The Role of Banks in Corporate Finance

by

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B.S., Economics
Georgetown University, Walsh School of Foreign Service, 1999

Submitted to the Department of Economics
in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 2005

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ABSTRACT

This dissertation consists of three chapters that examine the importance of commercial banks in the financing decisions of corporations. The first chapter focuses on syndicated loans. The syndicated loan market is an increasingly important source of corporate finance, with over $1 trillion in new syndicated loans signed annually. The first chapter empirically explores the syndicated loan market with an emphasis on how information asymmetry and renegotiation considerations influence syndicate structure and the choice of participant lenders. There are two principal findings. First, when the borrower requires more intense investigation and monitoring effort by a financial institution, the lead arranger retains a larger portion of the loan, forms a more concentrated syndicate, and chooses participants that are closer to the borrower (both geographically and in terms of previous relationships). The evidence is consistent with moral hazard in a setting of information asymmetry. The lead arranger attempts to guarantee due diligence effort by increasing its risk exposure, and the lead arranger chooses lenders that minimize information asymmetry. Second, when the borrower is more likely to need to renegotiate the loan agreement, lead arrangers add participants with very small portions of the loan to the syndicate. Given that unanimity of lenders is needed to renegotiate major terms of the loan, adding participants with small portions of the loan reduces the renegotiation surplus expected by the borrower. The evidence suggests that lenders form syndicates to reduce inefficient behavior and strategic default by borrowers.

The second chapter focuses on the use of bank lines of credit by corporations. Commercial bank lines of credit are used by more U.S. corporations than any other type of debt financing. Using novel data from annual 10-K SEC filings for a random sample of public firms, I analyze how corporate lines of credits are used by firms, how they are managed by banks, and which types of firms obtain lines of credit. The evidence suggests that lines of credit are the incremental source of debt financing for firms, and that banks carefully manage their use through covenants on profitability. Among firms that have lines of credit, a negative earnings shock leads to a restriction of the unused portion of the lines. Among all firms, only firms with high profitability are able to obtain lines of credit. The results suggest that lines of credit provide bank-managed flexibility for the firms that are able to obtain them, but only profitable firms are awarded this flexibility.

In the third chapter, I examine the increasing prevalence of commercial banks in the corporate debt underwriting market. The relaxation of restrictions on commercial bank underwriting, culminated in the passage of the Financial Services Modernization Act of 1999, has initiated a major change in debt underwriting markets facing borrowing firms. For the first time since the 1920s, financial institutions are able to jointly produce private lending and underwriting services. Using fixed effects regressions on a panel of 4,553 debt issues by 509 firms from 1990 to 2003, I find that issuing firms receive a 10 to 15 percent reduction in underwriting fees, which is driven by commercial banks jointly offering lending and underwriting services. I show firms are no more locked in to financial relationships after deregulation than before, and that issuing firms add multiple lead managers to prevent a lending commercial bank underwriter from gaining too much power over the firm. While a number of papers analyze commercial

bank entry, this work in this chapter is the first to use the effect of exogenous deregulation on within-firm variation over time to estimate key parameters. This methodological contribution is important; I show that cross section (or pooled) regressions produce biased and inconsistent estimates of the effect of commercial banks on yield spreads. The fixed effects strategy employed here calls into question the result in previous research that commercial banks obtain lower yield spreads for borrowing firms.

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Acknowledgements

I thank James Poterba, Antoinette Schoar, and Philip Strahan for their continuous help and support. No graduate student could hope for a better thesis committee, and this dissertation would not have been possible without their guidance. Conversations with Nittai Bergman, Amy Finkelstein, Robert Gibbons, Bengt Holmstrom, Dirk Jenter, and Stewart Myers were extremely helpful. I enjoyed sharing ideas and developing my research by conversing with current and former graduate students; in particular, I thank Daniel Bergstresser, Daniel Hungerman, David Matsa, and Joshua Rauh.

I am grateful to the Center for Retirement Research at Boston College and the FDIC Center for Financial Research for financial support. I also thank the Department of Economics at the Massachusetts Institute of Technology and the Finance Department at the Sloan School of Management for providing an outstanding environment to cultivate research. Audiences at universities provided helpful comments; in particular, I thank seminar participants at New York University (Stern), the University of Chicago Graduate School of Business, the Columbia University Graduate School of Business, Northwestern University (Kellogg), Harvard Business School, Yale School of Management, Dartmouth University (Tuck), University of Pennsylvania (Wharton), Princeton University, and the University of Rochester (Simon).

I also thank my family, and in particular my parents, Ashraf and Qaiser Sufi, who have provided the moral support and guidance that have made this undertaking possible. Above all, I thank my wife, Saima Abedin Sufi, who has graciously helped me to manage the twists and turns of these graduate student years.

Contents

Introduction

Commercial banks play an increasingly important role in the financing decisions of corporations. Existing theoretical and empirical research focuses mainly on the role of commercial banks in the financing decisions of firms without access to public equity and debt markets. In this dissertation, I depart from the existing research by focusing on the importance of banks in financing decisions of public corporations. The consolidation of the banking industry and the removal of regulatory constraints on the underwriting activities of commercial banks have led to a rise in the interaction between large corporations and commercial banks. Currently, there are over $1 trillion in new syndicated loans made to corporations annually by banks, and commercial banks underwrite over 90 percent of the public debt offerings by corporations. Over 85 percent of public firms have used some form of bank debt financing between 1996 and 2003.

The central research question I attempt to answer in this dissertation is: Why and how do corporations with access to public debt and equity markets use bank financing in their capital budget decisions? The existing theoretical frameworks developed in the banking and incomplete contracting literature provide guidance in the empirical analysis of this question. In the theoretical banking literature, the existence of commercial banks is motivated by the need for monitoring due to problems of information asymmetry between borrowers and creditors. More recent theoretical research uses advancements in incomplete contract theory to motivate the use of bank debt by corporations. This line of theoretical research emphasizes how dispersed public debt holders are unable to waive default provisions when corporations face difficulties. Banks therefore play a fundamental role in facilitating renegotiation when corporations experience financial or economic distress.

The existing theoretical research implies that banks play a fundamental role in reducing information asymmetry and facilitating renegotiation. This dissertation empirically examines the use of commercial banks in corporations' financing decisions, with a particular emphasis on these two issues. I use the theoretical frameworks described above to empirically explore the two main services provided by

banks to corporations: lending and underwriting securities. The first two chapters focus on lending, and the third chapter examines corporate debt underwriting.

The first chapter focuses on syndicated loans, which are the main product through which commercial banks offer funding to corporations. I explore this market with particular emphasis on how information asymmetry and renegotiation concerns influence the structure of syndicates and the choice of participant, or third-party, lenders. Consistent with the monitoring role of commercial banks, I find evidence that the lead bank in a syndicated loan retains a larger share of the loan when problems of information asymmetry are severe. When less is known about the borrowing firm, the lead arranger retains a larger share of the loan in order to be properly motivated to conduct the due diligence and monitoring that is required. In addition, when the borrower is more informational-opaque, the lead bank in the syndicate is more likely to choose participant lenders that are closer to the borrowing firm, both in terms of geographic proximity and previous lending relationships. These findings suggest that information asymmetry has a real effect on behavior in the syndicated loan market; they provide support for the view that commercial banks' interaction with corporations is motivated in part by issues of information asymmetry.

The first chapter also examines how the ability to renegotiate covenants in the syndicated loan market influences syndicate structure. In particular, I find evidence that the lead bank in the syndicate adds participant lenders with very small portions of the loan when the borrower is more likely to need to renegotiate the agreement. Given that unanimity of all syndicate members is required to renegotiate major terms of the loan, adding participants with small portions of the loan reduces the renegotiation surplus expected by the borrower. This evidence suggests that lenders form syndicates to reduce inefficient behavior and strategic default by the firm. The findings on renegotiation provide support to the view that renegotiation considerations are an important element in the syndicated loan market.

The majority of bank financing provided to public corporations is extended in the form of lines of credit. The second chapter of this dissertation represents, to my knowledge, the first comprehensive empirical study of the use of lines of credit in the corporate financing decisions of public firms. I find

evidence that a bank line of credit provides a flexible financial instrument that is the marginal source of increases and decreases in debt for the firms that obtain them. Lines of credit do not, however, represent unconditional extensions of unused financing capability. Instead, banks carefully monitor and manage lines of credit through covenants on profitability. I find evidence that banks place covenants on profitability more than any other financial measure; firms that experience a negative shock to their profitability subsequently lose access to the unused portion of their line of credit. I also find evidence that firms with low profitability do not obtain lines of credit. The evidence suggests that banks provide a flexible debt instrument that can be used with speed and discretion, but this flexibility is managed carefully by the bank. The evidence also suggests that banks have an advantage over other providers of debt financing in their ability to renegotiate and restrict lines of credit.

The third chapter focuses on commercial banks and the corporate debt underwriting market. The types of interactions between commercial banks and corporations was limited to lending relationships before the relaxation of restrictions on commercial bank underwriting, culminated in the passage of the Financial Services Modernization Act of 1999. Since 1999, commercial banks are able to jointly produce private lending and underwriting services. The results have been dramatic; the share of commercial bank underwriting of corporate debt securities has risen from less than 1 percent in 1990 to over 90 percent by 2003. I find evidence that commercial banks have increased their presence in the corporate debt underwriting market by using their information advantages from private lending relationships. Commercial banks jointly produce corporate debt underwriting and lending services, and offer significant fee discounts in this joint provision. The empirical methodology of this chapter is novel. I use fixed effects regressions that exploit the exogenous deregulation of restrictions on underwriting activity, and I am able to show that, in contrast to the findings of previous literature, commercial banks do not obtain lower yield spreads on the public debt offerings of their clients.

Rajan (1992) develops a model where commercial banks exploit their information advantages over clients in order to extract project rents. In the third chapter, I examine whether commercial banks exploit firms because of the information advantage they have over outside creditors. I find no evidence of

such exploitation. Commercial banks charge lower fees to corporations that stay low on debt issues two years after the initial underwriting. Firms are no more likely to be exclusively reliant on their lending commercial bank for future underwriting services than on non-lending banks. Overall, the findings of the third chapter suggest that commercial banks have a unique advantage in underwriting corporate debt because of their private lending relationships. At the same time, banks are not able to exploit this information advantage to extract rents from firms.

Theoretical research argues that commercial banks reduce information asymmetry and facilitate renegotiation. I find evidence that, even among public corporations, information asymmetry and renegotiation considerations are important factors in explaining the role of banks in corporate finance. Banks provide a monitoring and due diligence function that is necessary even among corporations with access to public equity and debt markets. Banks also serve an important role in providing flexible and renegotiable debt instruments to corporations.

Introduction References

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Chapter 1

Agency and Renegotiation in Corporate Finance: Evidence from Syndicated Loans

1.1 Introduction

Non-financial U.S. businesses obtain over $1 trillion in new syndicated loans each year, which represents more than 15 percent of their aggregate debt outstanding. Of the top 500 non-financial firms in the Compustat universe in 2002, over 90 percent obtained a syndicated loan between 1994 and 2002. According to the American Banker, syndicated lending represents 51 percent of U.S. corporate finance originated and represents more underwriting revenue for the financial sector than both equity and debt underwriting (Weidner (2000)). The market has experienced strong growth, going from $137 million in 1987 to over a $1 trillion today. Despite the importance of syndicated loans in corporate finance, research on the role of syndicated loans in U.S. corporate finance is limited.[1]

A syndicated loan is a loan where at least two lenders jointly offer funds to a borrowing firm. There is (at least) one "lead arranger" that establishes a relationship with the firm, negotiates terms of the contract, and guarantees an amount for a price range. The lead arranger then turns to "participant" lenders that fund part of the loan. In this chapter, I analyze 14,021 syndicated loan deals to 5,011 U.S. non-financial firms from 1991 to 2003. I use this sample of syndicated loans to explore two of the theoretical foundations of modern corporate finance: information asymmetry and renegotiation. More specifically, I exploit variation in the credit reputation of borrowing firms to explain how information asymmetry and *ex-post* renegotiation considerations affect the structure of syndicates and the choice of participant lenders. Syndicated loans are especially promising as an empirical laboratory because, unlike most financial products, firms from *all* points of the credit spectrum (privately-held, high yield, investment grade, etc.) utilize this form of finance. I find evidence that both information asymmetry and renegotiation concerns affect syndicate structure and participant choice in a manner consistent with previous theoretical research.

[1] Exceptions include Simons (1993), Dennis and Mullineaux (2000), and Lee and Mullineaux (2004). There is also a literature on syndicated loans to non-U.S. companies, the pricing and default risk of syndicated loans, and the effect on firm value of loan announcements. I discuss these papers below.

The first contribution of this paper is to document that information asymmetry shapes syndicate structure and the choice of participants in a manner consistent with prominent theories of agency and moral hazard (Holmstrom (1979); Holmstrom and Tirole (1997)). A basic assumption in these models is that firms with limited public information require investigation and monitoring by an "informed" lender before "uninformed" lenders invest in the firm. In this framework, there exists a moral hazard problem for the informed lender because the informed lender's monitoring and investigation effort is unobservable. In order to ensure diligence, a lender with monitoring and investigation responsibilities must retain a large financial stake in the borrowing firm; only a bank with a stake in the firm's performance exerts the necessary effort in due diligence and monitoring. My findings support this theoretical prediction. When borrowing firms require more intense investigation and monitoring (by a variety of measures), the lead arranger (informed lender) retains a larger share of the loan, there are fewer participants (uninformed lenders), and the syndicate structure is more concentrated. For example, after controlling for the size of the loan and the size of the firm, I find that syndicated loans to firms without publicly-available SEC filings have 25 percent fewer participant lenders and the lead arranger holds 10 percent more of the loan. This result is robust when comparing firms with and without publicly-available SEC filings, and when using within-firm variation (when the same firm goes from private to public or vice versa). I also find evidence that information asymmetry shapes syndicate structure *among* firms with publicly-available SEC filings. Following previous literature, I use the ratio of positive accruals to total assets and the ratio of R&D investment to sales as measures of the need for monitoring and due diligence among public firms. Using these alternative measures, I find similar results: lead arrangers on loans to public firms that require more intense monitoring and due diligence retain a larger share of the loan and form a more concentrated syndicate.

This finding underscores the importance of "informed" capital in the financial health of firms that require more investigation and monitoring by a financial institution. The evidence presented in this chapter supports the *foundation* of models that predict that small, informational-opaque companies are disproportionately affected by shocks to balance sheets of commercial banks (Holmstrom and Tirole

(1997); Kashyap, Stein, and Wilcox (1993)). In the syndicated loan market, firms that require investigation and monitoring obtain financing from third parties only after an informed lender takes a large financial stake in the firm.

I further document the importance of information asymmetry in syndicate formation by analyzing which participants are chosen as syndicate members. When the borrowing firm has no publicly available SEC filings or no publicly available credit rating, participant lenders on syndicates are "closer" to the borrowing firm, both geographically and in terms of previous relationships. In other words, when there is limited information about a borrower, lead arrangers attempt to reduce the need for information gathering by choosing participants that already "know" the firm.

I also examine whether reputation "build-up" may improve the ability for lead arrangers to successfully originate loans for borrowers with limited information. That is, repeated interactions between a lead arranger and a participant may lead to reputation effects that reduce the moral hazard problem when originating loans for opaque borrowers. However, the evidence is weak. First, previous lead arranger-participant relationships influence participant choice, but previous lead arranger-participant relationships are much less important (both in magnitude and statistical significance) than previous relationships between the borrowing firm and the participant lender. Second, while it is true that relationships between the borrowing firm and participants are stronger among firms without SEC filings, relationships between lead arrangers and participants do not appear to vary systematically across the credit reputation spectrum. The results suggest that a lead arranger selects participants based on the participant's familiarity with the *borrowing firm*, not based on the participant's familiarity with the *lead arranger itself.* This finding is in contrast to syndicates in IPO issues and venture capital, and suggests that potential information asymmetry problems cannot be overcome by lead arranger reputation alone.

The second contribution of this chapter is to demonstrate that *ex-post* renegotiation considerations influence the *ex-ante* structure of the syndicate in a manner consistent with incomplete contract theory and strategic default (Hart and Moore (1988); Bolton and Scharfstein (1996)). Renegotiation is an important aspect of the syndicated loan market, and the number of creditors is a choice variable. Both of

these factors make this market a promising empirical laboratory for analyzing these models. Bolton and Scharfstein (1996) document two opposing effects of renegotiation considerations on the optimal number of creditors. When firms are more likely to strategically default, lending syndicates should be larger and make renegotiation more difficult to discourage inefficient behavior by the firm. When firms are more likely to default due to exogenous shocks ("liquidity default"), lending syndicates should be smaller to facilitate renegotiation. Both theoretically and empirically, the two propensities are highly correlated; only firms with a realistic probability of liquidity default have the ability to "lie" and strategically default. The model therefore provides an ambiguous and testable prediction in the syndicated loan market: is liquidity or strategic default the more important factor in syndicate formation?

I find evidence that strategic default is the more important consideration in syndicate formation. Lenders appear to add participants to the syndicate to make renegotiation more difficult when firms are more likely to default. I isolate the analysis to rated firms with public filings, and I use variation in default risk *across* firms (proxied by senior unsecured debt ratings and leverage ratio) and *within* firms (proxied by credit downgrades). I find that loans to high yield firms, which are more likely to renegotiate loan terms due to default, have 15 to 20 percent more participant lenders. This result does not appear to be driven by diversification alone; while the number of participants increases with firm default risk, the actual concentration of the loan and the percentage (or amount) held by the lead does not. Finally, the larger number of participants is driven by lenders who hold very small amounts of the loan. The average number of lenders holding less than 2 percent of a loan for firms likely to renegotiate is 65% higher than loans to other firms. Given that *unanimity* of syndicate members is required for renegotiation of loan terms, the evidence suggests that lenders form larger syndicates to make renegotiation more difficult. In other words, each syndicate member has veto power over renegotiation, and so "participant-loading" reduces the expected payoff to the borrowing firm from renegotiation. By reducing the expected value from renegotiation, lenders can reduce strategic default by borrowers. This result implies that *ex-post* renegotiation considerations affect *ex-ante* contract structure in a manner consistent with incomplete contract theory.

The rest of the chapter is outlined as follows. The next section describes the syndicated loan market, the syndication process, and existing research related to this chapter. The third section describes the data and basic summary statistics. The fourth section explores how information asymmetry affects syndicate structure and the participants chosen as syndicate members. The fifth section focuses on renegotiation in the syndicated loan market and how it affects syndicate structure. The sixth section concludes.

1.2 The syndicated loan market: background and existing research

1.2.1 Background[2]

A syndicated loan is a loan made to a firm jointly by more than one financial institution. As Hitchings (1994) notes, "... it is fundamental to syndicated lending that the terms and conditions of the loan are similar for each of the lenders (32)". Members of the syndicate fall into one of two groups: lead arrangers and participant lenders. The distinction is important, and the two groups vary on three major dimensions. First, participant lenders rarely directly negotiate with the borrowing firm, and typically have an "arm's-length" relationship with the borrowing firm through the lead arranger. Lead arrangers establish and maintain a relationship with the borrower, and take on the primary information collection and monitoring responsibilities. (An often-cited "advantage" of a syndicated loan for a borrowing firm is being able to deal with only one bank while accessing funds of many banks.) Second, the lead arranger typically holds a larger share of the loan than any of the participants. Third, in terms of renegotiation rights, unanimity of all syndicate members is always required to change terms related to principal, interest, maturity, or collateral.[3] For example, if a borrowing firm enters into a state of default by missing a payment, all members must agree to change contract terms in order to avoid acceleration of the loan. Renegotiation of contracts is common, and is done through amendments to the original loan agreement.

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[2] The information in this section comes from practitioners working in financial institutions and lawyers who specialize in syndicated loan contracts. In addition, Wienke (1994), Hitchings (1994), and Esty (2001) are excellent descriptions of syndicated loan arrangements.

[3] Of the syndicated loans in my sample where the number of votes needed to change terms is available, 99.5 percent require unanimity of syndicate members to agree to a change in the contract. Minor changes that do not involve principal, interest payments, maturity, or collateral do not always require full unanimity.

The syndication process works as follows. The lead arranger signs a preliminary loan agreement ("mandate") with the borrowing firm that specifies covenants, fees, and collateral. The preliminary loan agreement also specifies a loan amount, and a range for the interest rate. Once the preliminary loan agreement is signed, the lead arranger then turns to potential participant lenders to fund part of the loan. The lead arranger provides potential participants with an information memorandum on the borrowing firm. Once the participants (and the amount they are to fund) agree to fund part of the loan, the loan agreement is signed by all parties.[4] Each participant member is responsible for a share of the loan. As noted above, the terms of the loan are identical for all syndicate members. In addition to interest and commitment fee income, the lead arranger receives a fee for arranging and managing the syndicated loan, which is paid by the borrowing firm.[5] During the life of the loan, the lead arranger typically also acts as the "agent" bank that monitors the firm, governs the terms of the loan, administers the drawdown of funds, calculates interest payments, and enforces financial covenants.

Three additional facts about the market are important. First, borrowing firms can hire more than one lead arranger. Lead arrangers are sometimes assigned a particular function (origination, loan administration, publicity, documentation, etc.), and work by Francois and Missonier-Piera (2004) suggests that multiple lead arrangers are the result of competitive advantages in various duties. Second, there is an "agency" section of the loan agreement that gives conditions for the removal of the lead arranging bank. As is noted in Dennis and Mullineaux (2000), the agreement usually exculpates the lead arranger from liability except where it results from gross negligence or willful misconduct. Third, a borrower defaults on a loan if it misses any required interest payment or if it violates any of the financial or non-financial covenants listed in the agreement. Covenants, default, and renegotiation are very important in this market, and I explore them in greater detail below.

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[4] I use the language that participants are "chosen" on deals by the lead arranger throughout this paper. In reality, the choice process can be more complex. Lead arrangers typically select a group of potential participants and the participants may agree or refuse to be part of the syndicate.

[5] This fee is an up-front payment from the borrower to the lead arranger and is not listed on the contract. Lead arrangers typically retain the largest portion of the fee, but can share the fee with participant lenders. Interviews suggest that fees vary between 25 and 175 basis points of the total loan amount.

The loan sales market is an important parallel to syndicated loans. There are a few key distinctions. First, the contracting behavior for a syndicated loan is distinct. As noted in Gorton and Pennachi (1995), a loan sale leaves the existing contract between the firm and the original lender unaltered. A new secondary participation contract is signed that gives the loan buyer access to cash flows. The terms of the new loan agreement can be altered significantly from the original contract. While the theory of loan sales presented in Gorton and Pennachi (1995) applies to syndicated loans, the problems of moral hazard are less severe in a syndicated loan setting. Lenders are mutually tied to one contract, and the lead arranger holds part of the loan. Second, as Dahiya, Puri, and Saunders (2003) demonstrate, the market for loan sales has developed into a market for mostly distressed debt. Over half of the firms in their sample of loan sales file for bankruptcy within 3 years of the initial sale of one of their loans. By 2001, according the Loan Pricing Corporation, over half of the loan sales in the syndicated loan market were distressed. The majority of the syndicated loan market consists of firms outside financial distress.

1.2.2 Existing research

Previous research on syndicated loans is limited when compared to research on public equity and debt underwriting markets. Most relevant to my analysis are three papers that evaluate syndicate structure. Simons (1993) examines the incentives to syndicate and finds evidence that diversification is the main reason behind syndication. She also finds that lead arrangers syndicate more of "quality" loans, where quality comes from *ex-post* examiner ratings. Dennis and Mullineaux (2000) find that lead arrangers are more likely to syndicate loans when the loan is large, the borrowing firm is public, and when the lead arranger has a strong reputation. They also find that, conditional on a loan being syndicated, a larger percentage of the loan is syndicated when there is public information on the borrowing firm and when the lead arranging bank has a strong reputation. Lee and Mullineaux (2004) find that syndicates are more concentrated when the quality of information on firms is worse. They also

find that syndicate structure is more concentrated with fewer lenders when firms have a higher default probability.[6]

There are also two recent working papers that evaluate syndicate structure. Jones, Lang, and Nigro (2000) find that information asymmetry, loan credit quality, capital constraints, and maturity affect the amount of the loan retained by the agent bank. Panyagometh and Roberts (2002) find evidence that the lead bank syndicates a larger proportion of loans that are subsequently upgraded, which they interpret as evidence that the lead bank does not exploit any additional information unavailable to participant lenders.

