.8e-07
	(0.72)	(0.03)	(0.99)	(0.07)	(0.02)	0.02	(0.07)
TIME	96.50	127.58	95.981	129.333	53.620	26.8180	53.8145
	(0.00)	(0.00)	(0.00)	(0.00)	(0.12)	(0.42)	(0.122)
N	689	689	689	689	689	689	689
LR chi-square	484.52	415.24	485.20	414.42	365.19	435.61	360.66

related to this proxy for credit risk.

The coefficients of the proxy for borrower agency costs, the market to book value of assets, are positive and significant in the size model and negative in the concentration equation. Syndicates are larger and more diffuse in the presence of increased agency costs, suggesting that incentives to monitor are not enhanced in these circumstances, and free riding is more likely on loans to agency-problematic borrowers.[22]

We also estimated several specifications with the ratio of the borrower's R&D expenditures to sales as a proxy for agency costs, but none of the estimated coefficients was significant,

[22]There is an alternative interpretation for these results. The Merton (1974) model suggests that the credit risk premium is a declining function of the market value of the borrower's assets. Hence, the variable MKBK might be serving as a proxy for the default risk on the loan. If so, our results are consistent with the proposition that arrangers create smaller and more concentrated syndicates as credit risk increases.

and these results are not reported here.

In general, our results for this subsample are quite robust relative to findings for the full sample estimations. Only the credit risk results remain problematic.

C. Subsample Results: Firms with a Senior Unsecured Credit Rating

In further investigation, we estimate the size and HHI models for borrowers for which we can observe the firm's senior unsecured credit rating from Standard & Poor's. We emphasize that this variable is only a proxy for the credit risk on the loan. Credit ratings on individual syndicated loans became available only in mid-1995, but our sample period ends in that year. We thus create a variable S&P RATING with values ranging from 1 to 13; a value of 1 reflects an AAA rating, 2 an AA, and so on. Credit risk increases with the scale, so we hypothesize that the coefficient of this variable will be negative in the syndicate size model and positive in the HHI equation. Such results would confirm that smaller and more concentrated syndicates form when credit risk is high in order to enhance monitoring incentives and to increase the prospects of a successful loan restructuring in the event of financial distress.[23]

The results are presented in Table V. The findings reveal that syndicate size declines significantly with credit risk, while concentration increases with the risk of default. Syndicates are structured to enhance incentives to monitor and to avoid hold-out problems in the presence of higher credit risk. When the lead bank constrains the resale options of the participants, the result again is a larger and more diffuse original lending group. The trade-off arrangers face between controlling participants' behavior and an original syndicate structure that is less focused on resolution of distress problems persists when we explicitly account for credit risk.

Loan maturity has a significant impact on syndicate size in this subsample, but not on concentration. The collateral dummy (SECURED) is not a significant variable for syndicate structure in this subsample. The proxies for reputation behave as they did in the larger samples, as do the variables reflecting the presence of constraints on re-sale activity in the secondary market. A key result here is that syndicate concentration increases with credit risk, but arranger efforts to control loan sales have an offsetting effect.

There is evidence that some explanatory factors influence only syndicate size and not concentration, and vice versa. In almost all cases for the larger samples, size and composition are affected similarly by a particular variable. Since the HHI is a declining function of syndicate size, a logical question is whether our results for syndicate composition are driven primarily by size. To investigate this issue, we reestimate the HHI model, controlling for the predicted size of the syndicate. We also examine whether our results are biased, given that the arranger's decision to restrict loan sales presumably is endogenous.

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[23]The literature argues that financing with multiple creditors has the advantage of deterring strategic default, but the disadvantage of impeding debt renegotiation (see Bolton and Scharfstein (1996), for example). Since restructuring a syndicated loan typically requires unanimity among the participants, all the lenders are pivotal, regardless of the size of their position. This implies the disadvantages to increasing the number of creditors will predominate in a loan syndicate since the likelihood of a successful renegotiation declines with the number of participants. Since the arranging bank pre-packages the relative sizes of the pieces offered, an effort to reduce the size of a syndicate is also likely to produce more concentrated holdings. This raises the question as to why commercial loan syndicates do not involve a weighted voting arrangement. We leave further research, but note that reputation considerations probably discourage hold-out behavior to some extent in a syndicate context. In Welch and Bris (2001), creditors gain from coalescing, while dispersion is more beneficial to creditors in Bolton and Scharfstein (1996).

Table V. Results for Borrowers with Credit Ratings

In Panel A, the dependent variable is the number of banks in the syndicate, including the lead bank. S&P RATING is the borrower's Standard & Poor's rating. In Panel B, the dependent variable is the Hirschman Herfindahl index.

Panel A. Results of Poisson Regressions for Syndicate Size				
CONSTANT	6.246	4.5268	0. 7780	-1.6941
	(0.00)	(0.00)	(0.083)	(0.09)
S&P RATING	-0.013	-0.0129	-0.0105	-0.0104
	(0.02)	(0.014)	(0.05)	(0.047)
MATURITY	0.0001	0.0001	0.0000	0.0000
	(0.00)	(0.00)	(0.00)	(0.00)
SECURED	0.076	0.0145	0.0811	0.0010
	(0.09)	(0.74)	(0.07)	(0.98)
MIN	0.397	0.4551		
	(0.00)	(0.00)		
CONSENT			0.0807	0.0464
			(0.03)	(0.21)
REPEAT	0.007		0.0089	
	(0.00)		(0.00)	
MKTSHARE		0.0257		0.0306
		(0.00)		(0.00)
FACSIZE	2.2e-10	1. 9e-10	2. 3e-10	2.0e-10
	(0.00)	(0.00)	(0.00)	(0.00)
TIME	-0.046	-0.0265	0.0031	0.0427
	(0.00)	(0.04)	(0.77)	(0.00)
N	216	216	216	216
R-Squared	0.3005	0.300	0.279	0.2698
Panel B. Results of Tobit Regressions for Syndicate Concentration				
CONSTANT	-1006.96	-184.074	3099.21	5741.77
	(0.86)	(0.97)	(0.55)	(0.26)
S&P RATING	96.8755	97.8421	95.4452	96.0296
	(0.00)	(0.00)	(0.00)	(0.00)
MATURITY	-0.1062	-0.11837	-0.1173	-0.1281
	(0.252)	(0.20)	(0.21)	(0.18)
SECURED	-71.1278	-0.0581	-82.0080	8.1377
	(0.74)	(1.00)	(0.70)	(0.97)
MIN	-535.85	-606.580		
	(0.02)	(0.006)		
CONSENT			-322.385	-290.707
			(0.09)	(0.13)
REPEAT	-8.0157		-10.4172	
	(0.006)		(0.00)	
MKTSHARE		-25.3430		-33.2690
		(0.03)		(0.00)
FACSIZE	--2.7e-07	-2.6e-07	-3.1e-07	-2.9e-07
	(0.03)	(0.08)	(0.01)	(0.026)
TIME	29.2124	18.8398	-15.0975	-46.2075
	(0.63)	(0.76)	(0.78)	(0.40)
N	216	216	216	216
LR chi-square	64.86	62.14	61.95	56.86

Table VI. Results of Tobit Estimations of Concentration Model with Predicted Syndicate Size as a Variable

In Panel A, the dependent variable is the HHI for the syndicate. We present the results of the second stage estimate which includes SIZEHAT, the predicted number of banks in the sample. In Panel B, the dependent variable is the HHI for the syndicate. In Panel C, the dependent variable is the HHI for the syndicate.

			Panel A. Estimation Results for the Full Sample			
CONSTANT	-3949.07	-5119.20	-4852.39	-331.125	934.602	-596.361
	(0.10)	(0.04)	(0.05)	(0.89)	(0.70)	(0.82)
RATING	-1177.52		-1312.08		-1441.44	
	(0.00)		(0.00)		(0.00)	
TICKER		-265.02		-266.187		-228.656
		(0.00)		(0.00)		(0.007)
MATURITY	-0.2925	-0.2983	-0.2995	-0.3419	-0.3579	-0.3713
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SECURED	556.504	733.013	578.44	779.879	633.586	889.805
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
MIN	-888.98	-960.95	-1023.78			
	(0.00)	(0.00)	(0.00)			
CONSENT				-587.77	-556.257	-644.550
				(0.00)	(0.00)	(0.00)
REPEAT	-15.4695	-20.381		-23.5614		
	(0.00)	(0.00)		(0.00)		
MKTSHARE			-52.074		-61.045	-83.6043
			(0.00)		(0.00)	(0.00)
FACSIZE	-1.4e-06	-1.5e-06	-1.4e-06	-1.6e-06	-1.5e-06	-1.7e-06
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SIZEHAT	65.1545	71.329	68.2967	78.1106	81.1912	92.5551
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
TIME	82.4095	93.5218	90.9389	40.7657	26.5928	39.5007
	(0.00)	(0.00)	(0.00)	(0.12)	(0.31)	(0.15)
N	1491	1491	1491	1491	1491	1491
LR chi-square	669.46	603.01	628.28	560.50	572.17	485.08