The work presented here extends the existing research on syndicated loans in several new directions. First, with regard to information asymmetry, this paper is the first, to my knowledge, that explicitly addresses how the characteristics of lenders might mitigate or exacerbate information asymmetries between lenders and borrowers. It is also the first to explore how relationships *among* syndicate members evolve. The participant choice analysis in the syndicated loan market is new and helps enrich the understanding of how information asymmetry affects relationships. Second, this paper is the first, to my knowledge, that explores how information asymmetry affects syndicate structure *among* public firms. Third, there is an implicit assumption in the previous literature that adverse selection is the key result of information asymmetry and little attention is given to moral hazard. I distinguish between adverse selection and moral hazard predictions, and I show that moral hazard is the more prominent feature of this market. Fourth, this paper is the first, to my knowledge, to find evidence that renegotiation considerations influence syndicate structure in the U.S. market in a manner consistent with incomplete contract theory and strategic default.

In addition to these papers on syndicate structure in the U.S. market, there are other lines of research on syndicated loans. Preece and Mullineaux (1996) and Megginson, Poulsen, and Sinkey (1995) do event studies using the market value of the firm and syndicated loan announcements. Esty and Megginson (2003) evaluate syndicate structure on project finance syndicated loans to firms in 61 different

[6] This finding is in contrast to the findings of my analysis. I give reasons for this discrepancy below.

countries. They find that loans in countries with weaker creditor protection have more syndicate members, which they interpret as a mechanism to prevent strategic default by borrowers. Esty (2004) and Qian and Strahan (2004) examine syndicated loans to firms in different countries with a focus on how legal and financial systems affect syndicated loan composition. There is also a recent literature on the pricing of syndicated loans and default risk (Thomas and Wang (2004); Altman and Suggitt (2000); and Angbazo, Mei, and Saunders (1998)).

This paper also fits into a wider area of research that examines the importance of syndicate structure in venture capital and securities underwriting markets. Corwin and Schultz (2005) examine IPO syndicates and find evidence that co-managers serve an important information production role and previous relationships among syndicate members are strong determinants of future syndicate relationships. Narayanan, Rangan, and Rangan (2004) examine SEO syndicates and find evidence that commercial banks with lending relationships with the borrower tend to co-manage with reputable investment banks. Lerner (1994) and Amit, Brander, and Antweiler (2001) evaluate venture capital syndicates. This paper is the first, to my knowledge, that explores how syndicate relationships are formed and how they persist in the syndicated loan market.

1.3 Data and summary statistics

1.3.1 Data

The primary data source used to evaluate syndicated loans is Dealscan by the Loan Pricing Corporation. Dealscan contains detailed information on syndicated loan contract terms, lead arrangers, and participant lenders. The primary sources of data for Dealscan are attachments on SEC filings, reports from loan originators, and the financial press. The sample I employ includes 14,021 syndicated loan deals to 5,011 U.S. non-financial firms from 1991 through the first half of 2003. The full Dealscan database includes 19,892 unsponsored confirmed syndicated loan deals to firms for these years. I drop syndicated loans without data on industry (1,383), firm sales information (3,381), or firm state (142). Of the remaining 14,986 loans deals, I drop any loan to a firm that has a ticker available, but I could not link the firm to Compustat. The remaining sample contains the final 14,021 loans. Firms in the sample with

ticker and/or credit rating data available are subsequently matched to Compustat to get a richer set of financial variables. This matching process yields detailed financial data for 10,703 of the loans in the sample (76 percent).

The analysis presented here evaluates syndicated loan deals. A syndicated loan deal may contain more than 1 loan tranche. In my sample, 75 percent of the loan deals contain only 1 tranche, 20 percent of the loan deals have 2 tranches, and there are a total of 18,993 loan tranches for the 14,021 loan deals. A deal-level analysis, as opposed to a tranche-level analysis, is the appropriate technique 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 1 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. Second, multiple tranches on the same syndicated loan deal cannot be treated as independent observations, and such an analysis produces standard errors that are improperly small. All results presented below are robust to a tranche-level analysis; the results are very similar quantitatively and significance levels are actually *stronger* in the tranche level analysis (as should be expected given a larger number of tranches than deals). For this analysis, the number of lenders and the amount held by each lender are calculated at the deal level.

Part of the analysis below focuses on which participant lenders are chosen as syndicate members. For this analysis, I collect data on the characteristics of the lenders. For the sample of loans, there are 689 financial institutions that ever serve as lead arrangers and 2,341 that serve as participants.[7] To make data collection manageable, I collect data on the top 100 lead arrangers and top 125 participants, by number of loans.[8] These "top lenders" represent 96 percent of the total number of lead arrangers serving on loans and 83 percent of total number of participants serving on loans. Data on lenders comes from (1) the

[7] I use two variables to classify lenders as either lead arrangers or participants. Both are available using the custom report feature in Dealscan's web-based LoanConnector. One variable is labeled "Lenders-Lead Arranger" and the other is "Lenders-All Lenders." If the variable "Lenders-Lead Arranger" is available, I classify the lender listed in this field as the lead arranger, and all other lenders are considered participants. If this field is unavailable, any lender listed as having a "Lead Role" in the "Lenders-All Lenders" is a lead arranger. A data appendix is available upon request to further explain the data construction.

[8] A full list of all lenders and all mergers is included in a data appendix available upon request.

Federal Reserve Y9C filings for U.S. regulated commercial banks, (2) the Compustat Industrial Annual tapes for other U.S. financial firms, and (3) the Compustat Global Financial Services tapes for non-U.S. financial firms. From these sources, I extract data on location, total assets, and equity to asset ratios for participants in my sample.

All financial institutions are aggregated to their parent company and inherit the characteristics of the parent company. I am careful to control for mergers among my sample, and acquired firms are aggregated to their acquirers at the effective date of the merger. In addition, acquiring financial firms inherit both previous lead arranger-participant relationships and previous borrowing firm relationships of the acquired firm. Using the entire sample of syndicated and sole lender loans from 1990 to 2003, I calculate measures of previous relationships for any firm that has a previous loan in the Dealscan sample.

1.3.2 Summary Statistics

Table 1 presents syndicated loan summary statistics. Borrowing firms on average have $3.1 billion in sales, and median sales is $629 million. About 46 percent of loans are to firms with an S&P senior unsecured debt rating, and the average firm has a rating of BBB-. I also include summary statistics for firms linked to Compustat and show data on assets (*data6)*, leverage (*(data9+data34)/data6*), return on assets (*(data14+data18)/data6)*), the R&D to sales ratio (*data46/data12*), and the accruals to total assets ratio.[9] In terms of loan characterstics, the average loan is $358 million with a maturity of 1,140 days. About 23 percent of deals include a term loan tranche.

For syndicate structure, the average loan has 8.1 lenders, 1.8 lead arrangers, and 6.3 participant lenders. For a sub-sample of 5,066 loans, I have the share held by each lender in the syndicate. I use this data to construct a variety of measures. First, I construct the percentage of the loan kept by the lead arranger (which is the average of all lead arrangers' shares if more than one lead arranger is present). Second, I use a Herfindahl index as a measure of the concentration of holdings within a syndicate. The Herfindahl is calculated using each syndicate members' share in the loan; it is the sum of the squared individual shares in the loan, and varies from 0 to 10,000, with 10,000 being the Herfindahl when a lender

[9] I follow Sloan (1996) in defining accruals as: *[(ΔData4 - ΔData1) -(ΔData5 - Δ Data34- ΔData71) – Data14].*

holds 100% of the loan. Third, I create measures of how many participants hold "small amounts" of the loan, defined as less than $5 million or less than 2 percent of the loan.

Table 2 lists the top 5 lead arrangers (by volume) and top 5 participants (by number of deals) for syndicated loan deals to private and public firms from 2001 to 2003. With the exception of Fleet and Deutsche Bank, the top 5 lead arrangers are the same in both markets. The third column of Table 2 lists the most common syndicate participant for each of the top 5 lead arrangers, and the percentage of the lead arrangers' arranged loans on which the participant was a syndicate member. Column 3 shows that repeat interactions among syndicate members are not extreme; for example, Bank of America chose Fleet as a participant on only 20 percent of its arranged loans. While repeat interactions are higher with Citigroup and JPMorganChase, this is an exception. On average, a given participant for a lead arranger has been on 13 percent of the arranged loans for the lead arranger in the past year. Corwin and Schultz (2005) examine IPO syndicates in the 1990s and find higher average persistence in relationships between syndicate members.[10]

1.4 Information asymmetry

Information asymmetry between firms and their investors and the resulting agency problems are key aspects of models that explain macroeconomic fluctuations (Bernanke and Gertler (1989); Holmstrom & Tirole (1997)), external financing constraints (Bernanke, Gertler, and Gilchrist (1999)), and the fragility of the small business sector (Rajan (1992); Kashyap, Stein, and Wilcox (1993)). Models of information asymmetry in corporate finance, such as Diamond (1991), have been used empirically to explore the differences between relationship-driven bank loans (where an informed lender retains the entire loan), and public debt issues (where an informed lender/underwriter sells the entire loan). Syndicated loans are positioned between these two extremes, having characteristics of both private sole-lender loans and public debt issues underwritten by a financial institution. In addition, firms from the

[10] For example, Corwin and Schultz (2005) show that Solomon Smith Barney served as a syndicate member on 83 percent of IPOs where the book manager was DLJ, and Merrill Lynch served as a syndicate member for 57 percent of IPOs where the book manager was Lehman Brothers.

entire credit spectrum use syndicated loans. These two facts make empirical analysis of how information asymmetry affects financial arrangements promising in this market.

1.4.1 Theoretical framework & empirical implementation

The basic theoretical framework I use is inspired by models in Holmstrom (1979), Holmstrom and Tirole (1997), and Gorton and Pennachi (1995). In this framework, the lead arranger is an "informed lender" who is able to monitor and learn about the firm through unobservable and costly effort. Potential participant lenders are "uninformed lenders" who rely on the information and monitoring provided by the informed lender to make profitable investments in firms. There exists a moral hazard problem at the lead arranger level, given that informed lender effort is unobservable. The informed lender's potential loss is increasing in the portion of the loan it holds, and so the amount of effort exerted by the lead arranger in due diligence and monitoring is declining in the portion of the loan it syndicates out to participants. At the extreme, only long run reputation considerations govern due diligence by the lead arranger if the lead arranger holds none of the loan (as in a debt underwriting, for example). In this framework, a lead arranger exerts less effort than it would if its actions were fully observable. Participant lenders correctly predict such "shirking" by the lead arranger, and they choose to hold less of the loan. Holmstrom and Tirole (1997) succinctly describe this aspect of their model by noting that "[uninformed lenders] invest directly in the firm, but only after the monitor has taken a large enough financial interest in the firm that the investors can be assured that the firm will behave diligently" (674).

In order to empirically implement this framework, I classify borrowing firms based on the need for monitoring and due diligence; I refer to firms that need more monitoring and due diligence as "opaque." When borrowers are relatively transparent and easy to monitor, the moral hazard problem for the lead arranger is less severe. With transparent firms, traditional diversification incentives likely determine the syndicate structure, and the lead arranger does not need to hold a relatively large share of

the loan.[11] As the borrowing firm becomes more difficult to investigate and monitor (more "opaque"), lead arrangers cannot credibly commit to the proper effort, and so they must hold a larger share of the loan.

I use a variety of measures to classify firms as "opaque" and "transparent"; they are shaped both by previous literature and by data limitations. The Dealscan data contain information about borrowing firms limited to three variables: firm sales, ticker, and S&P senior unsecured debt rating. Using these measures, I rank firms into three categories. First, "private" firms are firms with no ticker and no S&P senior unsecured credit rating which lack publicly available SEC filings. Although audited accounting information may be available for private firms, the identifying assumption is that participant lenders are more dependent on the lead arranger for both its monitoring skills and its ability to collect detailed information when the borrowing firm is not registered with the SEC. In addition, the penalties for falsifying accounting information are less severe when a borrower is not SEC-supervised, which makes monitoring by a lead arranger more important. The second group includes "unrated" firms; these are public borrowers with publicly available accounting data that lack an S&P senior unsecured debt rating. Finally, "transparent" firms are public with S&P senior unsecured debt ratings; these firms have publicly available accounting information with credit quality measured by an independent third party. Information asymmetry between lenders and the borrower and moral hazard are least severe on loans to these firms.

As noted above, I link all public firms (unrated and transparent) to Compustat. Among these public firms, I follow previous literature and use the ratio of R&D investment to sales and the ratio of accruals to total assets as measures of opacity *among* firms with publicly available SEC filings. Firms with high R&D investment to sales ratios have earnings that depend on the realization of future investment opportunities (Lorek, Stone, and Willinger (1999)); the evaluation of such future earnings realizations is difficult and requires additional effort by the lead arranger. The use of positive accruals has been shown to be associated with earnings inflation and opacity of cash flows (Teoh, Welch, and

[11] When borrowing firms are perfectly transparent, one prediction is that the monitoring and due diligence duties are completely independent of holding a portion of the loan. This is precisely the case in a debt underwriting, when the underwriter holds none of the debt issue.

Wong (1998); Sloan (1996)). Firms that report positive accruals require more rigorous monitoring by a financial institution, which exacerbates the moral hazard problem. I also use alternative measures which I describe in the results.

Table 3 presents cell means and standard errors for private, unrated, and transparent borrowing firms. Transparent firms are larger and obtain larger loans. In terms of syndicate structure, transparent firms have a larger number of lenders, lead arrangers, and participant lenders. On average, the lead arranger holds almost twice the share of the loan when the borrowing firm is private (38 percent) or unrated (35 percent) compared to transparent (20 percent), and the syndicate is more concentrated (Herfindahls of 3400 and 3100 compared to 1600). These last two facts give preliminary evidence of the effect of information asymmetry on syndicate structure; I show in the next section that these patterns are robust in a more rigorous empirical specification that controls for size differences.

1.4.2 Information asymmetry syndicate structure regressions

In this section, I examine how variation in the opacity of borrowing firms affects syndicate structure, and whether the effect is consistent with the information asymmetry hypotheses outlined above. The general formulation of equations estimated in Table 4 is:

$$Synd_i = \alpha + \sum_{t=1}^{12} Yeardum_t + X_i\beta + Opaque_i\gamma + \varepsilon_i \qquad (1)$$

The left hand side variables are measures of the syndicate, such as number of lead arrangers, number of participants, and the percentage retained by the lead arranger. The key right hand side variable of interest is *Opaque*, which represents measures, described above, of the need for a financial institution to investigate and monitor the borrower. The control variables (*X*) include industry indicator variables, the natural log of firm sales, the natural log of maturity of the loan in days, the natural log of the number of loan tranches, and an indicator variable for whether a loan deal contains a term loan.[12] As is evidenced in Table 3, the size of the loan varies widely between private, unrated, and investment grade firms; I control

[12] Another loan characteristic available for some loans in the sample is whether the loan is collateralized. Unfortunately, these data are available for only about 40 percent of the sample. For this sub-sample, I have run all regressions with the inclusion of a collateral indicator variable. The core results are unchanged.

for the size of the loan by sorting the sample into three groups based on the size of the loan, and allowing the intercept and the natural log of the size of the loan to vary by each group.[13] The key coefficient of interest is γ, or how increased "opacity" affects syndicate structure. In other words, γ measures whether lead arrangers hold more of the loan, form a more concentrated syndicate, or select fewer participants when the borrowing firm is more difficult to investigate or monitor. Finally, all standard errors are heteroskedasticity robust, and clustered at the firm level.[14]

Table 4, Panel A presents the estimates using transparent borrowing firms as the omitted group. The top 2 rows show that loans to private and unrated firms have fewer participant lenders, a more concentrated syndicate, and the lead arranger holds more of the loan (whether measured by the percent or amount of the loan). Columns (1) and (2) show the results on the full sample. Column (2) shows that private firms have 25 percent fewer participant lenders than transparent firms at the mean, after controlling for the size of the loan and the size of the firm. Columns (3) through (7) isolate the sample to loans where the amount held by each syndicate member is available. In the sub-sample, the number of lead arrangers does not appear to be different, but the number of participants for more opaque firms is lower. The percent held by the lead arranger is 10 percent higher for private firms at the mean, and the syndicate structure is 10 percent more concentrated using the Herfindahl index.

The results in Table 4, Panel A are consistent with the theoretical framework of agency and moral hazard outlined above. Firms that lack SEC filings are more difficult to investigate and monitor, which exacerbates the moral hazard problem of the lead arranger. When borrowing firms lack publicly available SEC filings, participant lenders are more reliant on the lead arranger for detailed information on the borrower. Also, the absence of SEC oversight reduces the penalties for borrowing firms from manipulating or overstating financial health or earnings. Thus, firms that lack SEC filings also require additional monitoring. Unrated firms have public SEC filings, but lack a publicly available third party

[13] In robustness checks in Section 5, I address the concern that syndicate structure and the size of the loan are jointly determined, and so the size of the loan should not be treated as exogenous.
[14] Between and random effects estimation yields almost identical results as the clustering on firm approach. I also do fixed effects estimates that I report in the text.

debt evaluation. The point estimates in Table 4, Panel A present an ordering consistent with moral hazard in a setting of information asymmetry. Lead arrangers retain the largest share of the loan and form the most concentrated syndicates with the fewest participants when borrowing firms are private. The same pattern is observed, to a weaker degree, when borrowing firms are public but unrated. The ordering of the estimated coefficients in column (2) for private and unrated firms is statistically significant at the 5 percent level.

Table 4, Panel B offers additional specifications to test the robustness of these results. One possible problem with the results in Table 4, Panel A is that private and unrated borrowing firms are not comparable to transparent firms given differences in unobservable characteristics correlated with (but not perfectly captured by) size.[15] In columns (1) through (3), I limit the sample to all transparent firms and only private and unrated firms above median sales ($250M). When comparing the largest private and unrated firms, the point estimates are very similar (with standard errors slightly higher due to a smaller sample). I use various measures from Compustat to see if the core predictions of the information asymmetry framework hold true when looking *among* public firms. Columns (4) through (6) use an alternative measure of opacity for public firms based on the R&D to sales ratio. Firms with higher R&D to sales ratio have fewer participants and a more concentrated syndicate. In columns (7) through (9), I use the accrual to assets ratio as a measure of the necessity of monitoring. Public firms that require more intense monitoring, measured with the accruals to total assets ratio, have a higher percentage of the loan retained by the lead arranger, and a more concentrated syndicated. In addition to these two measures, I also use years since IPO (older firms are more transparent) and the number of times a firm has accessed the syndicated loan market (firms that have already accessed market are more transparent). All results are robust to these two measures. Even among public firms, when the borrowing firms requires more intense effort for due diligence and monitoring, the lead arranger retains a larger share in the loan and forms a more concentrated syndicate.

[15] I use a set of comprehensive controls for the size of the loan and size of the firm in order to partial out this effect. Below, I also address this worry using fixed effects regressions and evaluating the within-firm change in syndicate structure when a given firm goes from private to transparent or vice versa.

I interpret these results as evidence of moral hazard with respect to lead arranger effort in monitoring and due diligence. An alternative explanation is a signaling model based on adverse selection. If a lead arranger has private information on a borrower unavailable to participant lenders, it may be tempted to syndicate out more of a loan when private information is negative. Participant lenders correctly predict such behavior, and the lead arranger is forced to "signal" that the loan is of high quality; the lead arranger retains a larger share of the loan and forms a more concentrated syndicate when information asymmetry is severe. Can these two hypotheses be empirically distinguished? The key distinction in the adverse selection and moral hazard hypotheses is the assumption of where information asymmetry lies. In the adverse selection hypothesis, the lead arranger has private information on the firm that is unknown to participant lenders. In the moral hazard hypothesis, all lenders are unfamiliar with the borrower and the moral hazard problem is most severe when the lead arranger must itself learn about the firm.

To distinguish these two hypotheses, I use previous lending relationships between the borrower and the lead arranger as a measure of the information advantage of the lead arranger with respect to participant lenders. If the adverse selection hypothesis is true, then a lead arranger with a previous relationship with the borrower should be forced to retain more of the loan and form a more concentrated syndicate. The prediction is the opposite under the moral hazard hypothesis; a lead arranger with a previous lending relationship with the borrower has already put in the effort required to learn about the firm, and so should be able to retain less of the loan and form a more diffuse syndicate. Table 4, Panel C tests these alternative hypotheses. I group both private and unrated firms into an "opaque" group and include an indicator variable for the presence of a previous lending relationship between the borrower and lead arranger. In addition, I interact these two variables and control for the number of previous loans by a borrower. The results support the moral hazard hypothesis. On deals where a previous lending relationship is present, the lead arranger retains a smaller portion of the loan and forms a more diffuse syndicate with more participants. While the result is true for all firms for the percentage retained by the lead arranger and the concentration of the syndicate (the level effect of a previous loan is significant), it is

only true for opaque firms for the number of participants (the interaction term is significant). The results suggest that problems of information asymmetry are less severe when the lead arranger has a previous lending relationship with the borrower, which supports the moral hazard interpretation.

1.4.3 Participant choice and information asymmetry

1. Characteristics of Participant Lenders

This section explores how information asymmetry between lenders and borrowers in the syndicated loan market affects which participant lenders end up as syndicate members. I examine whether lead arrangers select potential participants that are more familiar with the borrowing firm when information asymmetry problems are potentially severe.[16] In particular, I focus on two different questions. First, what are the characteristics of the lender given that the lender is chosen as a participant, and how do these characteristics vary with the opacity of the borrower? Second, what lender characteristics affect the probability that a given lender is chosen as a participant, and how do these characteristics differentially affect the probability when the borrower is opaque? For example, I am interested in the percentage of *chosen* participants that are foreign financial institutions, and whether that percentage increases or decreases when the borrowing firm is opaque. I am also interested in how *being* a foreign financial institution affects the *probability of being chosen* as a participant, and how this effect varies with the opacity of the firm.

The analysis in this section focuses only on lenders in the top 125 participants or top 100 lead arrangers, by number of deals. These top lenders account for 72,401 out of the total of 87,956 participants in the sample, or about 83 percent. The inclusion ratio is similar across all types of firms: 78 percent for opaque firms, 81 percent for unrated firms, and 84 percent for transparent firms. There is one important limitation in the Dealscan data with regard to lead arranger-participant relationships. When more than one lead arranger is present, I cannot distinguish which lead arranger brought a given

[16] I use the language that the lead arranger "chooses" the participant lenders. This is the most common direction of "choice" in the market, but it is a simplification. All theoretical predictions are identical if participants "choose" deals on which to serve. I am interested more in the efficiency of syndicate membership than how that efficiency is reached.

participant to the syndicate. For example, if Bank 1 and Bank 2 are lead arrangers and Bank 3 is a participant, I cannot infer which lead arranger brought Bank 3 to the deal. This presents a problem in tracking previous relationships between lead arrangers and participants, and in analyzing how the relationship affects the current deal. When I analyze lead arranger-participant relationships, I limit the sample to loans where there is exactly one lead arranger. This limitation reduces the sample to 8,960 loans and 44,845 participants.[17]

Table 5 presents the characteristics of chosen participants by the credit reputation of the borrower. Participants on loans to private borrowers are smaller and better-capitalized. The participants are more likely to be foreign when the borrowing firm is transparent. Relative to when borrowers have public credit ratings, chosen participant lenders are 8 percent more likely to be in the same region or census division, and 4 percent more likely to be in the same state as the borrowing firm when the borrowing firm is private or unrated. In other words, participant lenders for rated companies are more likely to be foreign banks, and more likely to be further away from the borrowing firm even conditional on being a domestic bank. Compared to rated firms, the lead arranger chooses participants that are geographically closer to the borrowing firm when the borrowing firm has no public financial information.

In terms of previous direct lending relationships, chosen participant lenders are more likely to have been a former lead or former participant for the borrowing firm when the borrowing firm is transparent. A total of 18 percent of participants on transparent deals are previous leads for the borrowing firm, and 65 percent are previous participants. The numbers are 10 percent and 48 percent when the borrowing firm is private. This last result, however, should be viewed with caution. Transparent firms have far more previous loans in the sample, and more lead arrangers and participants per previous loan. Transparent firms thus mechanically have a higher probability of having a previous relationship with a given participant. Using the fraction of previous firm loans on which a participant lender was a previous lead or participant is one way to adjust for this problem, and the results show no statistical difference

[17] I limit the sample to deals with exactly 1 lead arranger *only* when evaluating relationships between lead arrangers and participants. For the rest of the analysis, I use the entire sample.

between transparent, unrated, and private firms. However, even this statistic is problematic because transparent firms have more leads and participants per previous loan, so again there is a mechanical relationship. As I demonstrate below, a better way to understand how previous relationships impact the choice of participants is to ask the converse question: how do previous relationships with a firm affect the probability of being chosen as a participant?

The bottom section of Table 5 displays the basic differences in lead arranger-participant relationships for the sub-sample of loans with exactly 1 lead arranger. The overall percentage of participants that are in the same region, census division, or state as the lead arranger is relatively small compared to the percentage in the same region as the borrowing firm.[18] In addition, the variation across the credit spectrum is limited. In terms of the fraction of previous deals led by the lead arranger, participants are on a lower fraction when the borrowing firm is private or unrated. These results suggest that lead arranger-participant relationships are in fact slightly more persistent on transparent loans.

2. Participant choice probit analysis

The second part of the participant analysis asks the converse question: what factors influence the probability of a lender being chosen as a participant on a given deal? To answer this question, I employ a maximum likelihood probit choice model similar to the model used in Corwin and Schultz (2005) to describe the choice of IPO syndicate members. I define the "potential" participant choice set as all financial institutions that represent at least 0.5 percent of all participants for syndicated loans for the year of the loan in question. The probit analysis seeks to explain what factors influence the probability of a financial institution being chosen. More specifically, I estimate a probit of the following form:

$$\Pr(Participant = Bank_{ij}) = f(\alpha + \beta * Loan_i + \gamma * Bank_j + \varepsilon_{ij}) \qquad (2)$$

I am interested in how the characteristics of loan i and the characteristics of bank j influence the probability that bank j is chosen as a participant on loan i. The critical parameter of interest is γ, and I am particularly interested in how γ varies with the opacity of the borrowing firm. For example, how does the

[18] Foreign participants are considered in the same state and census division if they are in the same country as the lead arranger, and the same region if they are from the same continent.

existence of a previous relationship between a lender and a borrowing firm influence the probability of being chosen as a participant, and how does this vary by the opacity of the borrowing firm?

This analysis is not a standard multinomial choice model as in McFadden's (1974) multinomial logit framework where there are x potential outcomes and one is chosen. Instead, there are x potential outcomes and any number of them can be chosen. Amemiya (1974) addresses maximum likelihood probit estimation in a setting where multiple outcomes can be simultaneously chosen. His analysis implies that the proper maximum likelihood technique in this setting is to fit a probit estimation where one analyzes the probability that any given potential lender is chosen as a participant. One critical component of the analysis is the correlation structure of the error terms within a choice set. For example, the fact that bank j is chosen on deal i affects whether or not bank k is chosen on deal i. Instead of imposing any specific structure on the joint distribution of error terms for potential participants on the same loan, I allow the correlation to vary through clustering. My approach is more rigorous than that proposed by Amemiya (1974); I allow the error terms to be freely correlated across all potential syndicate members on a given loan *for all of a given firm's loans*. Some firms have more than 1 loan, and I allow errors to be correlated for all potential participants on any of the loans.

Table 6 presents the estimates. Transparent firms are the omitted group. Coefficients in Table 6 are marginal changes in probability and coefficients and standard errors are multiplied by 100. In addition to the variables reported, the estimation includes all deal level variables included in the syndicate structure analysis in Table 4, the size and capital position of the potential participant lenders, and the intercept is allowed to vary by credit reputation. Columns (1) and (2) ignore previous lending relationships between the borrowing firm and potential participants in order to examine the entire sample that includes first time borrowers. The results in column (1) demonstrate that being in the same region as the borrowing firm increases the probability of being chosen as a participant by 6.5 percent (on a mean of 8.3 percent), and being a foreign or unregulated domestic financial institution is negatively related to being chosen as a participant. Column (2) examines how these effects vary as firms require more intense due diligence and monitoring effort. The results in column (2) show that being in the same region as the

borrowing firm increases the probability that a lender is chosen by 5.3 percent for transparent firms; the interaction terms show that this effect becomes 6.7 to 7.1 percent for private and unrated firms.

Columns (3) and (4) limit the sample to borrowing firms that have at least one previous loan in the entire Dealscan data set of loans from 1990 to 2003. One result is immediately apparent: there is a large amount of persistence in lender-borrowing firm relationships. Column (3) shows that a former participant for a borrowing firm is 26.7 percent more likely to be chosen as participant on the current deal. When I interact previous relationships with the credit reputation of the borrowing firm (column 4), I find that former relationships are relatively more important when the borrowing firm is private or unrated. For example, a lender that is a former lead arranger for a borrowing firm is 5.9 percent more likely to be chosen as a participant, but the effect is 50 percent stronger when the borrowing firm is private. A lender that is a former participant for a firm is 25 percent more likely to be chosen as a participant, but the effect is more than 10 percent stronger if the borrowing firm is private or unrated.

The results in Tables 5 and 6 provide further evidence to support the moral hazard interpretation of earlier results. If the lead arranger cannot commit to exert costly and unobservable effort in its monitoring and investigation of the firm, one strategy is to choose participants that are closer to the borrowing firm (both in terms of geographical location and previous relationships). The results in Tables 5 and 6 show that lead arrangers pursue this strategy, and do so more strongly when public information on the borrowing firm is limited.

How do lead arranger-participant relationships affect participant choice? Table 7 presents a probit analysis identical to Table 6, but on the sub-sample of loans with exactly one lead arranger and with the inclusion of lead arranger-participant relationship measures. The results in columns (1) and (3) imply that being in the same region as the lead arranger and having been on a recent syndicate with the lead arranger both positively affect the probability of being chosen as a participant. However, the effects are rather small, especially when compared with the effects of being a former lead or participant for the borrowing firm. Column (3) shows that a lender that served on a syndicate with the lead arranger in the previous quarter is 2.4 percent more likely to be chosen as a participant. A lender that served as a

participant for the borrowing firm is 27.5 percent more likely to be chosen as a participant. Moreover, the effect of lead arranger-participant relationships does not vary by borrowing firm opacity. Neither the effect of being in the same region as the lead arranger nor the effect of being on a recent syndicate with the lead arranger differs when the firm is private or unrated. The overall results in Table 7 suggest that previous lead arranger-participant relationships are relatively less important than previous borrowing firm-participant relationships, and that lead arranger-participant relationships are no more persistent on loans to private or unrated firms. The findings suggest that a lead arranger selects participants based on the participant's familiarity with the *borrowing firm*, not based on the participant's familiarity with the *lead arranger itself.*

1.5 Renegotiation

Incomplete contract theory (Grossman and Hart (1986); Hart and Moore (1988); Hart and Moore (1990); and Hart (1995)) emphasizes the importance of control rights and renegotiation when contracts cannot be made contingent on all possible future outcomes. Incomplete contract theory has been used to explain corporate financial policy (Hart (1995); Dewatripont & Tirole (1994)), the structure and terms of debt contracts (Bolton and Scharfstein (1996)) and the instruments used by venture capital firms (Kaplan and Stromberg (2002)). While there is an increasing empirical literature on the impact of control rights on financial contracts, empirical research that examines the importance of renegotiation on *ex-ante* contract structure remains scarce.

Renegotiation is a prevalent and important part of the syndicated loan market. Amendments to original loan agreements are common and practitioners say that renegotiation considerations are a factor when the original loan agreement is signed. In the syndicated loan market, unanimity of all syndicate members is required for any change in major terms of the original loan. Both the prevalence of renegotiation and the unanimity provision in renegotiation make this market a promising empirical laboratory for exploring incomplete contract theory and renegotiation.

1.5.1 Theoretical framework & empirical implementation

The theoretical framework presented here is based on models by Hart and Moore (1988) and Bolton and Scharfstein (1996). In this framework, borrowing firms are able to engage in actions, such as cash diversion, that are observable to lenders but non-verifiable in a court of law. Diversion makes default (violating a financial covenant or missing a payment) on a syndicated loan more likely. Once the borrowing firm enters into a state of default, it wants to renegotiate the terms of the loan. Given the required unanimity of syndicate members to change loan terms, renegotiation occurs when there is enough surplus to induce all lenders to agree to a new contract. While renegotiation may be desirable *ex-post*, the ability of the borrower to easily extract renegotiation surplus is *ex-ante* bad for managerial incentives at the borrowing firm. If management at the borrowing firm can extract a large portion of the renegotiation surplus, shirking and diversion of cash flows will be more common. If the lead arranger wants to prevent diversion, then it may choose a syndicate structure that reduces the expected value from renegotiation for the borrower in order to improve managerial incentives. Bolton and Scharfstein (1996) show that lenders are able to discipline managers by increasing the number of lenders. Through Nash bargaining, more lenders lead to a smaller surplus retained by the borrower in the renegotiation.

The Bolton and Scharfstein (1996) model predicts a larger syndicate when firms are more likely to *strategically default*. Of course, borrowers may default through no fault of their own (*liquidity default*). Both in theory and practice, the firms that are more likely to have a liquidity default are the same firms that are able to strategically default. In the context of Bolton and Scharfstein (1996) where outcomes are observable but not verifiable, courts will likely be able to dismiss a claim by cash-rich high quality borrowers with low leverage ratios that true default is pending.[19] In an alternative model where outcomes are not fully observable to lenders, a borrower that lacks a credible probability of liquidity default is fully revealed as lying when it attempts to strategically default. In theory, therefore, firms that are more likely to default through no fault of their own are precisely the same firms that are able to strategically default. There are two effects that ultimately shape the optimal number of syndicate

[19] In the model, a borrower strategically defaults by claiming it has low earnings when it actually has high earnings. Such a claim is only reasonable if the low earnings outcome is possible. That is, firms that have very low probabilities of low earnings are "outside" the framework of strategic default.

members for loans to these firms. Lenders want to facilitate renegotiation when a true liquidity default occurs. At the same time, lenders want to make renegotiation more difficult when borrowers attempt to strategically default. The key question I answer in this section is: which type of default is more influential in syndicate formation?

I answer this question by examining the differences in syndicate structure on loans to "safe" firms versus firms that have an *ex-ante* non-trivial probability of default. In order to limit the interaction with information asymmetry predictions, the empirical analysis in this section focuses only on firms with publicly available credit ratings. I use credit ratings, leverage ratios, and interest coverage ratios to measure the *ex-ante* probability that default and subsequent renegotiation will occur.

Standard diversification motivations also influence the optimal number of creditors. Lenders want to limit exposure on loans where potential losses are more likely. A main empirical challenge is to determine whether the optimal number of creditors is shaped by renegotiation considerations or standard diversification motives. The unanimity clause in the syndicated loan market is the key feature I use to distinguish between the two. Absolute unanimity is required to renegotiate major terms of the loan (amount, principal, interest, or maturity). In some cases, unanimity is also required to renegotiate financial covenant violations. This disproportionate voting power for syndicate members holding even small amounts of the loan is a key feature I exploit in my empirical strategy.

Table 8 presents data that show the importance of financial covenants and renegotiation in the syndicated loan market. Panel A of Table 8 shows the prevalence of covenants restricting asset sales and mergers, and financial covenants. Asset sales and financial covenants are more common on loans to high yield firms (37 percent and 62 percent, respectively) than loans to investment grade firms (5 percent and 38 percent respectively). Table 8 also lists the 3 most common types of financial covenants.

A syndicated loan is technically in "default" if the borrower fails to meet one of these financial covenants or fails to make a specified interest payment. The lending syndicate has the option to accelerate the loan which can force the borrower into Chapter 11 proceedings. However, immediate acceleration of the loan is not common. Instead, syndicate members usually agree to a loan

"amendment," or a restructuring plan or new set of covenants, in exchange for a renegotiation fee paid by the borrowing firm. If the amendment changes any aspect with regard to interest payments, maturity, the amount of the loan, or collateral, all syndicate members must agree to the new contract amendment. Practitioner interviews suggest that even lenders holding very small portions of the loan have the *effective* power of rejecting the renegotiated contract and forcing the acceleration of the loan.

Panel B of Table 8 examines renegotiation data available in Dealscan. The Loan Pricing Corporation only reports amendment data where they are self-reported by the lending syndicate members. The renegotiation data are therefore incomplete, and should be viewed only as a window into the types of renegotiation, not a comprehensive inventory of all renegotiations that occur. The data are more widely reported on deals to high yield firms (21 percent versus 5 percent). Table 8 also lists the 4 most common amendments to the loan, which include a relaxation of financial covenants, increasing the amount of the loan, changing the pricing of the loan, and relaxation of covenants restricting asset sales.

1.5.2 Renegotiation syndicate structure regressions

In this section, I use syndicate structure regressions to examine how variation in the default risk of borrowing firms affects syndicate structure. I examine this effect to see whether strategic or liquidity default considerations are more important in syndicate formation. The analysis is limited to loans to public firms with S&P senior unsecured debt ratings. The general formulation of equations estimated in Table 9 is:

$$Synd_i = \alpha + \sum_{t=1}^{12} Yeardum_t + X_i\beta + Default_i\gamma + \varepsilon_i \qquad (3)$$

The left hand side variables are measures of the syndicate, such as number of lead arrangers, number of participants, and the percentage retained by the lead arranger. The key right hand side variable of interest is *Default*, which is a measure of the borrower's likelihood of missing an interest payment or violating a financial covenant. The likelihood of default is measured with the senior unsecured debt rating and the leverage ratio. Firms with a rating of BB+ or worse are classified as "high yield" and firms with a rating of BBB- or better are "investment grade." The leverage ratio is a continuous measure of the default

probability.[20] The control variables are identical to those described in Section 4. All standard errors are heteroskedasticity robust, and clustered at the firm level.

Table 9, Panel A presents the estimated coefficients. Columns (1) and (2) use the entire set of loans to rated companies, and show that the number of participants is higher for high yield firms, a result that is statistically different from 0 at the 5 percent level. Columns (3) through (8) limit the sample to only loans where the share held by each syndicate member is available. As shown in columns (3) and (4), the number of lead arrangers is higher on loans to high yield firms and firms with high leverage. Consistent with column (2), columns (5) and (6) show that firms more likely to default, whether measured by credit ratings or leverage ratios, have more participant lenders.[21] Columns (7) and (8) show that lead arrangers do not hold less of the loan when borrowing firms are more likely to default. In other words, the lead arranger adds participants to the syndicate, but it does not syndicate out more of the loan. This finding suggests that lead arrangers do not add participants for their own diversification needs.

Table 9, Panel B further explores the effect of renegotiation considerations on syndicate structure. Columns (1) and (2) show that lending syndicates for borrowers more likely to default are no less concentrated. In fact, the point estimates imply that the syndicate structure is slightly more concentrated (although the results are only significantly different than 0 at the 20 percent level). Columns (1) and (2) point to a conundrum; lead arrangers add more participants to the syndicate when the borrowing firm has a higher probability of default, but they do not syndicate out more of the loan, and do not spread the loan more evenly among more participants. This moves us away from diversification as a sole explanation for the added lenders. Syndicates on loans to firms more likely to default have more lenders, but the same

[20]All results in this section are robust to using the interest coverage ratio and the lagged three year standard deviation of return on assets as alternative measures of default probability.

[21]This result is the opposite of those in Lee and Mullineaux (2004), Table V, who find that syndicate size is decreasing in credit risk. This discrepancy is due to the fact that Lee and Mullineaux (2004) do not control for borrower size. Investment grade firms are on average 3 times larger than high yield firms in my sample. In addition, Lee and Mullineaux (2004) control only for the *level* of the loan amount. In my sample, the natural logarithm of loan amount is significantly stronger in predicting syndicate size; univariate R^2 is 0.27 when regressing syndicate size on the *level* of the loan amount and 0.49 when using the *natural logarithm* of the loan amount. I am able to replicate very similar findings as Lee and Mullineaux (2004) when using their specification, but show that the findings change when controlling for log assets and log amount (all data work available from author upon request).

concentration. This is possible only if some lenders hold very small portions of the loan. Columns (3) through (6) document this phenomenon. When the borrowing firm has a higher probability of default, the lead arranger is more likely to add participants who hold very small portions of the loan. The result is robust whether I measure "small portions" using an absolute amount (less than $5 million) or a share of the loan (less than 2 percent). The coefficient on the high yield indicator indicates that a firm likely to default has on average 0.62 more participants holding less than 2 percent of the loan (on a mean of 1.5 in this sample).

All lenders can veto renegotiation; therefore, participant lenders holding even small portions of the loan have disproportionate voting power in the syndicate. The results suggest that lead arrangers add participant lenders holding small amounts to make renegotiation more difficult. If lead arrangers form large syndicates only to better diversify risk, then larger syndicates would be more disperse and the lead arranger would choose to hold a smaller portion of the loan. This is not the case. Diversification alone cannot explain the fact that participant lenders with very small amounts are added to the syndicate.

Distinguishing between diversification incentives and renegotiation considerations is difficult. Clearly, both play an important role in syndicate formation to firms with high default probability. Figure 1 provides further evidence that it is not diversification alone that drives syndicate formation. It maps the difference in the number of participants on loans to high yield and investment grade firms that hold a given percentage of the loan, after controlling for the size of the loan. The difference between the number of lenders holding a given percentage of the loan is most pronounced among very small percentages (< 2 percent) and quickly disappears at 4 percent of the loan and above. High yield firms have on average 1 more participant holding less than 2 percent of the loan than investment grade firms, which is 65 percent more at the mean. To put this into perspective, 2 percent of the average loan to rated firms is about $11 million, or less than ½ of 1 basis point of the total average assets of a lender in the sample. A standard diversification argument implies that participant lenders want to limit their exposure; it does not explain why the difference is so pronounced at extremely small portions of the loan, and non-existent at levels just above 2 percent.

One alternative explanation of the above result is that the choice set of participant lenders facing lead arrangers for high yield firms is different than the choice set for investment grade firms. Perhaps the types of lenders in the high yield market are peripheral players that only accept small amounts of the loan. This, however, does not appear to be the case. Of the top 20 lenders that most often hold less than 2 percent of loans to high yield firms, 19 are commercial banks and none are small peripheral participants. Bank of America, Bank of New York, and ABN-AMRO are major players for all sectors of the syndicated loan market, and are the top 3 participants that hold less than 2 percent of loans to high yield firms.

Overall, the results suggest that lenders choose to make renegotiation more difficult when borrowers have a high probability of default. The results suggest that potential strategic default is more influential in syndicate formation than liquidity default.

1.5.3 Robustness of results

1. Fixed effects estimates

All identification of coefficients in Tables 4 and 9 come from between-firm variation in credit reputation. One possible concern is that a regression analysis comparing different firms might be biased due to firm-specific omitted variables. Table 10 exploits within-firm variation for 2,889 firms which have 2 or more loans in the sample in order to see if the core results are robust to a within-firm analysis. Of these firms, there are 89 firms that go from private to the unrated or transparent category (mostly through IPOs) and 93 that go from the transparent or unrated category to private (mostly by emerging from bankruptcy). In addition to variation in the availability of public filings, there is also within-firm variation in credit ratings. To exploit the within-firm variation in the sample, I estimate the following fixed effects specification:

$$Synd_{ij} = \alpha_j + \sum_{t=1}^{12} Yeardum_t + X_{ij}\beta + \beta_1 CreditQuality_{ij} + \varepsilon_{ij} \qquad (3)$$

That is, I estimate how within-firm variation in the credit quality of firm *j* affects the syndicate structure for loan *i*. Standard errors reported in the tables are heteroskedasticity robust and clustered at the borrowing firm level.

Columns (1) through (3) of Table 10 test whether the core information asymmetry results in Table 4 are robust to a fixed effects specification. The result that private and unrated firms have fewer lenders on their syndicates is robust and is driven by a fall in the number of participants. The point estimate in column (3) indicates that a given private firm has almost 25 percent fewer lenders relative to the period when the same firm is public with a credit rating. Columns (4) and (5) of Table 10 test whether the core renegotiation results in Table 9 are robust to a fixed effects specification. In these tables, I isolate the sample to rated firms. The point estimate in Column (4) shows that a given firm has more participants when it is high yield relative to when it is investment grade, but the estimate is not statistically distinct from 0 at the 10 percent level. Column (5) uses a sharper measure of the within-firm change in credit rating. I construct an upgrade and downgrade indicator variable that is turned on if the firm switches from investment grade to high yield or vice versa, respectively. Column (5) reports an increase in the number of participants when a firm experiences a downgrade. The point estimate is even stronger than the cross-section analysis, and is significant at the 5 percent level.

The results in Table 10 show that the core results of the between-firm analysis are robust to a fixed effects specification. In other words, syndicate structure responds in the hypothesized manner even when looking at within-firm changes in credit reputation. This helps to allay concerns that unobservable firm differences are inducing bias in the cross-section estimates in Tables 4 and 9.

The sample size for fixed effects analysis of the shares held by each lender is too small to obtain precise estimates. As noted above, the amount of the loan held by each lender is available only for about one third of the overall sample, and even a smaller share for the fixed-effects sample. I do not report coefficients from the fixed effects regressions where the Herfindahl of the syndicate or the amount held by each lead arranger is the dependent variable. In these regressions, the coefficient estimates are similar to those reported in Tables 4 through 9, but none of the estimates are statistically significant.

2. Exogeneity of loan characteristics

One important concern with the results in the syndicate structure regressions is the proposed exogeneity of loan characteristics to the structure of the syndicate. I use loan amount and loan maturity as exogenous right hand side variables when explaining syndicate structure, but they may implicitly be a function of the syndicate structure itself. The exogeneity assumption is motivated by the actual process of loan syndication; the general terms of the loan are decided before the lead arranger forms the syndicate. However, loan characteristics could be determined by *potential* syndicate structure considerations. For example, a lead arranger could know with certainty that 5 participants will each contribute $5 million for a given firm, and the amount of the loan becomes a function of the number of participant lenders. The core empirical tests of this chapter are not concerned with the coefficients on the loan characteristics such as loan amount or maturity. Instead, the key coefficient estimates of interest are those measuring the effect of the credit reputation of the firm on syndicate structure. However, if endogeneity of loan characteristics (loan amount, maturity, etc.) affects syndicate structure in a manner that also biases coefficients on credit reputation, then the core results may be questioned.

I do a variety of robustness checks to address this concern. First, all core results are robust to the complete exclusion of all loan characteristics. Even without controlling for the loan amount, the loan maturity, the number of loan tranches, and the presence of a term loan tranche, I find that firms that are more opaque, by a number of measures, have fewer lenders with more concentrated syndicates. I also find that firms with higher *ex-post* default probabilities have more participants but no less concentrated lending syndicates. Second, I use an instrumental variables strategy to instrument for the loan amount.[22] I instrument loan amount using lagged capital expenditures at the borrowing firm, with the identifying assumption being that lagged capital expenditures affect the syndicate structure of a given loan only though its effect on the loan amount. All results from the IV specification are almost identical to those found in Tables 4 and 9. These results are not reported but are available from the author.

[22] I instrument for loan amount, as opposed to loan maturity or any other loan characteristic, because it is the only loan characteristic that has a meaningful effect on the credit reputation variables.

1.6 Conclusion & future research

Syndicated lending represents an important source of corporate finance. Privately-held, high yield, and investment grade firms all utilize this financial product, and almost $1 trillion in new syndicated loans are signed every year. The Federal Reserve Shared National Credit program reports over $1.3 trillion in outstanding syndicated loan commitments to non-financial businesses in 2003. This chapter explores this market and finds important results that help explain how it functions. In particular, I focus on two hypotheses derived from corporate finance theory: how information asymmetry and *ex-post* renegotiation concerns affect syndicate structure and choice of participants.

My results suggest that syndicate structure and the choice of participant lenders reflect basic hypotheses of existing theory literature on moral hazard and renegotiation. First, I find that when borrowing firms need more intense investigation and monitoring effort by the lead arranger, the syndicate structure has fewer participants, a higher percentage retained by the lead arranger, and a higher general concentration. In addition, lead arrangers are more likely to choose participants that are "close" to these firms. These results are robust when using numerous variables to measure "opacity," or the need for monitoring and investigation. These findings are also robust to within-firm, fixed effects analysis. The evidence suggests that, when the borrower requires more intense investigation and monitoring, the lead arranger commits by taking a large financial stake in the credit. These findings also provide support for models that emphasize the importance of "informed" capital to the financial health of small firms with little or no public information (for example, Holmstrom and Tirole (1997)). The importance of lead arranger capital in syndicated loans to opaque firms provides insight into why these firms might be the most adversely affected in banking credit crunches.