D. Robustness Tests of the Syndicate Composition Model

By construction, the HHI is a negative function of the number of banks in a given syndicate, *ceteris paribus*, which may mean our results in the syndicate composition models are simply reflecting the impact of the given variables on lending group size. We contend that the proportional holdings of the participants are as relevant as the size of the lending group. To analyze whether the determining variables influence proportionate holdings of participants, independent of syndicate size, we estimate the HHI model in a two-stage process.

We initially estimate the syndicate size models as above, and then estimate the HHI equations using the predicted syndicate size (SIZEHAT) as an explanatory variable in the model. If the other variables in the model retain significance, we have evidence that the composition of the lending group is relevant, given its size.

The results of these estimations are reported in Table VI. The results are remarkably robust to those reported above. Interestingly, the coefficient on the predicted size variable is positive. All things equal, a lead bank takes efforts to enhance concentration as the anticipated size of the syndicate increases. Arrangers apparently recognize that increasing the size of a

Table VI. Results of Tobit Estimations of Concentration Model with Predicted Syndicate Size as a Variable (*Continued*)

In Panel A, the dependent variable is the HHI for the syndicate. We present the results of the second stage estimate which includes SIZEHAT, the predicted number of banks in the sample. In Panel B, the dependent variable is the HHI for the syndicate. In Panel C, the dependent variable is the HHI for the syndicate.

Panel B. Estimation Results for the Sample of Borrowers with Traded Equity

CONSTANT	-1244.45	-6658.33	-1131.61	-6732.94	3303.32	8288.7	3607.07
	(0.69)	(0.04)	(0.71)	(0.04)	(0.31)	(0.00)	(0.27)
ASSETS	-799.514		-808.522			-877.60	
	(0.00)		(0.00)			(0.00)	
SALES		-570.112		-596.90	-602.27		-660.443
		(0.00)		(0.00)	(0.00)		(0.00)
RATING	-482.68	-814.501	-459.030	-801.26	-986.06	-585.61	-999.57
	(0.00)	(0.00)	(0.001)	(0.00)	(0.00)	(0.00)	(0.00)
LEV	-1.7901	-2.4579	-1.9525	-2.9029	-2.0650	-1.6401	-2.169
	(0.40)	(0.26)	(0.36)	(0.20)	(0.38)	(0.46)	(0.252)
MKBK	-430.812	-315.525	-421615	-312.512	-397.94	-512.21	-409.25
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
MATURITY	-0.1614	-0.1891	-0.1581	-0.18743	-0.25963	-0.2204	-0.2637
	(0.01)	(0.004)	(0.01)	(0.004)	(0.00)	(0.001)	(0.00)
SECURED	150.712	250.761	161.596	256.83	329.82	223.79	339.40
	(0.18)	(0.04)	(0.16)	(0.034)	(0.009)	(0.06)	(0.007)
MIN	-1218.88	-1309.68	-1222.81	-1336.08			
	(0.00)	(0.00)	(0.00)	(0.00)			
CONSENT					-501.679	-502.49	-506.96
					(0.00)	(0.00)	(0.00)
REPEAT	-6.5033	-8.3959			-13.09		
	(0.001)	(0.00)			(0.00)		
MKTSHARE			-29.2584	-32.3897		-40.973	-46.905
			(0.001)	(0.00)		(0.00)	(0.00)
FACSIZE	-5.2e-07	-7.8e-07	-4.1e-07	-6.8e-07	-8.8e-07	-4.5e-7	-7.8e-07
	(0.00)	(0.00)	(0.001)	(0.00)	(0.00)	(0.001)	(0.00)
SIZEHAT	90.3483	95.8552	84.6084	91.6664	109.269	92.860	106.91
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.053)
TIME	106.227	149.079	105.27	151.153	42.5820	7.0304	42.11
	(0.001)	(0.00)	(0.001)	(0.00)	(0.213)	(0.83)	(0.22)
N	689	689	689	689	689	689	689
LR chi-square	510.54	439.25	507.91	434.51	387.68	456.62	380.55

lending group tends to dilute incentives to monitor and to complicate any prospective loan renegotiations, so offerings are structured to enhance concentration within the syndicate. Overall, the results strongly support the hypothesis that the composition of a lending group is no less important to the arranger than its size.