Second, I document the importance of renegotiation in this market, and find evidence that *ex-ante* syndicate structure is influenced by *ex-post* renegotiation concerns. In my results, lenders appear to form syndicates in order to make renegotiation difficult and deter strategic default. I conduct several empirical tests to show that lead arrangers appear to engage in "participant-loading" when borrowing firms have non-trivial probabilities of default; that is, lead arrangers add participants with small portions of the loan

to syndicates when renegotiation is a real possibility. The core results are robust to within-firm and between-firm variation, and to a variety of measurements of default probability. Given that unanimity of syndicate members is required to renegotiate terms of the loan, participant loading decreases both the probability of and payoff to successful renegotiation. The disproportionate voting power of lenders with even very small portions of the loan allows me to distinguish between renegotiation and standard diversification motives. The evidence suggests that lead arrangers attempt to reduce strategic default behavior by reducing the attractiveness of default. Liquidity default considerations do not appear as important in syndicate formation as strategic default considerations.

The findings of this chapter point to new avenues for future research, two of which I outline here. First, I have not explored what explains the rapid growth of the syndicated loan market in the last two decades. In a related area, I have not focused on whether the growth of the syndicated loan market has resulted in a lower cost of capital or improved liquidity management for borrowing firms. There is anecdotal evidence that the syndicated loan market is an attractive alternative to the high yield bond market (in terms of lower prices and the ability to renegotiate), and that it allows privately-held firms access to previously untapped large sources of capital. The primary data source used by corporate finance researchers, Compustat, does not break out bank debt from public debt, and contains no information on unused lines of credit. An examination of 10-Ks is the most direct research strategy for answering these questions, and something I am currently pursuing.

Second, syndicated loans are an avenue for continued empirical research on the importance of renegotiation in corporate finance. While this chapter analyzes the effect of renegotiation on *ex-ante* syndicate structure, another important line of research would help explain how larger lending syndicates affect *ex-post* renegotiation and Chapter 11 filings when firms become financially distressed.[23] In other words, this chapter asks, how do future renegotiation considerations affect initial syndicate structure? An equally interesting question is, how does the syndicate structure affect future renegotiation in financial

[23]Renegotiation in financial distress has been examined by Asquith, Gertner, and Scharfstein (1994) and Gilson, John, and Lang (1990). These papers do not, however, focus specifically on syndicated loans.

distress? Further exploration of the exact contracting strategies used by banks (and the renegotiation outcomes) would be informative for researchers focused on the importance of renegotiation.

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Figure 1
More participants hold small percentage of loan on high yield deals

This graph plots the difference in the average number of participants holding a certain percentage of a loan between high yield and investment grade loans, after controlling for the size of the loan.

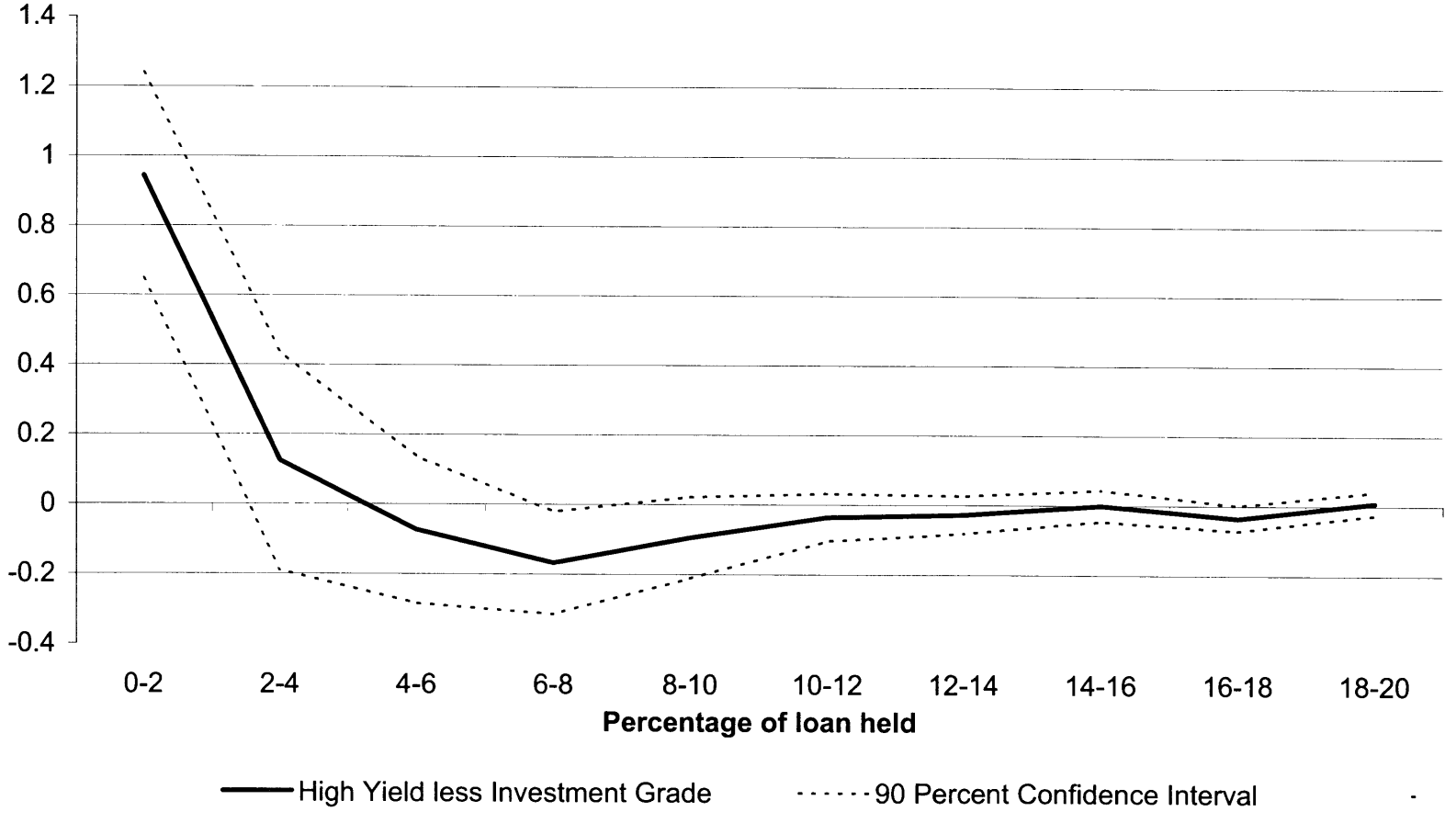

Table 1
Summary Statistics for Syndicated Loan Deals

This table presents summary statistics on the sample of 14,021 syndicated loan deals representing 5,011 firms from 1991-2003.

				Distribution		
Firm Characteristics	N	Mean	SD	10th	50th	90th
Total sales ($M)	14021	3127	9715	72	629	7800
S&P unsecured debt rating (1 = AAA)	6464	10.1	3.78	6	10	14
Compustat data available						
Total assets (book value, $M)	10703	4970	14249	132	1020	13307
Leverage (book debt/book assets)	10703	0.35	0.2	0.1	0.33	0.6
Earnings to assets	10703	0.08	0.08	0	0.08	0.16
R&D expense to sales ratio	4659	0.03	0.04	0	0.01	0.08
Accruals to total assets ratio	9909	-0.04	0.08	-0.12	-0.04	0.05
Syndicated loan characteristics						
Size of deal ($M)	14021	358	706	35	150	809
Maturity (days)	14021	1140	801	364	1095	2113
Number of loan tranches	14021	1.35	0.69	1	1	2
Deal includes term loan	14021	0.23	0.42	0	0	1
Syndicate structure						
Total number of lenders	14021	8.1	7.8	2	5	18
Total number of lead arrangers	14021	1.8	2.4	1	1	3
Total number of participant banks	14021	6.3	7.2	0	4	18
% of loan kept by each lead	5066	29	20	8	24	56
Concentration of syndicate (herfindahl)	5066	2495	1820	604	2000	5098
# participants holding < $5 M	5066	0.49	1.97	0	0	1
# participants holding < 2%	5066	0.83	3.21	0	0	1

Table 2
Top Lead Arrangers and Participant Banks, by Market

This table lists the top 5 lead arrangers (by deal amount) and top 5 participants (by total number of deals) for syndicated loans in the sample from 2001-2003. Market share figures for lead arrangers split the amount of a given syndicated loan equally over all lead arrangers when there are multiple leads. Firms are considered "private" if they have no publicly available SEC filings. The third column reports the most common participants for the top lead arrangers (and the fraction of all deals they participate with the lead arranger) on deals with exactly one lead arranger.

(1) Loans to private firms		(2) Loans to public firms		(3) Most common participant	
Lead arrangers					
	Mkt. share		Mkt share		% lead deals
Bank of America	0.22	JPMorganChase	0.34	Bank of America	
JPMorganChase	0.17	Citigroup	0.19	Fleet	0.20
Citigroup	0.10	Bank of America	0.16		
Bank One	0.05	Bank One	0.06	JPMorganChase	
Fleet	0.05	Deutsche Bank	0.02	Bank of America	0.37
Total amount ($B)	162	Total amount ($B)	1401	Citigroup	
Market herfindahl	1015	Market herfindahl	1826	JPMorganChase	0.49
Participants				Bank One	
	# deals		# deals	US Bancorp	0.27
U.S. Bancorp	150	Fleet	783		
ABN-AMRO	138	Bank of Tokyo-Mitsubishi	782	Fleet	
Fleet	136	Bank of America	723	Wachovia	0.24
National City	121	Bank One	717		
Bank One	118	Wachovia	715	Deutsche Bank	
				Fleet	0.35
Total number of participants	3586	Total number of participants	23521		

Table 3
Information Asymmetry Evidence

This table presents cell means and standard errors, by group, for the sample of 14,021 syndicated loan deals representing 5,011 firms from 1991-2003. A "private" firm is a firm with no publicly available SEC filings. An "unrated" firm is a firm with publicly available SEC filings and no S&P senior unsecured debt rating. A "transparent" firm is a firm with publicly available SEC filings and an S&P senior unsecured debt rating

	Private	Unrated	Transparent
Percentage of sample loans	0.21	0.33	0.46
Total sales ($M)	797	1039	5692
	(68)	(71)	(162)
Size of deal ($M)	153	171	586
	(6)	(4)	(12)
Maturity (average, days)	1100	1203	1118
	(16)	(11)	(10)
Number of loan tranches	1.42	1.35	1.32
	(0.01)	(0.01)	(0.01)
Deal includes term loan	0.31	0.24	0.18
	(0.01)	(0.01)	(0.1)
Syndicate Structure Characteristics			
Total number of lenders	4.83	6.06	11.02
	(0.09)	(0.08)	(0.11)
Total number of lead arrangers	1.46	1.54	2.18
	(0.03)	(0.02)	(0.04)
Total number of participant banks	3.37	4.52	8.84
	(0.08)	(0.07)	(0.11)
% of loan kept by each lead (avg)	37.8	35.3	19.9
	(0.8)	(0.4)	(0.3)
Conc. of syndicate (herfindahl)	3357	3107	1641
	(68)	(38)	(32)

Table 4, Panel A
Information Asymmetry Syndicate Structure Regressions

This table reports coefficient estimates from a regression relating syndicate structure to the firm's credit reputation. A "private" firm is a firm with no publicly available SEC filings, an "unrated" firm is a firm with no publicly available SEC filings and no S&P senior unsecured credit rating, and a "transparent" firm is a firm with publicly available SEC filings and a credit rating. To control for the size of the loan, I split the sample into thirds based on size, and the intercept (not reported) and natural log of size (reported) is allowed to vary for each third. In addition to variables reported, all regressions include a constant and year and industry dummies, and standard errors are heteroskedasticity-robust, clustered at the firm level. "Transparent" firms are the omitted group.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	Full	Full	Loans where amount held by each syndicate member available				
Dependent Variable:	# Leads	# Participants	# Leads	# Participants	Herfindahl	% held, each lead	Amount held, each lead ($M)
Private firm	0.17*	-1.45**,+	0.03	-0.72**	260**	2.53**	6.42**
	(0.08)	(0.16)	(0.08)	(0.26)	(79)	(0.89)	(2.58)
Unrated firm	0.06	-0.76**,+	0.09	-0.69**	230**	2.08**	4.77**
	(0.05)	(0.14)	(0.07)	(0.18)	(54)	(0.60)	(2.00)
Ln[firm sales]	-0.03	0.19**	-0.03	0.61**	-119**	-1.40**	-3.80**
	(0.02)	(0.05)	(0.03)	(0.09)	(21)	(0.24)	(0.96)
Ln[maturity, in days]	-0.01	0.44**	0.10**	0.29**	-102**	-1.49**	-4.08**
	(0.01)	(0.03)	(0.03)	(0.08)	(23)	(0.30)	(0.91)
Ln[loan amount]	0.20**	0.77**	0.17**	0.35	-596**	-4.18**	12.02**
	(0.04)	(0.13)	(0.05)	(0.23)	(70)	(0.83)	(0.93)
Ln[loan amount]*middle	0.46**	1.69**	0.63**	2.97**	-371**	-5.96**	5.67**
	(0.08)	(0.22)	(0.16)	(0.33)	(106)	(1.21)	(1.94)
Ln[loan amount]*large	1.21**	2.92**	1.35**	4.57**	420**	2.06**	78.90**
	(0.15)	(0.28)	(0.23)	(0.42)	(73)	(0.86)	(10.67)
Ln[# tranches]	0.14	1.03**	0.02	0.22	47	1.08	-2.89
	(0.09)	(0.24)	(0.12)	(0.28)	(72)	(0.80)	(3.42)
Term loan tranche in deal	0.00	0.23	0.06	0.49*	235**	1.47	4.25
	(0.06)	(0.19)	(0.08)	(0.25)	(76)	(0.86)	(2.54)
N	14021	14021	5066	5066	5066	5066	5066
R^2	0.23	0.37	0.24	0.60	0.51	0.48	0.43

**Significant at 1 percent level, *Significant at 5 percent level, + coefficients distinct from each other at 5 percent level

Table 4, Panel B
Information Asymmetry Syndicate Structure Regressions

This table presents additional evidence of the effect of information asymmetry on syndicate structure. Coefficients in columns (1) through (3) are estimated using all loans to transparent firms, but only loans to private and unrated firms that have greater than $250 M in sales. Columns (4) through (6) isolate the sample to firms with Compustat data on R&D expenses available, where the R&D expense to sales ratio proxies for information asymmetry. Columns (7) through (9) isolate the sample to firms with Compustat data on accruals available, where the accruals to total assets ratio proxies for a need for monitoring. In addition to variables reported, all regressions include all control variables in Table 4, Panel A. Also, all regressions include a constant and year and industry dummies. Standard errors are heteroskedasticity-robust, clustered at the firm level. Transparent firms are the omitted group for columns (1) through (3).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sample:	Transparent firms + (private and unrated with >$250 M in sales)			Compustat R&D data available			Compustat accrual data available		
Dependent Variable:	# Parts	% held by each lead	Herfindahl	# Parts	% held by each lead	Herfindahl	# Parts	% held by each lead	Herfindahl
Private firm	-1.76**,+	2.30	219*						
	(0.22)	(1.21)	(105)						
Unrated firm	-0.75**,+	1.56*	183**						
	(0.18)	(0.69)	(64)						
R&D to sales ratio				-7.42**	17.39*	2377**			
				(2.24)	(8.85)	(810)			
Accruals to assets							-0.46	8.92**	625*
							(0.78)	(3.18)	(280)
Leverage ratio				1.15	2.91	331	1.90**	-0.71	76
				(0.60)	(2.07)	(187)	(0.40)	(1.42)	(127)
Ln[firm sales]	0.11	-1.30**	-94**						
	(0.10)	(0.31)	(29)						
Ln[total assets]				0.25*	-2.14**	-185**	0.23**	-2.22**	-168**
				(0.12)	(0.39)	(37)	(0.07)	(0.30)	(27)
N	9866	3468	3468	4659	1875	1875	9668	3829	3829
R^2	0.32	0.42	0.42	0.36	0.53	0.56	0.36	0.50	0.52

**Significant at 1 percent level, *Significant at 5 percent level, + coefficients distinct from each other at 5 percent level

Table 4, Panel C
Information Asymmetry Syndicate Structure Regressions

This table presents evidence that moral hazard, as opposed to adverse selection, is driving the information asymmetry results. *Previous lending relationship* is an indicator variable turned on if the borrower has a previous lending relationship with any of the lead arrangers. *Opaque firms* are private and unrated firms. In addition to variables reported, all regressions include all control variables in Table 4, Panel A. Also, all regressions include a constant and year and industry dummies. Standard errors are heteroskedasticity-robust, clustered at the firm level. Transparent firms are the omitted group for columns (1) through (3).

	(1)	(2)	(3)
Dependent Variable:	# Participants	% held by each lead	Herfindahl
Opaque Firm	-1.12**	2.27**	225**
	(0.20)	(0.85)	(76)
Previous lending relationship	-0.17	-3.31**	-340**
	(0.22)	(0.85)	(81)
Opaque * Previous lending relationship	0.62**	0.33	23
	(0.23)	(0.91)	(85)
Ln[1 + # previous loans]	0.13	0.82**	120**
	(0.11)	(0.41)	(41)
Ln[total sales]	0.13*	-1.42**	-120**
	(0.05)	(0.23)	(21)
N	14021	5066	5066
R^2	0.26	0.55	0.42

**Significant at 1 percent level, *Significant at 5 percent level

Table 5
Characteristics of Participants, by Borrowing Firm Credit Reputation

This table examines the characteristics of 72,401 participants on 14,021 syndicated loan deals. There are 7,345 participants for private firms, 17,125 participants for unrated firms, 47,931 for transparent firms. Lead arranger-participant relationships are calculated on a subsample of 44,845 participants on 8,960 deals where there is exactly one lead arranger.

	Private	Unrated	Transparent
General Characteristics			
Total assets ($bln)	239*	230*	290
Equity to total assets ratio	0.066*	0.065*	0.061
Unregulated, domestic (Finance company/I-Bank)	0.072	0.046*	0.066
Foreign	0.41*	0.41*	0.51
Borrowing Firm-Participant Variables			
Conditional on being in U.S.			
In same region as borrowing firm	0.44*	0.44*	0.36
In same census division as borrowing firm	0.31*	0.30*	0.23
In same state as borrowing firm	0.14*	0.14*	0.10
Conditional on firm having previous loan:			
Former lead for firm indicator variable	0.10*	0.11*	0.18
Fraction of previous firm loans lead on	0.05	0.05*	0.06
Conditional on firm having previous syndicated loan:			
Former participant for firm indicator variable	0.48*	0.52*	0.65
Fraction of previous firm syndicated loans participant on	0.34	0.34	0.34
Lead Arranger-Participant Variables			
Calculated on sample where only 1 lead arranger			
In same region as lead arranger	0.23*	0.23*	0.20
In same census division as lead arranger	0.16	0.16*	0.14
In same state as lead arranger	0.09	0.09*	0.10
On a deal with lead arranger in previous quarter	0.65*	0.66*	0.75
On a deal with lead arranger in previous year	0.84*	0.84*	0.90
Fraction of syndicated loans with L.A. in previous qtr	0.12*	0.13*	0.14
Fraction of syndicated loans with L.A. in previous year	0.12*	0.13*	0.14

*Significantly different from transparent firms at 5% level (errors clustered at firm level)

Table 6
Participant Choice Probits

This table presents coefficient estimates for a probit specification estimating how bank characteristics affect the probability of being chosen as participant. All coefficients represent the effect on probability when indicator goes from 0 to 1, and coefficients and standard errors are multiplied by 100. The choice set includes all banks with at least 0.5 percent market share in the year of the loan. Estimations include deal level controls described in Table 4, Panel A, year and industry dummies, and the constant is allowed to vary by group. In addition, the natural log of the total assets and the leverage ratio of the potential participant is included in all specifications and allowed to vary by group for columns 2 and 4. Columns 2 and 4 have transparent firms as the omitted group. Standard errors are allowed to be correlated for all potential participants for all of a given firm's loans in the sample.

	Without Relationships		With Relationships	
	(1)	(2)	(3)	(4)
Dependent variable mean:	*8.26*	*8.26*	*9.53*	*9.53*
Former lead for borrowing firm indicator			6.14*	5.88*
			(0.66)	(0.66)
Private				3.17*
				(1.25)
Unrated				-0.22
				(0.57)
Former participant for borrowing firm indicator			26.74*	24.94*
			(0.68)	(0.70)
Private				2.50*
				(1.06)
Unrated				2.10*
				(0.51)
Same region as borrowing firm indicator	6.47*	5.32*	3.91*	3.21*
	(0.21)	(0.27)	(0.18)	(0.22)
Private		1.39*		1.30*
		(0.39)		(0.43)
Unrated		1.80*		1.21*
		(0.32)		(0.31)
Foreign indicator	-4.34*	-4.61*	-2.89*	-2.87*
	(0.15)	(0.21)	(0.13)	(0.17)
Private		1.06*		0.31
		(0.40)		(0.39)
Unrated		0.33		-0.13
		(0.29)		(0.28)
Unregulated domestic indicator	-5.15*	-5.31	-3.10*	-3.06*
	(0.09)	(0.11)	(0.14)	(0.17)
Private		3.76*		0.84
		(0.92)		(0.75)
Unrated		0.69		-0.58
		(0.67)		(0.54)
N	799796	799796	545493	545493
Number of Loans	14021	14021	9628	9628
Pseudo R^2	0.11	0.12	0.26	0.26

* Significant at the 1 percent level

Table 7
Participant Choice Probits, on Sub-Sample of Deals with One Lead Arranger

This table replicates Table 6 on the sub-sample of deals with exactly one lead arranger. In addition to all variables included in estimation in Table 6, two new variables (same region as lead arranger indicator and on syndicate with lead arranger in previous quarter indicator) are included.

	Without Relationships		With Relationships	
	(1)	(2)	(3)	(4)
Dependent variable mean:	*7.94*	*7.94*	*9.22*	*9.22*
Former lead for borrowing firm indicator			7.12*	6.78*
			(0.66)	(0.68)
Private				3.25*
				(1.32)
Unrated				-0.16
				(0.61)
Former participant for borrowing firm indicator			27.50*	24.80*
			(0.72)	(0.76)
Private				2.52
				(1.53)
Unrated				2.86*
				(0.62)
Same region as borrowing firm indicator	6.27*	5.37*	3.75*	3.17*
	(0.22)	(0.30)	(0.20)	(0.24)
Private		0.97*		0.94
		(0.40)		(0.44)
Unrated		1.15*		0.70
		(0.33)		(0.32)
Same region as lead arranger	1.21*	1.15*	0.73*	0.59*
	(0.15)	(0.21)	(0.14)	(0.17)
Private		0.04		0.33
		(0.36)		(0.45)
Unrated		0.03		0.25
		(0.29)		(0.30)
On syndicate with lead arranger in last quarter	3.63*	3.65*	2.39*	2.31*
	(0.11)	(0.16)	(0.13)	(0.17)
Private		-0.63		-0.22
		(0.26)		(0.45)
Unrated		0.22		0.22
		(0.25)		(0.29)
N	520069	520069	348746	348746
Number of Loans	8960	8960	6029	6029
Pseudo R^2	0.14	0.14	0.30	0.30

* Significant at the 1 percent level

Table 8
A Window into Covenants & Renegotiation

This table presents covenant and renegotiation data on the syndicated loans sample from 1996 to 2003 for public firms with an S&P senior unsecured debt rating. Of the 4,946 syndicated loan deals for this time period, 2,499 contain financial covenant data and 674 contain renegotiation data. Renegotiation data is for a random sub-sample of 200 deals where renegotiation data is available. A high yield firm has an S&P senior unsecured debt rating of BB+ or worse. An investment grade firm has a credit rating of BBB- or better. Standard errors are in parentheses.

PANEL A: Covenants	High yield	Investment grade
Asset sales/merger covenant listed, percent	0.374	0.051
	(0.01)	(0.005)
Financial covenant listed, percent	0.623	0.377
	(0.010)	(0.010)
Conditional on FC listed:		
Debt to cash flow	0.633	0.279
	(0.012)	(0.015)
Interest coverage	0.531	0.376
	(0.013)	(0.016)
Fixed charge coverage	0.470	0.141
	(0.013)	(0.012)

PANEL B: Renegotiation	High yield	Inv. grade
Renegotiation data available	0.214	0.051
	(0.008)	(0.005)
Conditional on data available:		
Financial covenants relaxed	0.252	0.153
	(0.046)	(0.07)
Amount of loan increased	0.103	0.109
	(0.032)	(0.062)
Pricing of loan terms changed	0.151	0.110
	(0.038)	(0.062)
Asset sales/merger covenants relaxed	0.141	0.186
	(0.037)	(0.076)

Table 9, Panel A
Renegotiation Syndicate Structure Regressions

This table reports coefficient estimates from a regression relating syndicate structure to the firm's credit reputation, with a focus on how *ex post* renegotiation concerns affect *ex ante* syndicate structure. The sample for these regressions includes only firms with publicly available SEC filings and an S&P senior unsecured debt rating. A high yield firm is a firm with a credit rating of BB+ or worse and an investment grade firm is a firm with a credit rating of BBB- or better. In addition to variables reported, all maturity, loan size, and tranche controls listed in Table 4, Panel A are included in the regressions. All regressions also include a constant and year and industry dummies, and standard errors are heteroskedasticity-robust, clustered at the firm level. Investment grade firms are the omitted group.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample:	All loans to rated firms		Loans to rated firms where amount held by each syndicate member available					
Dependent Variable:	# Leads	# Participants	# Leads	# Leads	# Participants	# Participants	% held by each lead	% held by each lead
High yield firm	0.26	0.60*	0.39*		0.60*		0.24	
	(0.14)	(0.28)	(0.18)		(0.29)		(0.68)	
Leverage ratio				1.24**		1.86*		1.12
				(0.39)		(0.88)		(1.91)
Income to assets ratio	-0.22	-3.03	-1.08	-1.00	-4.14	-4.05*	-7.05	-6.78
	(0.65)	(1.56)	(1.01)	(0.99)	(2.27)	(2.07)	(6.21)	(6.06)
Ln[total assets]	0.01	0.27*	-0.07	-0.07	1.20**	1.19**	-1.55**	-1.54**
	(0.04)	(0.12)	(0.09)	(0.08)	(0.22)	(0.22)	(0.40)	(0.39)
N	6259	6259	2159	2159	2159	2159	2159	2159
R^2	0.23	0.30	0.24	0.24	0.51	0.51	0.40	0.40

**Significant at 1 percent level, *Significant at 5 percent level

Table 9, Panel B
Renegotiation Syndicate Structure Regressions

This table reports coefficient estimates from a regression relating syndicate structure to the firm's credit reputation, with a focus on how *ex post* renegotiation concerns affect *ex ante* syndicate structure. The sample for these regressions includes only firms with publicly available SEC filings and an S&P senior unsecured debt rating. A high yield firm is a firm with a credit rating of BB+ or worse and an investment grade firm is a firm with a credit rating of BBB- or better. In addition to variables reported, all maturity, loan size, and tranche controls listed in Table 4, Panel A are included in the regressions. All regressions also include a constant and year and industry dummies, and standard errors are heteroskedasticity-robust, clustered at the firm level. Investment grade firms are the omitted group.

Dependent Variable:	(1) Herfindahl	(2) Herfindahl	(3) # Participants with <= $5M	(4) # Participants with <= $5M	(5) # Participants with <= 2%	(6) # Participants with <= 2%
High yield firm	85		0.33**		0.62*	
	(64)		(0.11)		(0.25)	
Leverage ratio		230		0.73*		1.14*
		(174)		(0.35)		(0.50)
Income to assets ratio	-550	-557	-1.73	-1.86	-4.15**	-4.54**
	(526)	(521)	(1.39)	(1.34)	(1.35)	(1.39)
Ln[total assets]	-100**	-103**	0.35**	0.33**	0.25	0.21
	(38)	(37)	(0.10)	(0.10)	(0.14)	(0.13)
N	2159	2159	2159	2159	2159	2159
R^2	0.40	0.40	0.09	0.09	0.35	0.35

**Significant at 1 percent level, *Significant at 5 percent level

Table 10
Fixed Effects Syndicate Structure Regressions

This table reports fixed effects coefficient estimates from relating syndicate structure characteristics to the firm's credit reputation. Identification of credit reputation coefficients comes from a given firm switching from one category to another. For example, out of 2889 firms with more than one loan in the sample, 89 switch from being private to a public category (most through IPOs), and 93 switch from a public category to being private (mostly by emerging from bankruptcy). Columns (4) and (5) limit the sample to rated companies only. In column (5) *UPGRADE* takes on the value 1 if a firm moves from high yield to investment grade and *DOWNGRADE* takes on the value 1 if a firm moves from investment grade to high yield. In addition to variables reported, all maturity, loan size, and tranche controls listed in Table 4, Panel A are included in the regressions. Standard errors are heteroskedasticity-robust, clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)
Sample:	All firms with >= 2 loans			and credit rating available	
Dependent Variable:	# Lenders	# Leads	# Participants	# Participants	# Participants
Private firm	-1.64*	0.13	-1.77**		
	(0.73)	(0.33)	(0.62)		
Unrated firm	-0.77**	0.06	-0.83**		
	(0.29)	(0.10)	(0.28)		
High yield firm				0.13	
				(0.65)	
Upgrade					0.57
					(0.93)
Downgrade					1.43*
					(0.74)
Leverage ratio				-1.18	-1.27
				(1.72)	(1.74)
Income to asset ratio				-2.90	-2.94
				(3.23)	(3.20)
Ln[firm sales]	0.45**	-0.08	0.54**	0.79**	0.79**
	(0.17)	(0.08)	(0.17)	(0.27)	(0.28)
N	11897	11897	11897	5764	5764
# Firms	2889	2889	2889	1248	1248
R^2	0.47	0.33	0.39	0.35	0.36

**Significant at 1 percent level, *Significant at 5 percent level

Chapter 2

Managed Flexibility: Bank Lines of Credit in Corporate Finance

2.1 Introduction

Public firms in the United States utilize bank lines of credit, or revolving credit agreements, more than any other debt instrument. Draw downs on lines of credit represent more than 25 percent of aggregate debt outstanding for public firms. Over 80 percent of bank financing extended to public firms is in the form of lines of credit, and unused lines of credit on corporate balance sheets represent 11 percent of total assets. Despite the importance of bank lines of credit, the absence of data has limited existing empirical research on their role in corporate financing decisions. While a number of articles discuss the theoretical foundations for the existence of lines of credit,[1] empirical evidence is limited.[2]

A line of credit, also referred to as a loan commitment or revolving credit facility, provides a firm with a nominal amount of debt capacity against which the firm draws funds. In this chapter, I examine a novel data set to analyze how lines of credit fit into the overall financial structure of U.S. public firms. The data cover 298 randomly sampled Compustat firms from 1996 to 2003 for an unbalanced panel of 1,725 firm-year observations. In constructing this data set, I collect detailed information on the sources of corporate debt and the amount of used and unused bank lines of credit. I use this dataset to explore how firms use lines of credit, how banks manage lines of credit, and which types of firms use lines of credit. This paper is the first, to my knowledge, to explore these questions in a large sample of publicly traded firms.

The central finding of the empirical analysis conducted in this chapter is that bank lines of credit are not, as implicitly assumed in the existing literature, unconditional obligations by banks to firms. Instead, banks condition lines of credit on the borrower's maintenance of a variety of financial covenants.

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[1] Examples of articles that discuss the theoretical foundations of lines of credit include Berkovitch and Greenbaum (1991); Boot, Thakor, and Udell (1987); Duan and Yoon (1993); Holmstrom and Tirole (1998); Maksimovic (1990); Martin and Santomero (1994); Morgan (1994); and Shockley and Thakor (1997).

[2] Empirical papers that examine lines of credit in the corporate financing decisions of firms include Agarwal, Chomsisengphet, and Driscoll (2004) and Ham and Melnik (1987). Agarwal, Chomsisengphet, and Driscoll (2004) also note the lack of empirical research on corporate demand for lines of credit.

When firms experience a negative earnings shock, they default on these covenants and lose access to the unused portion of the line of credit.

The exposition of this central finding is developed in three steps. First, conditional on a firm having a line of credit, I find evidence that draw downs (pay downs) on bank lines of credit are the source of marginal increases (decreases) in debt levels. I also find that firms use lines of credit at the margin to adjust leverage ratios. This finding suggests that lines of credit provide a particularly flexible source of financing for the firms that obtain them. Theoretical research hypothesizes that lines of credit are the marginal source of debt financing, and the results presented here are consistent with this hypothesis.

In the second section of the chapter, I argue that the flexibility provided by lines of credit makes the standard agency problems associated with debt particularly severe. In a world of complete information and complete contracts, bank lenders would condition the availability of the unused portion of a line of credit on the particular investment that the firm is undertaking. In other words, firms would be able to draw down on their unused line of credit only when projects are profitable and the bank is guaranteed a return. If banks cannot write such a contract and there exists an asymmetry of information between borrowing firms and lending banks, then lines of credit are especially prone to corporate abuse. There are three examples of potential abuse from the existing literature. First, as in the debt overhang model of Myers (1977), borrowing firms may draw down on lines of credit during economic distress to pay off more immediate or senior claims. Second, firms may draw down on lines of credit to undertake particularly risky investments as the probability of bankruptcy increases, as in the "asset substitution" model of Jensen and Meckling (1979). Third, firms may draw down on lines of credit to maintain operations at a firm with negative returns because of private benefits of operation. While these problems are generally true of all corporate debt, they are particularly acute for lines of credit because of their flexibility.

The second result in this chapter is to document that banks condition the availability of lines of credit in order to limit these potential abuses. More specifically, I find that availability under lines of credit is contingent on numerous financial covenants, of which the maintenance of profitability is the

most common. Using within-firm variation in profitability, I document that negative earnings shocks lead to "technical defaults," or violations of these covenants by borrowing firms. I find that such violations are in turn associated with a restriction of the unused portion of the line of credit. In particular, a one standard deviation decrease in profitability increases the probability of technical default by 0.12 (on a mean of 0.10). In turn, a technical default for a given firm one year ago is associated with a reduced unused line of credit capacity of more than 20 percent at the mean. The results imply that banks contract on profitability as the key performance measurement associated with the true return of incremental projects, and "manage" the unused portion of the line of credit through this measure.

This finding suggests that, in practice, a line of credit is a different financial product then is implicitly assumed in much of the theoretical literature. Most of the theoretical literature implicitly assumes that lines of credit are unconditional obligations of banks (see for example Holmstrom and Tirole (1998) and Boot, Thakor and Udell (1987)). In these papers, lines of credit solve a time inconsistency problem in which borrowers are unable to raise "spot-market" financing in future periods (often due to moral hazard). In these models, unconditional lines of credit (partially) solve this problem because they cannot be renegotiated at a future date when more financing may be needed. Lines of credit only represent an improvement over future spot-market financing if banks cannot renege on the commitment at a future date. If the bank can renege, then the reasons behind the firms' inability to raise spot-market financing at future dates will also make the line of credit unavailable. The findings of this chapter suggest that banks have the ability to restrict access to unused portions of lines of credit when firms experience economic or financial distress. To further document this finding, I provide anecdotal evidence by exploring language in annual 10-K SEC filings that documents how closely lines of credit are managed by banks. Lines of credit provide flexibility, but that flexibility is carefully managed.

The first two findings imply that lines of credit are flexible debt instruments; given the agency problems associated with flexibility, banks use covenants on profitability to manage the unused portion of lines of credit. The third finding is a logical extension of the first two findings. Contrary to the finding prevalent in the literature that more profitable firms use less debt, I find that more profitable firms are

more likely to use bank lines of credit. Profitable firms are both more likely to hold unused balances of lines of credit, and more likely to draw down on lines of credit. This result holds among *all* firms, not just those that use some form of debt. The strongest results suggest that a firm with earnings one standard deviation below the mean is 12 percent less likely to have a line of credit. This result suggests that the finding in the previous literature that more profitable firms use less debt is driven in particular by non-bank debt, something I confirm in the results.

Taken together, these three findings imply that lines of credit are a flexible source of financing obtained only by firms with a polished record of earnings. Even among firms that obtain lines of credit, a negative earnings shock limits the availability of the unused portion. The findings suggest that lines of credit are closely monitored and managed by bank lenders, and that they are not available to fund projects in times of economic or financial distress.

Overall, the empirical findings in this chapter lend support to theoretical frameworks that motivate lines of credit for reasons other than moral hazard or time inconsistency. For example, Martin and Santomero (1997) argue that secrecy, flexibility, and speed are the primary reasons for the use of credit lines. Consistent with their findings, Federal Reserve survey data report that flexibility and speed of action are the primary reasons for the use of lines of credit (Avery and Berger (1991)). My findings suggest that firms with lines of credit can adjust debt levels and leverage ratios more easily, but only firms with positive earnings history obtain access to the lines of credit that provide such flexibility.

The rest of this chapter is outlined as follows. In the next section, I briefly describe the basic characteristics of lines of credit, and I explore the existing theoretical and empirical research. The third section describes the data collection and presents summary statistics. The fourth section documents that lines of credit are the marginal source of debt financing. The fifth section explores how banks manage lines of credit through covenants. The sixth section documents which types of firms use lines of credit, and the seventh section concludes.

2.2 Lines of credit: description and existing research

2.2.1 Description and theory

A firm that obtains a line of credit receives a nominal amount of debt capacity against which the firm draws funds. Lines of credit, also referred to as revolving credit facilities or loan commitments, are almost always provided by banks or financing companies. In the sample I describe below, 96 percent of the lines of credit described in annual reports are explicitly listed as being from banks or financing companies. The used portion of the line of credit is a debt obligation, whereas the unused portion of the line of credit remains off the balance sheet. In terms of pricing, the firm pays a commitment fee on the unused portion of the line of credit that is a percentage of the unused portion, and a pre-determined interest rate on any drawn amounts. In a sample of 19,523 lines of credit obtained between 1996 and 2003 in the Dealscan data base by the Loan Pricing Corporation, the average commitment fee is 33 basis points above LIBOR, and the average interest rate on drawn funds is 195 basis points above LIBOR.

Existing lines of credit are detailed on annual 10-K SEC filings by corporations. For example, Lexent Inc., a broadband technology company, details their line of credit in their FY 2000 10-K filing as follows:

> At December 31, 2000, the Company had notes payable to banks aggregating $2.0 million under a $50 million collateralized revolving credit facility, which expires in November 2003. Borrowings bear interest at the prime rate or at a rate based on LIBOR, at the option of the Company. This credit facility is to be used for general corporate purposes including working capital. As of December 31, 2000, the prime rate was 9.5%. The line of credit is secured by substantially all of the Company's assets, including its membership interests and stock in its subsidiaries, and is senior to $5.1 million of subordinated indebtedness to a principal common stockholder (Lexent Inc. (2000)).

In the 10-K filing, companies typically detail the existence of a line of credit and its availability in the liquidity and capital resources section under the management discussion, or in the financial footnotes explaining debt obligations.

Lines of credit may contain a variety of covenants that fall broadly into four categories: (1) covenants that require the borrower to maintain certain financial ratios, (2) covenants that require prepayment of the debt obligation if the firm sells assets, issues equity, or issues new debt ("sweeps covenants"), (3) covenants that restrict dividend payments or other uses of cash, and (4) covenants that restricts the total amount of the line of credit to a "borrowing base" of some liquid asset of the firm (cash,

accounts receivable, etc.). Covenants are a very important component of understanding lines of credit, and something I explore further in the results.

There is a large body of theoretical research on lines of credit. The first class of models uses problems of time inconsistency between borrowers and future creditors to motivate the use of lines of credit. These papers are in the spirit of the optimal contracting literature, and include Berkovitch and Greenbaum (1991); Boot, Thakor, and Udell (1987); Duan and Yoon (1993); Holmstrom and Tirole (1998); Morgan (1994); and Shockley (1995).

I focus here on two of these papers that I believe demonstrate the core ideas of these models. The paper by Holmstrom and Tirole (1998) motivates the use of lines of credit by embedding a moral hazard problem within a three-period model where an interim liquidity shock is realized in the second period. When the liquidity shock is realized in the second period, the borrower must retain a large enough portion of the third period return to motivate him to be diligent; in other words, there a standard moral hazard problem that forces the borrower to retain a large stake in the project. Given this agency problem, the first best is unattainable. If the liquidity shock is high enough, the borrower will not be able to obtain funds, given that he must retain enough of the project return to maintain diligence. The second best solution requires that the borrower buy liquidity insurance. One mechanism is a line of credit.[3] In the first period, borrowers obtain a commitment to lend in the second period up to a certain point. When the liquidity shock is realized, the borrower then has access to funds. In some states of the world, the creditors end up losing money in the second period, but they break even in expectation. This is the intuition of the liquidity insurance in the model.

Boot, Thakor, and Udell (1987) also use a basic agency problem to motivate corporate demand for lines of credit. They also have a three-period model with an agency problem, where borrowers select an effort level in the first period and choose whether to invest or not in the second period. The moral

[3] Holmstrom and Tirole (1998) emphasize that the line of credit must be irrevocable, and that the liquidity shock is verifiable. In other words, there is no possibility that borrowers misallocate the funds available under the line of credit. In addition, Holmstrom and Tirole (1998) emphasize that other types of financing arrangements may serve the purpose of a bank line of credit in their model, as long as the arrangement provides unconditional financing.

hazard problem arises because the effort decision is unobservable to creditors. In the Boot, Thakor, and Udell (1987) model, there is stochastic interest rate realized in the second period that serves the same purpose as the liquidity shock in Holmstrom and Tirole (1998). If interest rates are too high in the second period, borrowers anticipate a low expected return from the project and thus choose low effort. In other words, high interest rates in the second period lower the return to effort, which leads managers at borrowing firms to shirk. In the second period, banks fully predict such behavior, and thus ration credit. A line of credit signed in the first period solves this problem by charging an up-front fee and guaranteeing a low rate of interest in the second period. Thus, the line of credit serves as interest rate protection which can guarantee that borrowers put in high effort initially.

What are the empirical implications of these types of models? First, banks cannot renegotiate the line of credit in the interim period if the contract is to improve on spot-market financing. The critical element in these models is some time inconsistency that leads spot market creditors at a future date to deny credit. If a line of credit is conditional on future outcomes, then lenders extending the line of credit also deny credit. In the models described above, the optimal behavior for the bank in some states of the interim period is to actually refuse to allow the line of credit to be drawn. According to these models, if bank lines of credit are to solve these problems of time inconsistency, they must be extended unconditionally.

The second main empirical hypothesis that comes from these models is that it can be difficult for firms to raise capital in spot markets when investment opportunities arrive and/or change. Lines of credit provide a particularly flexible source of debt financing that can be drawn upon with fewer difficulties. At the margin, lines of credit should be the incremental form of debt financing.

Martin and Santomero (1997) provide a different approach to motivate the existence of lines of credit; they motivate lines of credit by assuming that firms desire speed and secrecy in pursuing investment opportunities. Given the need for speed and secrecy, their model assumes that lines of credit are optimal relative to other forms of debt, and explores the types of firms that will use lines of credit. There is an implicit assumption that spot market financing requires time and makes investment decisions

known to the product market competitors of the borrower. The first empirical prediction is that firms in high growth industries more heavily utilize lines of credit. The second empirical prediction is similar to the second prediction of the models discussed above; firms use lines of credit because of their speed and flexibility, and lines of credit should therefore be the incremental source of debt financing. Unlike the models above, the model by Martin and Santomero (1997) does not require lines of credit to be unconditional obligations, because there is no interim agency problem for the borrower.

Saidenberg and Strahan (1999) and Gatev and Strahan (2005) focus on the role of bank lines of credit in providing liquidity insurance during temporary negative supply shocks in commercial paper markets. The theoretical framework of these papers focuses on the liquidity advantages of banks, where deposit reserves typically increase when credit crunches occur. These papers focus on *aggregate* liquidity shocks that are independent of the investment opportunities or earnings potential of the borrower; borrowers draw on lines of credit when these aggregate shocks occur.

2.2.2 Empirical evidence

Empirical research on the use of lines of credit by borrowers is limited. There are two articles that are directly related to the research presented here. Ham and Melnik (1987) collect data from a direct survey of 90 corporate treasurers. Based on answers to the survey, they estimate a drawn line of credit demand function, and find that draw downs on lines of credit are inversely related to interest rate cost and positively related to total sales. Agarwal, Chomsisengphet, and Driscoll (2004) examine the use of lines of credit for 712 privately-held firms that obtained loans from FleetBoston Financial Corporation. Their analysis focuses only on firms that obtain lines of credit. They find evidence that firms with higher interest rates and fees have smaller credit lines. They also find that firms with higher profitability and higher working capital obtain larger credit lines. Finally, they find that firms that experience more uncertainty in their funding needs commit to smaller credit lines.

These papers increase our understanding of the use of lines of credit, and my findings are largely complementary. These two papers do not focus on the use of lines of credit by large public corporations, and do not focus on how corporations manage their lines of credit over time. In contrast to these two

papers, my data focus on a large sample of public firms which I follow over a period of 8 years. In addition, these papers examine lines of credit in a setting independent of other debt. My analysis explicitly compares when firms obtain lines of credit versus other types of debt financing.

There is also empirical research examining the supply side of lines of credit. Sufi (2005); Shockley and Thakor (1997); and Kashyap, Rajan, and Stein (2002) focus on contract structure of credit lines and the types of financial institutions that provide them. Saidenberg and Strahan (1999) and Gatev and Strahan (2005) use aggregate data on loans and commercial paper to show that lines of credit are drawn when commercial paper markets experience negative supply shocks.

2.3 Data and summary statistics

2.3.1 Data

The existing empirical research on lines of credit is limited partially due to the lack of data. The most commonly used database for financial characteristics of public corporations is Compustat. Compustat contains valuable information regarding the debt structure, but does not detail the source of the debt or whether the debt is in the form of a line of credit. Compustat *item 34* represents "debt in current liabilities," and is broken down into "notes payable" (*item 206*) and "debt—due in one year" (*item 44*). Compustat *item 9* represents "long-term debt," and is broken down into "convertible debt" (*item 79*), "debt—subordinated" (*item 80*), "debt—notes" (*item 81*), "debt—debentures" (*item 82*), "long-term debt—other" (*item 83*), and "long-term debt—capitalized lease obligations" (*item 84*).

Using these variables, it is not possible to determine whether debt comes from public issues, banks, private placements, shareholders, or from non-bank private sources. These data are available, however, in the debt schedules of annual 10-K SEC filings. As Johnson (1997) notes, Regulation S-X of the U.S. Securities and Exchange Commission requires that firms identify the sources of debt. For example, the firm almost always reports the amount of a given debt issue or loan, if it is public or private, what is the source of the debt, and, in particular, whether the debt obligation is from a bank or other institution. Although all of this information is available in 10-K filings, none of these variables are available in Compustat. In addition, Regulation S-K of the U.S. Securities and Exchange Commission

requires firms to discuss explicitly their liquidity, capital resources, and result of operations (Kaplan and Zingales, 1997). All firms filing with the SEC therefore provide detailed information on the used and unused portions of lines of credit.

This paper is not the first to collect data on the sources of debt from annual 10-K SEC filings. Johnson (1997) collects these data for a cross-section of 847 firms in 1989. In two papers, Houston and James (1996, 2001) use a sample of 250 firms for which they collect these data in years 1980, 1985, and 1990. Asquith, Gertner, and Scharfstein (1994) collect these data for a sample of 102 financially-distressed junk bond issuers which they follow during the late 1980s and early 1990s. In the summary statistics below, I compare the data that I have collected with that of Houston and James (1996). To my knowledge, this paper is the first to collect these data on a large sample of public firms after 1995.

I construct the universe and sample set of firms as follows. I begin with all non-financial U.S. firms with at least 4 years of continuous positive data on total assets (*item 6*) and continuous non-missing data on total sales (*item 12*) from 1996 through 2003. I focus on the period from 1996 through 2003 for two reasons. First, existing research by Houston and James (1996, 2001) and Johnson (1997) focuses on earlier periods. Second, annual 10-K SEC filings are available electronically for all firms in the years after 1996, which makes the costs of data collection much lower for this time period. I restrict the sample to firms with at least 4 years of continuous data on total assets and total sales because I am particularly interested in how debt structure evolves within a given firm over time, something that is not done widely in previous research. The universe of Compustat firms meeting these criteria includes 5,807 firms. I then randomly sample 300 firms from this universe, and follow them from 1996 through 2003.