We note that an arranger's decision to constrain loan sales by the participants is presumably endogenous. To see if our earlier results may be biased, we carry out another two-stage estimation process. We first estimate equations with MIN and CONSENT as the dependent variables and measures of borrower default risk on the right-hand side. We limit this analysis to samples where we could observe the borrower's credit rating or could gather financial ratio information from Compustat *Research Insight*. We also include the SECURED dummy as a proxy for credit risk in these models.

Table VI. Results of Tobit Estimations of Concentration Model with Predicted Syndicate Size as a Variable (*Continued*)

In Panel A, the dependent variable is the HHI for the syndicate. We present the results of the second stage estimate which includes SIZEHAT, the predicted number of banks in the sample. In Panel B, the dependent variable is the HHI for the syndicate. In Panel C, the dependent variable is the HHI for the syndicate.

Panel C. Estimation Results for the Sample of Rated Borrowers				
CONSTANT	-3670.82	-1554.98	5665.50	11277.9
	(0.503)	(0.78)	(0.26)	(0.034)
S&P RATING	82.2710	83.7261	79.7452	79.1880
	(0.001)	(0.001)	(0.002)	(0.003)
MATURITY	-0.1961	-0.2210	-0.1951	-0.2240
	(0.036)	(0.021)	(0.04)	(0.022)
SECURED	-122.855	24.6305	-146.050	31.6379
	(0.555)	(0.90)	(0.49)	(0.88)
REPEAT	-16.5767		-20.2282	
	(0.00)		(0.00)	
MKTSHARE		-57.5614		-72.4761
		(0.00)		(0.00)
MIN	-1011.41	-1134.829		
	(0.00)	(0.00)		
CONSENT			-409.180	-354.84
			(0.03)	(0.06)
FACSIZE	-1.2e-06	-1.1e-06	-1.2e-06	-1.2e-06
	(0.00)	(0.00)	(0.00)	(0.00)
SIZEHAT	94.5507	94.5982	88.0194	95.1341
	(0.00)	(0.001)	(0.001)	(0.001)
TIME	56.4881	30.8420	-45.2346	-110.7955
	(0.34)	(0.61)	(0.408)	(0.05)
N	216	216	216	216
LR chi-square	78.46	73.76	73.39	67.70

We then take the predicted values of MIN and CONSENT from these models and use them as explanatory variables in the syndicate size and concentration models. We continue to find the same result; the arranger's use of loan sale restrictions results in larger and more diffuse syndicates. The other results in the models are largely unchanged.

V. Conclusions

We offer evidence that the size and composition of a lending syndicate are far from random choices, given the size of a loan. Keeping syndicates small and more concentrated minimizes adverse selection problems, enhancing incentives to monitor. The same is true when credit risk is high, improving the prospects for a positive outcome in the event of financial distress and efforts to restructure the loan. Smaller and more concentrated syndicates form when a loan is secured, consistent with findings in the finance literature that collateralized loans have a higher risk of default than unsecured loans.

Interestingly, when the lead bank constrains participants' resale activities, a larger and more diffuse syndicate results. Participants will bid for only smaller portions of loans that are liquidity-constrained. The lead bank accepts a larger and more diffuse initial group to

gain some control of reselling behavior and minimize potential changes in the syndicate structure over the life of the loan.

Larger and more diffuse syndicates are formed for longer-maturity loans, consistent with some evidence that longer-term bank loans have less credit risk. We find similar results for borrowers holding many growth options with their attendant agency problems. While smaller and more concentrated syndicates would provide stronger incentives to monitor firms rich in growth options, participants do not appear willing to accept sizable exposures to such borrowers. An alternative interpretation is that our proxy for agency costs is actually capturing credit risk. If so, the coefficient we obtain has the correct sign.

Reputable lead banks form larger and more diffuse syndicates, presumably because reputation formation and maintenance requires a large network of contacts and frequent repeat business. This result implies there is an implicit cost to reputation, in that prominent banks must tolerate a higher probability of free riding by participants.■

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