The random sample begins with an unbalanced panel of 300 firms and 2,095 firm-year observations. For these 300 firms, I collect detailed data on the sources of debt and used and unused lines of credit from annual 10-K SEC filings. Firms filing their initial 10-K with the SEC typically include up to 2 years of historical data in their initial 10-K. Although these historical data generate Compustat observations with non-missing information on earnings and assets, the actual 10-K and financial footnotes on debt are not available for these historical data. I therefore include only firm-year observations where

an actual 10-K exists for the year in question. I drop 118 firm-year observations due to this restriction. I also drop 140 observations where book leverage is greater than 1. Finally, I drop 112 firm-year observations where share price (*item 199*), tangible assets (*item 8*), or EBITDA (*item 13*) is missing. The final sample includes 298 firms and 1,725 firm-year observations. This dataset has at least twice the number of firm-year observations of other studies using similar data from annual 10-K SEC filings.

Core financial variables are defined as follows. Similar to Baker and Wurgler (2002), I define book leverage as the book value of assets less book value of equity, all divided by total assets. The book value of equity is defined as the book value of assets (*item 6*) less the book value of total liabilities (*item 181*) plus deferred taxes (*item 35*). Book debt is short-term debt plus long term debt (*item 34 + item 9*), all divided by total assets (*item 6*). A measure of asset tangibility is defined as tangible assets (*item 8*) divided by total assets. The market to book ratio is defined as total assets less the book value of equity plus the market value of equity, all divided by total assets. The market value of equity is defined as common shares outstanding (*data 25*) multiplied by share price (*data 199*). Finally, the primary measure of profitability and cash flow is EBITDA (*data 13*), divided by total assets. In the analysis beginning in the next section, I follow the literature and Winsorize the market to book ratio and profitability at the 1st and 99th percentile. Outliers are a real problem in Compustat, and this is the standard procedure used in the literature to correct such problems (see Baker, Stein, & Wurgler (2003)).

Table 1 compares the sample of 300 firms used in this chapter with the full set of Compustat firms and the sampling universe. It presents the distribution of firm characteristics related to size, profitability, tangibility, and market to book ratios. I report the 10th, 50th, and 90th percentile instead of means and standard deviations because of the problem of outliers in Compustat. The first three columns present the distribution of firm characteristics for the set of all Compustat firm-year observations with positive assets data and non-missing sales data. The second set of three columns present the distribution of characteristics for the sampling universe, which includes only firms that have at least 4 years of contiguous positive assets data and non-missing sales data. The third column presents the distributional properties for the randomly sampled 300 firms. As expected, the distribution of firm characteristics in the

random sample is very similar to the distributions of all Compustat firms, and for the sampling universe. I am therefore confident that this is a representative sample with similar distributional characteristics as the full sample of Compustat firms.

2.3.2 Summary statistics

Table 2 contains the summary statistics for the sample of 298 firms from 1996 to 2003, for a total unbalanced panel of 1,725 firm-year observations. Both aggregate book debt and book leverage come directly from Compustat as described above; debt is then broken up into its components using the data collected from annual 10-K SEC filings. Book leverage is on average 0.45, and the book debt to total assets ratio is on average 0.21. Using the data collected from annual 10-K SEC filings of firms, I break down the debt into various categories. First, unused lines of credit represent on average more than 11 percent of total assets. As noted above, unused lines of credit are not debt obligations; they are recorded off of the balance sheet. Used lines of credit represent 5.5 percent of assets, or more than 25 percent of total book debt (0.055/0.208). Term bank debt represents 3.3 percent of assets. I classify public debt, private placements, and industrial revenue bonds as "arm's length" debt (Diamond (1991)), which accounts for 6.1 percent of total assets, or almost 31 percent of total book debt. Convertible debt accounts for about 2.2 percent of total assets, and non-bank private debt accounts for 1.6 percent of total assets. Non-bank private debt includes debt primarily from shareholders, related parties, and debt from vendors.

When compared to Houston and James (1996), the summary statistics show similarities and discrepancies. It is important to note that the Houston and James (1996) sample is limited to firms with long-term debt outstanding in 1980 that were traded on an exchange or with the National Association of Securities Dealers. I make neither of these restrictions on my sample. Therefore, the average book debt to total assets in their sample is higher (0.39 versus 0.21). The average market to book ratio in my sample is slightly higher (2.07 versus 1.46), which is consistent with the finding that firms with high market valuations relative to book value use less debt. Our percentages of total debt in the form of public debt (0.15) and commercial paper (0.02) are almost identical. The bank debt to total debt figure in Houston and James (1996) is considerably higher than in my sample (0.63 versus 0.42). The discrepancy is due to

the fact that convertible debt and private placements are not broken out specifically in their analysis, and may be included in the bank debt figure. Houston and James (1996) "define bank borrowing broadly to include borrowing referred to as 'bank' as well as private borrowing where the identity of the lender is not provided (1870)." It is possible that over time the annual 10-K SEC filings of firms have improved the reporting of the sources of non-bank private debt such as convertible debt and private placements. Houston and James (1996) note that the percentage of debt held by banks in their sample is high compared to data from the business sector and Federal Reserve; this is most likely a result of some debt being classified as bank debt when it is from non-bank debt sources.

In column (3) of Table 2, I present the mean fraction of all firm-year observations where the type of debt obligation in question is greater than 0. Almost every firm in the sample has some type of liability, and 82 percent have some type of debt. Among debt obligations, 70 percent of firm-year observations have positive unused lines of credit, and 47 percent have used lines of credit. Overall, 73 percent of firm-year observations have some unused or used line of credit, and 82 percent of firms in the sample have a lines of credit some time between 1996 and 2003; these numbers are higher than any other type of financial debt instrument. Term bank debt is used by 33 percent of firm-year observations, whereas public debt and commercial paper is used by only 15 percent and 5 percent respectively. Convertible debt and non-bank private debt are used by 14 percent and 23 percent of firm-year observations, respectively.

Table 2 also presents the yearly means for the sample of firms that have data available in all 8 years of the sample (114 firms). Used lines of credit appear to peak at the same time as the economic cycle in 1998 and 1999. There is a secular trend upwards in the amount of arm's length and convertible debt employed by these firms, whereas there appears to be a downward trend in the percentage of non-bank private debt. The trend in commercial paper is similar to the trend in used lines of credit.

2.4 Lines of credit and adjustments in debt

One common hypothesis in the theoretical models described above is that lines of credit provide financial flexibility. In Table 3, I test this hypothesis by exploring which type of debt financing firms

adjust when adjusting their overall level of debt. In other words, I am interested in answering the following question: when firms adjust their levels of debt, what type of debt is the marginal source of the adjustment? If firms adjust using lines of credit more than any other type of debt, then the evidence supports the theoretical hypothesis of the models discussed above that lines of credit provide flexibility and are the marginal source of debt financing.

Consistent with these models, Table 3 presents evidence that lines of credit are the marginal source of financing. I split the sample into two types of firms: firms that have a line of credit at any point in the sample and firms that do not. In Panel A, I explore adjustments in the leverage ratio, which can be interpreted as increases of the share of debt to current assets. I split the sample into 6 groups based on the size of the adjustment. There are very few firm-year observations with major adjustments in the leverage ratio, defined as an upward or downward adjustment of 30 percentage points or more. I break out these extreme adjusters to make sure that outliers are not driving any of the key results. Among firms that use lines of credit at any point in the sample, approximately 16 percent of firm-years have a decrease in the leverage ratio by 5 to 30 percentage points, and 19 percent have an increase in the leverage by 5 to 30 percentage points. Among large adjustments in leverage ratios upward and downward, used lines of credit are the largest source of these adjustments. When firms experience an adjustment upward of their leverage ratio between 5 and 30 percentage points, firms increase their used lines of credit to assets ratio by 4.5 percentage points. Even in relatively small adjustments to the leverage ratio of 1 to 5 percentage points, lines of credit are the largest source of the adjustment. It is important to note that these firms on average have a higher percentage of their debt in the form of arm's length debt, but lines of credit appear to be the marginal source of changes in leverage.

There are two interesting observations when examining adjustments in the leverage ratio for firms without lines of credit. First, the total number of large adjustments as a fraction of the total number of firm-year observations is much lower. For example, for firms that have lines of credit at any point in the sample, over 20 percent of firm-year observations are associated with an adjustment upward in the leverage ratio of more than 5 percent. The equivalent number for firms without lines of credit is 13

percent. The same trend is true for downward adjustments in the leverage ratio. While this result does not necessarily imply that firms without lines of credit are unable to adjust their ratios, the results suggest that firms that have lines of credit adjust their capital structures more frequently. Second, the margin of adjustment for firms without lines of credit appears to be convertible debt and private non-bank debt, although these results are not statistically significant given the small number of total adjustments. There are systematic differences in the types of firms that use lines of credit and those that do not, which is something I explore in the results below.

In Panel B, I analyze the nominal adjustment in debt as a percentage of lagged assets. The trends in the data are quite similar. When firms adjust their levels of debt upward and downward, they use lines of credit more than any other type of financing. Overall, in every category of adjustment in either leverage ratios or the levels of debt (with one exception), lines of credit are the largest source of the adjustment. The evidence suggests that firms use lines of credit as the marginal source of debt financing, and that flexibility is a key characteristic of this financial product.

2.5 Managing flexibility through covenants

2.5.1 Large sample evidence

Table 3 presents evidence that firms draw down on their lines of credit at the margin to increase their debt levels. As the marginal source of debt financing, potential agency problems are particularly severe with this financial product. I give three examples of such agency problems: asset substitution, debt overhang, and private managerial benefits of operation. First, following Jensen and Meckling (1976), managers (representing shareholders) with outstanding debt obligations have incentives to engage in activities with small probabilities of large payoffs because they have a call option on the value of the firm. In this asset substitution theoretical framework, management (representing shareholders) experiences no downside to failure and thus has a strong incentive to draw down on the line of credit to pursue risky projects when bankruptcy is imminent. Second, similar to the debt overhang problem described by Myers (1977), managers may draw upon bank lines of credit to pay off senior debt claims that may be close to default. Banks want to restrict such uses of the line of credit when existing debt obligations are

outstanding and senior to the claim of banks. Third, if information asymmetry exists and managers have private benefits of ownership, then management may pursue non-profitable projects using lines of credit.

These agency problems are generally true of all debt obligations, *but they are especially severe with lines of credit.* Lines of credit are existing obligations against which firms can draw with speed and discretion. Alternative types of term debt require investigation by the debt holders upon initiation of the contract, and rigorous documentation. Lines of credit are especially prone to abuse precisely because of their flexibility. The case of Enron Corporation provides an interesting anecdote. In late October 2001, Enron drew down $3 billion on bank lines of credit (Emshwiller, Smith, and Sapsford (2001)). Four days later, Moody's downgraded Enron's debt, and two weeks later, the SEC announced its accounting investigation that would eventually lead to the demise of the corporation. Upon the Chapter 11 filing in December, 2001, JPMorganChase announced that it had over $500 million in unsecured exposure and Credit Lyonnais had over $250 million in unsecured exposure.

In this section, I present evidence that banks understand these agency problems and employ covenants to address them. In particular, I focus on financial covenants, or covenants that require the maintenance of specified financial ratios. Financial ratios are specified in the initial contract, and the borrower is in default of the loan agreement if a ratio is not satisfied. These defaults are typically referred to as "technical defaults," and the lender has the legal right to accelerate the loan. Technical defaults are usually renegotiated; terms, maturity, and amounts are often changed, but the lender only rarely accelerates the loan.

Table 4 presents evidence from Dealscan by the Loan Pricing Corporation on financial covenants. The sample includes 19,523 sole lender and syndicated lines of credit obtained by non-financial business from 1996 to 2003.[4] Almost half of all lines of credit in the sample have covenants based on financial ratios. The most common type of financial covenant is a cash flow or profitability based covenant, occurring on 38 percent of the lines of credit. Covenants on total net worth and balance sheet based

[4] The Dealscan sample here is different than the sample employed in Chapter 1 in three ways. First, this sample includes only line of credit tranches and ignores term bank debt. Second, this sample includes both sole lender and syndicated loans. Third, this sample evaluates loans from 1996 through 2003, as opposed to 1991 through 2003.

covenants are also common. The most common covenant in the Dealscan sample is a debt to cash flow covenant, which is on 24 percent of the lines of credit. According to interviews with people at the Loan Pricing Corporation, the data in Dealscan represent a lower bound for the frequency of covenants. In other words, lines of credit often contain covenants that are not reported in Dealscan.

The factors leading the presence of covenants on bank debt has been explored by Bradley and Roberts (2004). They find evidence that small borrowers, highly-levered borrowers, and borrowers with high growth opportunities are more likely to have covenants on their bank credit agreements. They interpret this as evidence that supports the agency theory of covenants; covenants on debt prevent opportunistic behavior by managers acting on behalf of shareholders and at the expense of debt holders. Their evidence is consistent with the interpretation of covenants provided in this chapter. Covenants exist to prevent corporate abuse by management at the expense of the bank providing the line of credit.

In columns (1) and (2) of Table 5, I report coefficient estimates from fixed effects regressions that attempt to determine when defaults on covenants occur. Data on defaults is collected from the annual 10-K SEC filings for the firm. The exact specification is a linear probability fixed effects model, where the left hand side variable is 0 if no default occurs and 1 if default occurs. Formally, I estimate:

$$Default_{it} = \alpha_i + \alpha_t + \beta X_{it} + \varepsilon_{it} \qquad (1)$$

In this specification, X_{it} represents a matrix of firm profitability, net worth, and leverage measures. As documented above, these measures are subject to covenants. The coefficient estimate of β examines whether reductions in earnings, reductions in net worth, or increases in leverage lead to technical defaults of covenants associated with lines of credit. The sample for the estimation of (1) includes only firm-years where a line of credit is present, and standard errors are heteroskedasticity-robust, clustered at the firm level.

I estimate equation (1) above using a linear probability specification instead of maximum likelihood probit or logit specification for two reasons. First, probit fixed effects estimation suffers from the incidental parameters problem, which leads to intractable estimation of firm fixed effects (see Greene

(2000), 837). Second, most specifications in this chapter are linear, and I want to remain consistent in interpretations of coefficients as marginal linear changes at the mean. Finally, I estimate equation (1) using fixed effects in a maximum likelihood logit specification, and find almost identical results to the linear probability model reported.

Column (1) shows that a negative earnings shock is associated with a higher probability of default on a covenant. The coefficient estimate implies that a one standard deviation decrease in earnings (0.28) increases the probability of default by (0.28*0.44 =) 0.12 on the mean of the left hand side variable of 0.10. In column (2), I examine how a fall in net worth and rise in leverage affects the probability of default. The coefficient estimates imply that a one standard deviation drop in net worth (1.5) increases the probability of default by (1.5*0.019 =) 0.03 and a one standard deviation increase in leverage (0.20) increases the probability of default by (0.20*0.30=) 0.06. Even with the lower coefficient estimate on profitability in column (3), a one standard deviation in profitability still leads to almost a 0.09 increase in the probability of default. Using the standard deviation of the right-hand side variables as the measure of variation, the point estimates imply that a drop in profitability has the largest magnitude effect on the probability of default.

In columns (3) through (5), I am interested in how default at time *t* affects the amounts available under the line of credit at time *t+1*. More specifically, I estimate:

$$Line_{it} = \alpha_i + \alpha_t + \beta X_{i,t-1} + \gamma * Default_{i,t-1} + \varepsilon_{it} \qquad (2)$$

The sample includes only those firm-year observations where a line of credit was present at *t-1*, and standard errors are heteroskedasticity-robust, clustered at the firm level. Column (3) estimates equation (2) using the total lines of credit (both used and unused) to asset ratio. The point estimate implies a drop in the total amount of lines of credit, but the result is not statistically distinct from 0 at a reasonable level. When I break out lines of credit into used and unused, I find that unused lines of credit fall by 0.04 when the firm defaults on its covenants, a result that is statistically distinct from 0 at the 5 percent level. In this sample, the mean of the left hand side variable is 0.15, which implies that a default reduces the unused

portion of the line of credit by over 25 percent at the mean. It is not surprising that I find no drop in the used portion of the line of credit after a default; firms that default are usually unable to pay down the drawn portion of the line of credit, and so it remains on the balance sheet as a debt obligation.

The results in Tables 4 and 5 imply that lines of credit are closely managed by banks. In particular, a negative shock to earnings leads to default on covenants, which in turn reduces availability under the line of credit. These results are consistent with the theoretical framework associated with agency problems and flexibility. Given that lines of credit are flexible debt instruments that are the incremental source of debt financing, banks carefully manage the unused portion of the line of credit through covenants. The findings of this section also weaken the assumption in theoretical work that bank lines of credit are unconditional obligations. Banks appear to have a variety of tools that make restriction of credit possible.

2.5.2 Anecdotal evidence from 10-Ks

While the results in Tables 4 and 5 present statistically robust large sample evidence of banks actively managing lines of credit, I document here a few anecdotes directly from language in annual 10-K SEC filings to support the findings. Covenants on bank lines of credit are common and usually documented directly in the financial footnotes describing debt obligations. For example, Genessee & Wyoming reports in its FY 1996 10-K filing:

> These credit facilities are secured by substantially all the assets of the Company and the stock of certain subsidiaries. The credit facilities agreement requires the maintenance of certain covenants, including, but not limited to, funded debt to EBITDA, funded debt to net worth, cash flow coverage, EBIT to interest and minimum net worth, all as defined in the agreement. The Company is also limited in its ability to incur additional indebtedness, create liens on its assets, make certain capital expenditures and pay dividends greater than $32,000 in any one quarter. The Company and its subsidiaries were in compliance with the provisions of these covenants as of December 31, 1996 (Genessee & Wyomong (1996)).

While I focus primarily on financial covenants, banks contract on a variety of measures when managing the lines of credit they extend to their corporate clients. Electronics Boutique, in its FY 2002 filing, reports that its line of credit is contingent on the ownership stake of management (*italics added*):

> The Company had available a revolving credit facility allowing for maximum borrowings of $50.0 million at February 2, 2002 and February 1, 2003. ... The revolving credit agreement contains restrictive covenants regarding transactions with affiliates, the payment of dividends, and other financial and non-financial matters and is secured by certain assets, including accounts receivable, inventory, fixtures and equipment. *If the Kim family does not own, indirectly through EB Nevada, at least 25% of the Company's outstanding capital stock, the Company may be declared in default under the credit facility* (Electronics Boutique (2003)).

Although this is only one anecdote, it suggests that banks not only understand the incentive effects of the dilution of ownership's stake in the firm, but they also attempt to contract on it.

Not only is there anecdotal evidence on the existence of covenants, there is evidence on how banks manage lines of credit in the event of default. Total Renal Care Holdings addresses the failure to meet covenants in their FY 1999 10-K filing:

> When measured as of December 31, 1999, the company was not in compliance with certain formula-based covenants in the credit facilities. If the lenders do not waive this failure to comply, a majority of the lenders could declare an event of default, which would allow the lenders to accelerate payment of all amounts due under the credit facilities. Additionally, this noncompliance will result in higher interest costs, and the lenders may require additional concessions from the company before giving a waiver. ...Under these conditions, the company is currently unable to draw additional amounts under the credit facilities (Total Renal Care Holdings (1999)).

The language used in annual 10-K SEC filings by corporations confirms the results of the large sample analysis above. Banks appear to actively manage the unused portion of extended lines of credit. Lines of credit are contingent on a variety of financial covenants, and banks restrict use of the line of credit when these covenants are violated.

2.6 Which types of firms use lines of credit?

Conditional on having a line of credit, firms use lines of credit as the marginal source of debt financing. Given the agency problems associated with the unused portion of a line of credit, banks employ strict covenants and actively manage the availability of credit. If banks are particularly concerned with agency problems, then only reputable firms with a solid earnings history should be able to obtain a line of credit. I examine this hypothesis in this section.

Table 6 examines the unconditional mean characteristics for firm-year observations with and without lines of credit. Firms with lines of credit have higher levels of book debt and book leverage.

Firms without lines of credit have a much higher portion of their debt in the form of convertible securities. Firms with lines of credit are more profitable. The difference in the mean profitability to assets ratio is 0.27, which is one full standard deviation for the whole sample. The difference in median profitability shows that this difference is not being driven by outliers. Even the median firm with a line of credit has profitability to assets ratio 0.17 higher than firms without lines of credit. Firms with line of credit have lower market to book ratios and are larger. The industry composition of firms with and without line of credit is quite similar, with the exception that firms with lines of credit are more likely to be in trade industries and less likely to be in services. Overall, the unconditional means provide direct evidence that profitable firms use lines of credit more heavily than firms with low profitability.

In order to see if the profitability result is robust to further controls, I estimate linear multivariate regressions. In particular, Table 7, Panel A presents estimated coefficients from the following specification:

$$Debt_{it} = \alpha_t + \beta X_{i,t-1} + \gamma * \text{Profits}_{i,t-1} + \varepsilon_{it} \qquad (3)$$

The left hand side variables are measures of debt and lines of credit used by the firm, scaled by total assets. These measures of debt are regressed on a series of lagged firm characteristics. I follow the existing literature on capital structure that explores the impact of four main firm characteristics on leverage (Rajan and Zingales (1995)). I am particularly interested in the effect of profitability on debt and lines of credit. In previous literature, firms with high profitability are found to have lower levels of leverage in both U.S. and foreign data. The previous literature interprets this finding as evidence that profitable firms (a) prefer to operate out of cash flows rather than debt (Myers and Majluf (1984)), and (b) prefer to avoid the disciplinary role of debt (Rajan and Zingales (1995)). Firms with high asset tangibility are able to pledge more collateral, and are thus found to have higher levels of leverage. Larger firms are found to have higher levels of leverage, which may be due to the fact that larger firms fail less frequently. Firms with high market to book ratios are found to have lower levels of leverage, which is interpreted as evidence of debt overhang (Myers (1977)). In other words, firms with high market to books may have

future investment opportunities that require equity financing, and outstanding debt dilutes the value of future projects to potential shareholders. Specification (3) is initially estimated in pooled regressions with standard errors that are heteroskedasticity-robust, clustered at the firm level. In specifications below, I estimate between (group means) and fixed effects regressions to identify the source of variation that is driving the pooled results.

Columns (1) and (2) replicate the core findings of previous literature and find that firms with higher profitability have less debt, high market to book firms have less debt, firms with high asset tangibility have more debt, and larger firms have more debt. Columns (3), (4), and (5) show the estimated coefficients when the left hand side variable is total lines of credit, used lines of credit, and unused lines of credit, respectively. While firms with higher profitability generally use less debt, they use more lines of credit. The point estimate in column (3) implies that a one standard deviation increase in profitability (0.28) is associated with a (0.11*0.28=) 0.03 increase in total lines of credit scaled by assets. This represents almost a 20 percent increase at the mean of the left hand side variable. It is important to note that this result holds when comparing firms with and without debt. Conditional on having debt, more profitable firms hold an even greater amount of total lines of credit (results not reported). This finding is consistent with the findings of Agarwal, Chomsisengphet, and Driscoll (2004), who find that firms with higher profits and higher working capital obtain larger lines of credit. Columns (7) and (9) show that convertible debt and arm's length debt are decreasing in the profitability of the firm. In other words, the fact that book debt is decreasing in profitability appears to be driven by convertible debt and arm's length debt.

I interpret the findings above as evidence that firms with low profitability are unable to obtain lines of credit at a reasonable price. An alternative explanation is that high profitability is a measure of future growth opportunities, and firms with high growth opportunities desire flexibility in financing. Firms with lower earnings have lower growth opportunities, and do not desire lines of credit. The point estimates on the market to book ratio dispute this interpretation. In previous literature, the market to book ratio is interpreted as a direct measure of growth opportunities (Rajan and Zingales (1995), Baker and

Wurgler (2002)). I find that firms with high market to book ratios are less likely to employ bank lines of credit, which suggests that it is not high growth opportunities that are causing some firms to obtain lines of credit. In other words, if two firms have identical future growth opportunities, the firm with higher current profitability holds a larger balance of line of credit. The result that firms with high market to book ratios have lower balances of lines of credit is opposite of the prediction of Martin and Santomero (1997) that higher growth firms use more lines of credit.

In terms of the specification in Table 7, Panel A, there is one important note. The distribution of the left-hand side variables in specification (3) is 0 for a number of observations, and positive for others. The distribution of the left-hand size variable can be viewed as censored. I have replicated all results in Table 7, Panel A using a maximum likelihood tobit specification, with almost identical results. In specifications below, I decompose the extensive margin ($\{0,1\}$) and intensive margin (level conditional on $\{1\}$) to determine the effect of firm characteristics on the amount of different types of debt employed.

Panel B of Table 7 examines whether the extensive or intensive margin is driving the results in Panel A. For each of the debt instruments, I estimate the following extensive margin specification:

$$HasTypeDebt_{it} = \alpha_t + \beta X_{i,t-1} + \gamma * \Pr ofits_{i,t-1} + \varepsilon_{it} \qquad (4)$$

where $HasTypeDebt_{it}$ is a $\{0,1\}$ variable that measures whether firm i has the type of debt in question in year t. I then estimate a specification similar to (3) on the sample of firm-years that have the type of debt in question. In other words, I am interested if profitable firms are more likely to obtain lines of credit (extensive margin) or, conditional on obtaining a line of credit, more likely to hold more as a fraction of assets (intensive margin).

Columns (1) and (2) of Table 7, Panel B present evidence that the extensive margin is driving the results on lines of credit in Table 7, Panel A. Column (1) implies that a one standard deviation in profitability (0.28) leads to a 0.12 higher probability of obtaining a line of credit. The point estimate on the intensive margin is positive, but it is neither economically nor statistically significant. Columns (5),

(6), (9), and (10), show that arm's length debt and convertible debt are used less by more profitable firms, and this is true on both the extensive and intensive margin.

Taken together, the results in Table 7, Panels A and B support the argument that firms with low profitability are unable to access the market for lines of credit at a reasonable price. At this point in this project, I am not able to assert this causal story with certainty. Table 7 measures correlations in the data that are suggestive of this argument, but further work exploring exogenous shocks to earnings are necessary to provide compelling evidence that low profitability firms are unable to obtain a line of credit at a reasonable price. At this point, the evidence suggests that only firms with reputable earnings histories are able to obtain this financial product. This evidence is consistent with intuition provided by Rajan and Zingales (1995) who argue that a positive relationship between earnings and cash flows should be witnessed if debt "suppliers [are] more willing to lend to firms with current cashflows" (1452). The developed hypothesis follows directly from the analysis on how banks manage the unused portion of lines of credit. I find that, conditional on having a line of credit, banks extensively use covenants on measures of profitability to manage the line of credit. Firms with negative profitability shocks lose access to the unused portion of their line of credit. Given this behavior by banks when firms have lines of credit, it follows directly that banks may also restrict access to lines of credit by firms with low profitability.

Table 8 examines whether the results in Table 7 are due to within-firm or cross-section variation. In columns (1) and (3), I estimate fixed effects linear specifications of the following form:

$$Line_{it}, HasLine_{it} = \alpha_i + \alpha_t + \beta X_{i,t-1} + \gamma * \text{Profits}_{i,t-1} + \varepsilon_{it} \qquad (5)$$

In columns (2) and (4), I estimate a between, or group means, regression of the following firm

$$\overline{Line_i}, \overline{HasLine_i} = \beta \overline{X}_i + \gamma * \overline{\text{Profits}}_i + \overline{\varepsilon}_i \qquad (6)$$

where:

$$\overline{Z}_i = \frac{1}{T} * \sum_{t=1}^{T} Z_{it} \qquad (7)$$

In other words, in columns (2) and (4), I regress the mean of the usage of lines of credit for each firm *i* on the means of the right hand side variables of interest. Fixed effects estimates will measure the degree to which variation within each firm is driving the results in Table 7, whereas between estimates will measure the degree to which variation across firms is driving the results in Table 7.

Table 8 presents evidence that the core results in Table 8 are mainly driven by cross-section variation in profitability. The coefficient estimates on profitability in the fixed effects specification in columns (1) and (3) are positive and statistically distinct from zero at the 13 percent and 27 percent confidence level, respectively. Consistent with column (5) of Table 5, I find that a negative shock to earnings reduces the *unused* portion of lines of credit in fixed effects regressions (not reported). In other words, although *total* amount of lines of credit shows only a marginally statistically significant positive relationship with within-firm variation in profitability, the *unused* portion shows a statistically significantly positive relationship with within-firm variation in profitability. The coefficient estimates on profitability in the between estimation are very similar to the pooled regression estimates in Table 7, both in magnitude and statistical significance.

The between- and within-firm analysis in Table 8 demonstrates that it is primarily cross-sectional variation in profitability that determines the use of lines of credit. Although these results should be interpreted only as correlations, they imply that firms with low earnings capability are unable to access lines of credit at a reasonable price. There is, however, also evidence that within-firm variation in profitability can lead to a reduced line of credit. Although the results are only marginally statistically significant, they suggest that when a given firm experiences a negative shock to earnings, it loses access to the line of credit.

2.7 Conclusion

Bank lines of credit are used by more U.S. corporations than any other type of debt financing. Despite the importance of bank lines of credit in U.S. corporate finance, the empirical evidence on lines of credit is limited. In this chapter, I explore how firms use lines of credit, how banks manage lines of credit, and which types of firms have access to lines of credit.

Consistent with theoretical research on lines of credit, I find that this financial product provides financial flexibility for the firms that obtain them. I find that firms use lines of credit as the incremental source of adjustments in leverage ratios and nominal levels of debt. I argue that as the incremental source of debt financing, lines of credit are particularly prone to corporate abuse. To curb this abuse, banks use covenants to manage the unused portion of lines of credit. In particular, banks restrict access to the unused portion of the line of credit when a firm defaults on profitability covenants due to a negative earnings shock. This finding suggests that the assumption in the theoretical literature that bank lines of credit are unconditional obligations of banks is not accurate. Banks award certain firms with the flexibility of a line of credit, but they manage that flexibility by requiring firms to maintain high profitability.

The evidence presented here on the types of firms that utilize bank lines of credit is largely consistent with the view that lines of credit are awarded only to profitable firms. Although debt is generally used less by profitable firms, the amount of used and unused lines of credit are increasing in firm profitability. This result appears driven by cross-sectional variation at the extensive margin. In other words, the evidence suggests that only profitable firms are able to gain access to the flexibility of lines of credit. A more rigorous analysis using exogenous shocks to firm profitability is necessary to assert this causal interpretation with greater certainty.

The central purpose of this chapter is to explore the role of lines of credit in corporate finance. In future work, I hope to relate these findings to two areas. First, the traditional view of banks in corporate finance is that they provide a critical monitoring function that distinguishes bank debt from arm's length debt (Diamond (1984), Diamond (1991), Ramakrishnan and Thakor (1984)). The existing research implies that large, transparent, and reputable corporate borrowers will "graduate" from bank debt to arm's length debt because monitoring is less crucial. My results imply that bank debt is used by even large, transparent, and reputable borrowers, and that highly monitored bank debt may still be necessary because of the flexibility it provides. The findings here may also help to explain why bank debt is almost always senior to all other debt obligations. Given problems of debt overhang (Myers (1977)) and the fact that

lines of credit are the incremental source of financing, it follows directly that bank debt should be senior to all other debt claims.

Second, there is a growing body of research on the role of adjustment costs in the determination of financial structure (Leary and Roberts (2005); Flannery and Rangan (2005)). In particular, these papers support traditional trade-off theories of financial leverage by implying that firms adjust toward target leverage ratios slowly because adjustment costs are quite high. My findings imply that lines of credit are the marginal source of adjustments in the levels of debt and leverage ratios; an understanding of the adjustment costs associated with lines of credit is therefore an important part of understanding whether adjustment costs do in fact explain the slow adjustment to target leverage ratios.

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Table 1
Comparing Sample with All Compustat Firms

This table compares the full sample of Compustat firms with the universe formed for sampling and the sample itself. In the first three columns, I report the distribution of firm characteristics for all non-financial U.S.-based Compustat firm-year observations from 1996 to 2003 with positive asset data (*item6*) and non-missing sales data (*item 12*). The second three columns limit the sample to firms that have at least 4 years of consecutive positive assets data and non-missing data. The final three columns report the distribution of firm characteristics for the random sample employed in this paper.

	Full Compustat Sample Firms = 7,717; N = 43,767			All firms with at least 4 years of consecutive sales and asset data Firms = 5,807; N = 39.600			Random Sample Firms = 300; N = 2,095		
	10^{th} Percentile	Median	90^{th} Percentile	10^{th} Percentile	Median	90^{th} Percentile	10^{th} Percentile	Median	90^{th} Percentile
Total assets ($M)	5	103	2154	6	109	2349	6	128	2272
EBITDA/assets	-0.485	0.091	0.227	-0.446	0.093	0.227	-0.421	0.096	0.235
Tangible assets/assets	0.037	0.193	0.659	0.037	0.194	0.658	0.046	0.190	0.579
Market to book ratio	0.843	1.514	5.362	0.837	1.499	5.242	0.828	1.472	4.762

Table 2
Summary Statistics

This table present summary statistics for a random sample of 298 firms from 1996 to 2003, for a total unbalanced panel if 1,725 firm-year observations. Book leverage, book debt, and firm characteristics are directly from Compustat, and the break down of corporate debt is from hand-collected data of SEC 10-K annual filings. All measures of debt are scaled by total assets. In columns (3) through (8), I report the means, by year, for the sample of 114 for which data is available for all years.

	Mean	St. Dev	Fraction with type	1996	1997	1998	1999	2000	2001	2002	2003
All debt figures are scaled by total assets											
Book leverage	0.446	0.237		0.418	0.406	0.412	0.440	0.430	0.423	0.446	0.450
Book debt	0.208	0.205	0.816	0.188	0.17	0.18	0.203	0.192	0.192	0.194	0.198
Unused lines of credit	0.114	0.141	0.702	0.112	0.118	0.104	0.098	0.116	0.102	0.102	0.099
Used lines of credit	0.055	0.097	0.471	0.044	0.039	0.050	0.053	0.048	0.042	0.041	0.039
Term bank debt	0.033	0.084	0.329	0.023	0.022	0.023	0.028	0.026	0.025	0.026	0.025
Arm's length debt	0.061	0.128	0.299	0.057	0.056	0.055	0.059	0.059	0.070	0.077	0.075
Public debt	0.032	0.091	0.146								
Private placements	0.025	0.09	0.134								
Industrial revenue bonds	0.003	0.016	0.106								
Commercial paper	0.004	0.021	0.049	0.003	0.003	0.005	0.007	0.012	0.005	0.003	0.004
Non-bank private debt	0.016	0.06	0.234	0.024	0.012	0.011	0.008	0.008	0.006	0.005	0.006
Convertible debt	0.022	0.079	0.141	0.011	0.016	0.014	0.025	0.024	0.029	0.027	0.034
Capitalized leases	0.007	0.023	0.350	0.009	0.006	0.006	0.007	0.005	0.005	0.005	0.004
Other debt	0.011	0.034	0.378	0.019	0.015	0.017	0.016	0.010	0.010	0.010	0.010
Mortgages	0.006	0.031	0.100								
Government	0.001	0.006	0.035								
Unclassifiable	0.004	0.012	0.317								
Firm characteristics											
Tangible assets/total assets	0.262	0.214									
Market to book ratio	2.066	2.063									
Total assets	1404.613	4458.116									
EBITDA/total assets	0.027	0.282									

Table 3
Lines of Credit and Debt Adjustments

This table reports the frequency of annual adjustments in leverage ratios and debt levels as a fraction of lagged assets, and decomposes the adjustment by type of debt. For example, 0.161 of all firm-year observations for firms with lines of credit experienced a reduction in the leverage ratio between 0.05 and 0.30, and these firms reduced their line of credit to assets ratio by 0.046. Firms with lines of credit include any firm that has a line of credit in any year of the sample.

Panel A: Adjustments to leverage ratio

$$\frac{X_t}{A_t} - \frac{X_{t-1}}{A_{t-1}}$$

	Firms with lines of credit (Firms=244, Firm years=1302)						Firms without lines of credit (Firms=49, Firm years=224)				
	Fraction w/ adjustment	Line of credit	Term bank	Arm's length	Conv. Debt	Private non-bank	% with adjustment	Term bank	Arm's length	Conv. debt	Private non-bank
Adjustment <= - 0.30	0.009	-0.098	-0.086	-0.078	-0.086	-0.066	0.022	0.000	0.000	-0.263	-0.217
- 0.30 < Adjustment <= - 0.05	0.161	-0.046***	-0.021	-0.018	-0.012	-0.009	0.071	0.007	-0.005	-0.040	-0.054
- 0.05 < Adjustment <= - 0.01	0.200	-0.013**	-0.006	-0.005	0.001	-0.002	0.094	-0.005	0.000	-0.005	-0.002
0.01 <= Adjustment < 0.05	0.141	0.012	0.003	0.007	0.004	-0.001	0.049	0.000	0.000	0.009	0.009
0.05 <= Adjustment < 0.30	0.187	0.045**	0.028	0.016	0.017	0.006	0.094	0.002	0.013	0.050	0.038
0.30 <= Adjustment	0.016	0.104	0.088	0.050	0.108	0.050	0.040	0.000	0.181	0.269	0.045

Panel B: Adjustments to Debt, as percentage of lagged assets

$$\frac{X_t - X_{t-1}}{A_{t-1}}$$

	Firms with lines of credit (Firms=244, Firm years=1302)						Firms without lines of credit (Firms=49, Firm years=224)				
	Fraction w/ adjustment	Line of credit	Term bank	Arm's length	Conv. Debt	Private non-bank	% with adjustment	Term bank	Arm's length	Conv. debt	Private non-bank
Adjustment <= - 0.30	0.008	-0.103	-0.095	-0.024	-0.078	-0.099	0.018	0.000	0.000	-0.242	-0.271
- 0.30 < Adjustment <= - 0.05	0.149	-0.056***	-0.023	-0.016	-0.008	-0.010	0.071	0.007	0.000	-0.039	-0.041
- 0.05 < Adjustment <= - 0.01	0.164	-0.010	-0.006	-0.001	-0.002	-0.002	0.098	-0.003	0.000	-0.001	-0.006
0.01 <= Adjustment < 0.05	0.109	0.014	0.004	0.009	-0.001	0.000	0.067	0.004	0.005	0.003	0.006
0.05 <= Adjustment < 0.30	0.210	0.045***	0.020	0.026	0.010	0.007	0.040	0.001	0.000	0.064	0.034
0.30 <= Adjustment	0.065	0.238	0.215	0.114	0.114	0.067	0.049	0.001	1.375	1.274	0.160

***,**,* Significantly different from all other categories of adjustment at 1, 5, and 10 percent, respectively.

Table 4
Covenants

This table presents the fraction of lines of credit that have various types of financial covenants. The sample includes 19,523 sole lender and syndicated lines of credit obtained by non-financial businesses from 1996 to 2003, and comes from Dealscan by the Loan Pricing Corporation. Lines of credit can have more than one type of financial covenant.

Type of covenant	Fraction of loans	Type of covenant	Fraction of loans	Type of covenant	Fraction of loans
Cash flow/profitability based	0.381	Net worth based	0.232	Balance sheet based	0.192
Fixed charge coverage	0.180	Total net worth	0.122	Leverage ratio	0.064
Debt service coverage	0.060	Financial net worth	0.110	Current ratio	0.084
Interest coverage	0.185			Debt to equity	0.005
Cash interest coverage	0.009			Debt to total net worth	0.073
Debt to cash flow	0.237				
Senior debt to cash flow	0.045				
Any financial covenant	**0.487**				

Table 5
Lower Earnings Lead to Covenant Defaults and Restricted Unused Lines of Credit

This table reports coefficient estimates from firm fixed effects regressions. Columns (1) and (2) relate the probability of default at time t on various financial measures at time t. The sample for columns (1) and (2) include all firm-year observations where the firm has a line of credit. Columns (3) through (5) relate the amount of used and unused lines, scaled by total assets, at time t to whether a technical default occurred at *t-1*. The sample for columns (3) through (5) include all firm-years where the firm had a line of credit at *t-1*. Standard errors are heteroskedasticity-robust, clustered at the firm level

	(1)	(2)	(3)	(4)	(5)
Sample	Has line $_t$	Has line $_t$	Had line $_{t-1}$	Had line $_{t-1}$	Had line $_{t-1}$
Dependent Variable	Default$_t$	Default$_t$	(Total line/assets)$_t$	(Used line/assets)$_t$	(Unused line/assets)$_t$
(EBITDA/assets) $_t$	-0.437***	-0.311**			
	(0.147)	(0.148)			
(Net worth/assets) $_t$		-0.019**			
		(0.008)			
(Book debt/assets) $_t$		0.300**			
		(0.118)			
Default $_{t-1}$			-0.023	0.017	-0.041**
			(0.026)	(0.016)	(0.018)
(EBITDA/assets) $_{t-1}$			-0.019	-0.059*	0.040
			(0.057)	(0.031)	(0.047)
Market to book $_{t-1}$			0.004	0.006**	-0.002
			(0.005)	(0.002)	(0.004)
(Tangible assets/total assets)$_{t-1}$			0.005	0.126**	-0.121*
			(0.078)	(0.055)	(0.071)
Ln(total assets) $_{t-1}$			-0.032	0.012	-0.044**
			(0.020)	(0.010)	(0.017)
# Firm-years	1262	1262	1061	1061	1061
# Firms	242	242	233	233	233
R^2	0.25	0.26	0.64	0.64	0.54

***,**,* statistically significantly different than 0 at the 1, 5, and 10 percent, respectively.

Table 6
Comparing firms with and without lines of credit

This table presents the mean and median firm characteristics for firm-year observations where a line of credit is present and not present.

	With a line of credit (N = 1263)		Without a line of credit (N = 462)	
	Mean	Median	Mean	Median
Debt Structure				
Book leverage	0.492*	0.494	0.321	0.250
Book debt/total assets	0.248*	0.239	0.098	0.000
Term bank debt/total assets	0.041*	0.000	0.012	0.000
Arm's length debt/total assets	0.075*	0.000	0.021	0.000
Commercial paper/total assets	0.005*	0.000	0.000	0.000
Non-bank private debt/total assets	0.016	0.000	0.017	0.000
Convertible debt/total assets	0.018*	0.000	0.032	0.000
Firm characteristics				
EBITDA/assets	0.101*	0.122	-0.174	-0.053
Market to book	1.741*	1.319	2.956	1.880
Tangible assets/total assets	0.293*	0.234	0.177	0.105
Total assets	1760*	224	433	45
Industry composition (SIC 1 digit code)				
Mining, construction, agriculture (0, 1)	0.045		0.045	
Manufacturing (2, 3)	0.501		0.526	
Trans, comm., gas, & electricity (4)	0.092*		0.035	
Trade (5)	0.166*		0.037	
Services (7, 8)	0.188*		0.351	

* Significantly different than firms without lines of credit at the 1 percent level

Table 7, Panel A
Types of Debt and Firm Characteristics

This table presents coefficient estimates for pooled regressions relating the type of debt that firms use to characteristics of the firm. All dependent variables are scaled by total assets. Standard errors are heteroskedasticity-robust, clustered at the firm level.

Dependent Variable: Scaled by total assets	(1) Book Leverage$_t$	(2) Book debt$_t$	(3) Total lines$_t$	(4) Used lines$_t$	(5) Unused lines$_t$	(6) Term bank$_t$	(7) Arm's length$_t$	(8) Non-bank private$_t$	(9) Convertible debt$_t$
(EBITDA/assets)$_{t-1}$	-0.093***	-0.046*	0.111***	0.031**	0.080***	0.030***	-0.053***	-0.005	-0.041***
	(0.033)	(0.027)	(0.026)	(0.012)	(0.020)	(0.011)	(0.016)	(0.009)	(0.012)
Market to book$_{t-1}$	-0.016***	-0.012***	-0.010***	-0.004***	-0.006***	-0.003***	-0.003**	-0.002***	0.001
	(0.004)	(0.003)	(0.003)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
(Tangible assets/total assets)$_{t-1}$	0.171***	0.185**	0.063	0.035	0.027	0.034	0.062*	0.008	-0.017
	(0.048)	(0.047)	(0.047)	(0.025)	(0.030)	(0.024)	(0.035)	(0.017)	(0.012)
Ln(total assets)$_{t-1}$	0.031***	0.025**	-0.002	-0.003	0.001	-0.002	0.029***	-0.005***	0.004***
	(0.005)	(0.005)	(0.005)	(0.002)	(0.003)	(0.002)	(0.003)	(0.001)	(0.001)
# Firms	298	298	298	298	298	298	298	298	298
# Firm-years	1725	1725	1725	1725	1725	1725	1725	1725	1725
R^2	0.18	0.18	0.12	0.13	0.08	0.11	0.06	0.06	0.07

***,**,* statistically significantly different than 0 at the 1, 5, and 10 percent, respectively.

Table 7, Panel B
Types of Debt and Firm Characteristics

This table presents coefficient estimates for pooled regressions relating the type of debt that firms use to characteristics of the firm. In the odd columns, the dependent variable is {0,1} depending on whether the firm-year uses the financial instrument in question. In the even columns, the dependent variable is the level of dependent variable scaled by assets, given that the level is greater than 0. Standard errors are heteroskedasticity-robust, clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total lines$_t$		Term bank$_t$		Arm's length$_t$		Non-bank private$_t$		Convertible debt$_t$	
Dependent Variable:		Level,		Level,		Level,		Level,		Level,
Levels scaled by total assets	{0,1}	given {1}	{0,1}	given {1}	{0,1}	given {1}	{0,1}	given {1}	{0,1}	given {1}
(EBITDA/assets)$_{t-1}$	0.434***	0.014	0.073	0.115***	-0.086*	-0.297*	0.018	-0.037	-0.137***	-0.150***
	(0.064)	(0.052)	(0.069)	(0.028)	(0.051)	(0.159)	(0.059)	(0.036)	(0.044)	(0.054)
Market to book$_{t-1}$	-0.022***	-0.009**	-0.022***	-0.007**	-0.014**	-0.015	-0.019***	-0.006**	-0.001	0.016**
	(0.007)	(0.004)	(0.006)	(0.003)	(0.007)	(0.010)	(0.005)	(0.003)	(0.004)	(0.006)
(Tangible assets/assets)$_{t-1}$	0.247***	-0.003	0.191*	0.019	0.382***	-0.056	0.030	0.008	-0.035	-0.139**
	(0.093)	(0.058)	(0.111)	(0.045)	(0.099)	(0.088)	(0.102)	(0.052)	(0.072)	(0.067)
Ln(total assets)$_{t-1}$	0.032***	-0.014***	0.002	-0.006	0.108***	0.025***	-0.031***	-0.010**	0.029***	0.004
	(0.011)	(0.005)	(0.013)	(0.005)	(0.010)	(0.007)	(0.010)	(0.004)	(0.009)	(0.007)
# Firms	298	242	298	156	298	98	298	132	298	81
# Firm-years	1725	1263	1725	567	1725	515	1725	403	1725	243
R^2	0.27	0.10	0.05	0.12	0.38	0.25	0.06	0.18	0.09	0.13

***,**,* statistically significantly different than 0 at the 1, 5, and 10 percent, respectively.

Table 8
Lines of Credit and Firm Characteristics: Between and Fixed Effects Estimation

This table presents coefficient estimates for between (group mean) and fixed effects regressions relating the use of lines of credit to characteristics of the firm. Total lines of credit is scaled by total assets in columns (1) and (2). Standard errors are heteroskedasticity-robust, clustered at the firm level.

Dependent Variable: Levels scaled by total assets	(1) Fixed effects Total lines $_t$	(2) Between Total lines $_t$	(3) Fixed effects Hasline $_t$ {0,1}	(4) Between Has line $_t$ {0,1}
(EBITDA/assets)$_{t-1}$	0.038	0.108***	0.082	0.490***
	(0.025)	(0.041)	(0.073)	(0.081)
Market to book $_{t-1}$	-0.001	-0.013**	0.005	-0.025**
	(0.002)	(0.005)	(0.005)	(0.010)
(Tangible assets/assets)$_{t-1}$	0.026	0.024	0.185	0.167
	(0.059)	(0.053)	(0.134)	(0.105)
Ln(total assets) $_{t-1}$	-0.017	-0.003	0.017	0.028***
	(0.010)	(0.005)	(0.020)	(0.011)
# Firms	298	298	298	298
# Firm-years	1725	1725	1725	1725
R^2	0.65	0.19	0.70	0.40

***,**,* statistically significantly different than 0 at the 1, 5, and 10 percent, respectively.

Chapter 3

Does Joint Production of Lending and Underwriting Help or Hurt Firms?

3.1 Introduction

Deregulation of restrictions on commercial bank underwriting activities, culminated in the passage of the Financial Services Modernization act of 1999, has led to major changes in the debt underwriting markets facing borrowing firms. From 1992 to 2003, the percent of debt securities underwritten by commercial banks went from 4 percent to 85 percent. Over the same period, the percent of debt securities underwritten by a financial firm with which the borrowing firm had a recent private lending relationship went from less than 1 percent to 75 percent. In 2003, 4 of the top 5 lead underwriters in debt underwriting markets were commercial banks.[1]

This important change necessitates empirical research because economic theory yields ambiguous predictions about the welfare impacts on borrowing firms from this major shift induced by regulatory policy. Firms could potentially benefit; commercial banks with private lending relationships may have a cheaper cost of underwriting. The introduction of new players in underwriting markets may spur competition, resulting in lower underwriting fees. Yield spreads on debt issues could be lower if lending financial institutions better certify public issues by firms with which private lending relationships are present. On the other hand, dominant financial institutions with large market share in both lending and underwriting markets could expropriate project rents from borrowing firms by locking them into relationships. If fixed costs of information collection are high or problems of information asymmetry severe, financial institutions in a dominant position *vis-à-vis* the firm may extract rents from profitable firm projects, as in the model by Rajan (1992). Anecdotal evidence suggests this is a potential problem; corporate finance executives report being "pressured" into obtaining underwriting services in exchange

[1] Throughout this paper, a commercial banks refers to a financial institution that is either (1) a U.S. financial firm filing a Federal Reserve Y9C report, or (2) a foreign financial firm that has an SIC code of 6020 or 6029. Generally, an investment bank is a financial institution that engages primarily in fee-based services such as underwriting, M&A, and brokerage services. Commercial banks engage primarily in interest-based services of deposit-taking and lending.

for loans from commercial banks (WSJ (2004a)). Investment banks complain that the practice of tying loans and underwriting services is illegal and harmful to competition (WSJ, (2004b)).

In this chapter, I examine a panel of 4,553 debt issues by 509 firms from 1990 to 2003. I employ a fixed-effects regression analysis to explore how joint production of lending and public debt underwriting services affects underwriting fees, yield spreads, and syndicate structure for debt issues. While a number of papers explore this issue, this paper is the first to estimate key parameters using within-firm variation over time in the ability, by law, of financial institutions to underwrite debt securities for firms with which they have a lending relationship. This approach is an important contribution; I show that fixed effects estimation produces results at odds with findings in the previous literature. I also show that cross-section estimates reported in the previous literature are likely biased due to unobservable firm characteristics.

Using a fixed effects estimation strategy to eliminate this bias, I find three results. First, relative to the period when joint production was restricted by law, underwriting fees charged to a given firm are 10 to 15 percent lower when the issue is underwritten by a commercial bank with which the firm has a lending relationship in the year prior to the underwriting. This result is strongest among investment grade and large firms. Evaluated at the mean, the strongest result suggests that investment grade firms enjoy a cost savings of about $200,000 per debt issue. The evidence suggests that financial institutions that jointly produce lending and underwriting services do not harm firms, but offer price discounts on underwriting services. I provide several robustness checks to warrant this claim. I find that lending commercial banks do not offer an initial cut in fees to capture future business at higher prices; the underwriting fee is lower when lending institutions first underwrite a debt issue and *remain low* even into the future. I also find that underwriting markets are more competitive (in terms of the market share held by the top 5 underwriters and the herfindahl index) in recent years than in the early 1990s.

Second, the fixed effects analysis finds no evidence that commercial banks with or without recent lending relationships obtain a lower yield spread when issuing a firm's debt security. This result is robust when examining large and small firms, and investment grade and high yield firms. This finding is in

stark contrast to a number of papers in the previous literature. To explain this discrepancy, I show that cross-section (or pooled) regressions that compare yield spreads on commercial bank underwritten securities to yield spreads on non-commercial bank underwritten securities produce biased and inconsistent estimates. The discrepancy between the pooled and fixed effects analysis is important; estimates produced in cross section regressions, especially early in the sample, are likely biased due to the fact that commercial banks underwrite for firms of higher unobservable quality. The econometrician, using only observable characteristics as controls, falsely ascribes lower yield spreads to the fact that a commercial bank underwrites the issue. A fixed effects strategy that isolates *within-firm* variation in spreads removes the bias by removing unobservable characteristics of a given firm that do not vary across time. In other words, a significant contribution of this paper over the prior literature is that estimation of key parameters comes from within-firm variation over time driven by exogenous regulatory changes, not from between-firm variation at a given point in time (likely driven by unobservable firm characteristics).

The fact that yield spreads do not change significantly suggests that both commercial banks and investment banks produce similar information on firms to certify issues. However, my results on underwriting fees indicate that commercial banks with lending relationships produce the information more cheaply.

The final section of this chapter examines whether firms are more locked in to financial relationships after deregulation and explores the strategies utilized by firms to prevent being expropriated by financial institutions. I evaluate the evolution of capture probabilities, or the probability that a lead manager on a debt issue for a given firm is chosen as the lead manager on the firm's next debt issue. I find evidence that capture probabilities have not increased with deregulation, and are no higher when a lending relationship is present with the underwriter. Borrowing firms appear to reduce the lock in effect of a lending underwriter by hiring multiple lead managers. The presence of more than one lead manager on debt issues has increased from less than 2 percent in 1992 to almost 80 percent in 2003. Further, this result is driven by debt issues on which one of the lead arrangers has a lending relationship with the borrowing firm. In other words, a firm rarely hires only one lead manager if it has a lending relationship

with that lead manager. The results suggest that firms utilize syndicate structure to prevent any one financial firm from gaining too much power over the firm.

There is a substantial body of research that explores the entry of commercial banks into securities underwriting markets. This chapter represents a new contribution to this literature for 4 reasons. First, it is the first paper, to my knowledge, that examines the effects of commercial bank entry for the entire period of deregulation and for a significantly long period after the Financial Services Modernization Act of 1999. Such an extension is important, because changes in debt underwriting markets have been most significant since 1999. Second, as mentioned above, this paper is the first to exploit within-firm variation driven by exogenous regulatory changes to assess the impact of commercial bank entry into securities activity. The empirical strategy eliminates potential bias due to unobservable firm characteristics. I show explicitly how coefficients in cross section analyses are biased and inconsistent in yield spread regressions, which cautions against using these cross section methods to assert causal relationships between commercial bank entry and outcomes. Third, the analysis of a panel of debt issues through the entire period of deregulation allows for sharper conclusions with regard to the price effects on firms. For example, commercial banks could offer only short-term discounts in order to initially capture underwriting business, only to charge higher prices in the future. This paper is the first, to my knowledge, that explicitly tests dynamic behavior surrounding commercial bank entry into securities underwriting. Finally, this paper evaluates new and interesting trends in the syndicate structure of debt issues which, to my knowledge, have not been explored.[2]

3.2 Background, Theory, and Previous Research

3.2.1 The deregulation of restrictions on commercial bank underwriting activity

[2] Narayanan, Rangan, and Rangan (2004) explore the effect of syndicate structure in equity markets from 1993 to 1997; they find that lending commercial banks co-manage with non-lending banks when lending relationships with the borrowing firm are present. I discuss their paper in more detail when presenting the syndicate structure results.

The deregulation of restrictions on commercial bank securities activity through the late 1980s and 1990s is well documented.[3] The Banking Act of 1933, four sections of which are collectively known as the "Glass-Steagall Act," strictly prohibited securities underwriting by commercial banks. On April 30th, 1987, the Federal Reserve authorized limited underwriting activity for previously prohibited securities including municipal revenue bonds, commercial paper, and mortgage-related securities. On January 18th, 1989, the Federal Reserve expanded the definition of eligible securities to include corporate debt and equity securities, and allowed for "Section 20" subsidiaries (named after Section 20 of the Banking Act of 1933) of commercial bank holding companies to underwrite these securities on a limited basis.

The Federal Reserve imposed three important restrictions on commercial bank underwriting activity. First, the revenue from the underwriting of corporate debt and equity securities could not exceed 10 percent of the subsidiary's revenue. Second, a regulated commercial bank had to apply and win approval for a Section 20 subsidiary. On December 20, 1996, the Federal Reserve increased the revenue restriction on Section 20 subsidiary underwriting activity from 10 to 25 percent. All revenue restrictions on commercial bank securities activity were eliminated in November of 1999 when President Clinton signed into law the Financial Services Modernization Act (also known as the Gramm-Leach-Bliley Act).

The gradual deregulation of commercial bank underwriting restrictions provides the empirical laboratory for studying the effect of joint production of lending and debt underwriting services. Figure 1 shows how commercial banks responded to deregulation. In 1990, not a single debt security in my sample was underwritten by a commercial bank. From 1991 to 1996, commercial banks gained market share in debt underwriting markets, but remained small compared to investment banks. Almost half of the gain in market share by commercial banks up to 1996 was driven by unregulated commercial banks; these are foreign banks, such as Credit Suisse and Union Bank of Switzerland which had no depository branches in the United States. From 1996 to 1999, there is a sharp increase in the percentage of debt issues underwritten by commercial banks. Finally, in the aftermath of FSMA, commercial banks have

[3] See Lown, et al (2000) and Cornett, Ors, and Tehranian (2002) for a comprehensive treatment of deregulation up to and through the Financial Services Modernization Act of 1999.

dominated debt underwriting markets; by 2003, almost 90 percent of underwritten issues have a commercial bank lead manager.

The main focus of this chapter is not on commercial bank entry *per se*, but rather the increasing practice of jointly producing loans and underwriting services. Figure 2 shows the trend in joint production. Similar to Figure 1, Figure 2 shows that, prior to 1996, only a small percentage of debt issues were underwritten by financial firms with which the borrowing firm has a recent loan (defined to be a loan within the past 2 years). The percentage of debt issues underwritten by a recent lender increases from 1996 to 1999 from 10 percent to almost 35 percent. The increase is larger after the passage of FSMA; by 2003, over 70 percent of debt issues are underwritten by a financial institution with which the borrowing firm has a recent lending relationship. Figure 2 also shows that commercial banks were constrained to underwrite for only some of the firms in their loan portfolio prior to FSMA. In the early part of the sample, many firms that had lending relationships with a bank that legally COULD underwrite the firms debt security did NOT hire the commercial bank. By 2003, over 80 percent of debt-issues by firms that COULD have hired a commercial bank underwriter did in fact hire the commercial bank underwriter. This trend suggests that revenue restrictions on commercial bank underwriting had real effects early in the sample period.

Figure 2 also shows that investment banks, prior to 1996, almost uniquely focus on underwriting markets. There were never regulatory constraints on investment banks from providing private lending services. Even so, investment banks almost exclusively focused on underwriting activities up to and through deregulation; prior to 1997, only 1 percent of all issues were underwritten by an investment bank with which the borrowing firm had a lending relationship in the past two years. While regulatory restrictions prevented commercial banks from underwriting, it is likely that competition, size or resource constraints prevented investment banks from originating loans. There is evidence that investment banks have recently increased their role in private lending. For example, after 1999, 8 percent of issues were underwritten by an investment bank that also had a recent loan to the firm.

Table 1 lists the top 5 lead managers for underwritten debt issues through the sample. In 1990 and even by 1996, the underwriters are predominately investment banks, with Goldman Sachs, Morgan Stanley, Merrill Lynch and Salomon Brothers maintaining over 10 percent market share each. The shift in market composition begins in 1996 and is completed by 2003. By 2003, 4 of the top 5 underwriters are commercial banks, with Citigroup, JPMorganChase, and Bank of America holding the top 3 spots. Table 1 also provides basic measures of market concentration. The market share of the top 5 underwriters and the herfindahl index of the market have both declined substantially since 1990. This provides initial evidence that commercial banks have not reduced competition in debt underwriting markets.

3.2.2 Theory

Theory yields ambiguous predictions regarding the effect of joint production of lending and underwriting on fees and yield spreads. With respect to fees, commercial banks may be able to more cheaply produce debt underwriting and lending activities through information scope economies. If there is a fixed cost component of both lending and underwriting for the same firm, commercial banks may achieve cheaper costs by combining the two functions. The information scope economies assumption is used in the model by Kanatas and Qi (2003), and seems reasonable given practitioner anecdotal evidence. The key question remains, will joint producers relay cost savings to the borrowing firms through lower fees? A darker side of joint production with respect to underwriting fees comes from models such as Rajan (1992). If information asymmetries are severe and firms are unable to credibly relay information on projects to financial institutions outside their existing relationship, a joint producing financial firm may gain a position of power over the firm. By tying lending and underwriting services, the financial institution may be able to expropriate project profits from firms. In addition, if lending institutions gain market power in debt underwriting markets, they may charge higher fees.

The previous literature has primarily concentrated on the effect of commercial bank entry on yield spreads, or the interest rate on public debt issues underwritten by commercial banks. The negative view holds that an underwriter with an outstanding loan to a firm has an inherent conflict of interest in issuing securities for that firm. In the extreme example, a lender with private information about pending

firm default issues a public security on behalf of the firm to pay off the outstanding loan, leaving public investors with non-performing securities. Investors properly predict such behavior, and demand higher yield spreads to take on such securities. The positive view holds that commercial bank lenders, with detailed information on firms from lending relationships, are better certifiers of public issues; investors reward issues underwritten by lenders with lower yield spreads.

3.2.3 Previous Research

The initial empirical research on the topic begins with the work of Kroszner and Rajan (1994) and Puri (1996) who study securities underwritten by commercial banks in the 1920s, prior to the passage of the Glass-Steagall Act. These papers document evidence that commercial banks issued higher quality securities that were sold for higher prices, which negates the assertion that commercial banks had conflicts of interest in underwriting securities for firms with which they may have had loans outstanding. Empirical analysis of the modern era begins with Gande, Puri, Saunders, and Walter (1997). The sample includes 670 debt issues between 1993 and 1995, and the authors, using cross-section regressions, find that commercial banks obtain yield spreads for their clients up to 42 basis points lower than investment banks when the commercial bank has outstanding loans to the firm. Gande, Puri, and Saunders (1999) employ a sample of all debt issues between 1985 and 1996 and find that overall underwriting fees are lower after 1989 than before, and again find that yield spreads are significantly lower when the bank has outstanding loans to the firm. Roten and Mullineaux (2002) extend the analysis by Gande, Puri and Saunders to debt issues from 1995 through 1998. Their findings are exactly the opposite of Gande, Puri, and Saunders; in this later period, they find "no evidence that a prior commercial bank lending relationship influences underwriting yields for any type of issue." They also find no evidence that Section 20 underwritings produce a favorable competitive effect on underwriting fees. A more recent paper by Narayanan, Rangan, and Rangan (2003) uses a sample from 1993 to 1997 and finds similar results to those of Gande, Puri, and Saunders (1999).

Schenone (2005) and Drucker and Puri (2005) focus on equity markets. Schenone analyzes IPOs between 1998 and 2000 and finds that IPOs by firms with a lending relationship with a prospective

underwriter face a 16 percent lower cost of equity than firms without a banking relationship. Drucker and Puri (2005) study the joint production of seasoned equity offerings and lending relationships. They find evidence that commercial banks "tie" lending and underwriting services, and offer cheaper fees for both.

In these papers, the empirical analysis is derived from cross-section regressions where the underwriting fee, yield spread, or underpricing of equity is the dependent variable, and the key right hand side variable is whether or not a commercial bank underwrites the issue/has a loan with the issuer. Identification of the key parameter comes from comparing firms for which commercial banks serve as an underwriter (and have a lending relationship) to firms with no commercial bank is present. Implicitly, all papers accept the presence of lending relationships with an underwriter and the choice of underwriter as exogenous. A worry in this empirical approach is selection bias; firm characteristics unobservable to the econometrician (but observable to banks and firms) affect which firms choose commercial banks or, alternatively, which firms are targeted by commercial bank underwriters. If commercial banks target firms that are higher quality (based on characteristics unobservable to the econometrician), these firms will obtain lower yield spreads and lower fees given their higher quality. The econometrician falsely ascribes the lower spreads and fees to the commercial bank underwriter.

Some settings do not allow for the use of fixed effects estimation strategies. For example, every firm has at most 1 IPO, and so one cannot estimate a within-firm change in underpricing. In addition, the previous literature acknowledges this problem and utilizes methods to solve it.[4] In this chapter, I only show that cross-section analyses with regard to yield spreads on *debt issues* produce biased estimates. The results in *equity markets* (Drucker and Puri, 2005) may be robust to a fixed effects strategy. Overall, the existence of unobservable firm characteristics warrants caution in interpretation of cross-section results; one cannot assign a causal effect of commercial banks on underwriting fees, yield spreads, or

[4] For example, Gande, Puri, Saunders, and Walter (1997) use maximum likelihood to estimate the probability a firm has a loan with a bank, and then uses the residuals in the OLS regression of yield spread on commercial bank underwriter. Drucker and Puri (2005) use a matching technique to attempt to eliminate selection bias. This matching methodology assumes that all relevant differences between loans jointly offered and loans not jointly offered are captured by observable characteristics.

underpricing. I formalize this concern in the next section and show that fixed effects regressions produce more reliable estimates.

Yasuda (2005) takes a different approach than these articles. Using debt issues from 1993 to 1997, she employs a multinomial choice model in which the choice of lead manager is a function of reputation, the underwriting fee, and previous lending relationships. Her results suggest that there is a trade-off between lending relationships and the underwriting fee in the choice model, especially for junk bond and first-time issuers. Rather than using the underwriting fee as a dependent variable, she uses the underwriting fee as an exogenous variable that is used in the choice set by the borrowing firm. Yasuda (2005) uses an expectation-maximization algorithm to estimate the unobserved fees by underwriters not chosen. She argues that using only observed fees leads to bias due to the fact that the unobserved fees by banks not chosen are likely higher than the observed fees. Her approach indicates a potential problem in using observed underwriting fees as a dependent variable. I address these concerns below when outlining the empirical strategy.

3.3 Data and Empirical Strategy

3.3.1 Data

I use three data sources. The core data set on non-convertible debt issues, issue characteristics, fees, yield spreads, and names of lead managers comes from the Securities Data Corporation (SDC). Data on lending relationships is from Dealscan by the Loan Pricing Corporation. Finally, firm characteristics such as book leverage ratio, income, and total assets come from Compustat.

The Dealscan data used to extract lending relationships suffers from two major problems. First, the coverage before 1990 is sporadic. I therefore begin my sample in 1990. Second, the data from Dealscan suffer from systematic selection bias; the data do not cover all loans to all firms, but are focused on large loans to public firms. To address this problem, I limit the sample to the largest firms in Compustat, firms for which I am confident Dealscan covers all lending relationships. The exact sample is constructed as follows. First, using the Compustat database, I obtain a list of the top 1000 firms each year from 1989 to 2002, ranked by the total book value of assets. If a firm is ever in the top 1000 firms in any

year, then the firm is included in the analysis *for all years*. I limit the sample to firms that are in Compustat for at least 4 years. This process results in 1340 firms. Using CUSIP identifiers, I find all debt issues by these 1340 firms from 1990 to 2003, which results in 6979 debt issues by 687 firms representing $1.1 trillion in total debt issued.[5] I drop any floating coupon issue and any issue lacking data on maturity, underwriting fees, yield spreads, or lead managers. The resulting sample is 4,713 debt issues by 669 firms. Finally, the focus of this chapter is on a fixed effects analysis, and so only firms with at least 2 issues are included in the data. The final panel data set of non-convertible, fixed coupon payment debt issues includes 4553 issues by 509 firms representing almost $900 billion in total debt issued.

I assign syndicate member positions based on codes provided by SDC. A syndicate member is considered a "lead manager" if its position is described as "book runner" (27 percent), "joint book runner" (8 percent), or "joint lead manager" (1 percent). A syndicate member is a "co-manager" if its position is described as "co-manager" (62 percent) or "global coordinator" (1 percent).

Table 2 presents the summary statistics. The mean number of issues per firm is 9. The majority of firms are from the manufacturing sector (SIC codes of 2 and 3) and the transportation, communications, gas and electricity sector (SIC code of 4). The key dependent variables are the underwriting fee as a percentage of total issue amount (mean 0.76) and the yield spread to benchmark (mean 125 basis points). Approximately 16 percent of debt issues are secured, and 40 percent are callable. The average amount of a debt issue is $196 million with a maturity of 14 years.

Mergers and acquisitions among financial firms during this time period are common. I track all relevant mergers for this analysis, and any acquired firm is treated as its acquirer as of the effective date of acquisition. Acquirers inherit the relationships of their targets, and relationship variables reflect this algorithm. A list of all relevant mergers and their effective dates is included in a data appendix available upon request.

3.3.2 Empirical Strategy

[5] The total SDC database on non-convertible debt issues by U.S. firms includes 10782 issues representing $1.6 trillion.

The main difference in debt underwriting markets today and in the early 1990s is that financial firms are now able to jointly provide lending and debt underwriting services. My empirical strategy exploits the exogenous removal of legal restrictions to estimate the within-firm change in yield spreads and underwriting fees due to the joint production of lending and debt underwriting services. The ideal setting is as follows: suppose financial firms were legally disallowed from lending and underwriting to the same firm before 1996. Between 1996 and 1999, financial firms were allowed to underwrite and lend to firms in category *x*, but not for firms in category *y*. Finally, after 1999, financial institutions were allowed to underwrite and lend to firms in both categories *x* and *y*. If every firm in category *x* hires the same bank for underwriting and private lending services in 1996, and every firm in category *y* does in 1999, then one can easily estimate the within-firm effect of joint production on underwriting fees or yield spreads through the following equation:

$$Spread_{ij} = \alpha_i + \alpha_t + lend_{ij}\beta + X'_{ij}\Gamma + \varepsilon_{ij} \qquad (1)$$

The variable *lend* takes on the value 1 if a financial institution with which issuing firm *i* has a recent lending relationship underwrites issue *j* (and 0 otherwise). In the ideal framework, *lend* takes on the value 1 for all firms in category *x* post 1996 and in category *x* and *y* post 1999. The coefficient β then represents the within-firm effect of joint production on *Spread*, where the different times of deregulation for categories *x* and *y* allow me to distinguish β from the year indicator variables (α_t).

Although the empirical setting of deregulation does not perfectly replicate (1), it represents a good approximation. Prior to 1996, the joint production of lending and debt underwriting is rare. As Figure 2 shows, prior to 1994, less than 5 percent of debt issues in the sample are underwritten by financial institutions with which the issuing firm has a recent lending relationship. The number does jump slightly in 1995 and 1996, but the percentage of issues underwritten by lending institutions is still very low compared to the post 1999 period. In 1996, the limits on commercial bank underwriting activity were eased, and as a result, the percentage of debt issues by lending institutions increases to almost 35 percent by 1999. Post 1999, the number increases to almost 80 percent by the end of the sample. While

commercial banks may target specific firms at different points in time in the sample, the fixed effects strategy eliminates the firm specific error that drives endogenous selection. In other words, the control group in all regressions is the *same firm* before it hires a lending commercial bank as its underwriter. Given that almost all firms eventually hire a financial institution with which they have a recent lending relationship, identification of key parameters comes from within-firm changes. I am able to distinguish this effect from the year indicator variables given that firms hire a recent lender as an underwriter at different points in time.

Table 3 offers a detailed glance at how deregulation leads to joint production in the sample over time. From 1990 to 1992, only 4 out of the 259 firms issuing debt securities hire an underwriter with which they have a recent lending relationship. The firms that hire a private lender as underwriter are much larger and have much higher book leverage ratios in this early time period. From 1993 to 1996, the number increases to 49 out of 345. After the implementation of the FSMA in 1999, 75 percent of firms have securities underwritten by a recent lender. In 2003 alone, 85 percent of firms have securities underwritten by a recent lender. By the end of the sample, firms hiring lending institutions to underwrite their securities appear similar to firms not hiring lending institutions based on observable characteristics.

The third row of Table 3 shows the fraction of firms that hire a recent lender as an underwriter out of the sample of firms that COULD HAVE hired a recent lender. In other words, this is the sample of firms that recently loaned from a potential commercial bank underwriter. Before the revenue restriction was lifted in 1996, firms with recent lending relationships with a commercial bank legally able to underwrite rarely actually hired the underwriter. This suggests that revenue restrictions limited the ability of commercial banks to underwrite. After the Financial Services Modernization Act, 93 percent of firms that COULD HAVE hired a recent lender actually did. This response is the variation I exploit to estimate the change in underwriting fees, yield spreads, and syndicate structure.

Table 4 presents lead manager choice probit regressions to demonstrate how deregulation has altered the choice of lead manager.[6] In these probit specifications, the choice set of lead managers includes all lead mangers with at least 1 percent market share in the year of the issue, and the dependent variable takes on the value 1 if a given lead manager is chosen. This table demonstrates how previous lending relationships have become a more important determinant of underwriter choice. Between 1990 and 1992, a previous debt underwriting relationship and the reputation of the lead manager in underwriting markets are extremely strong in determining which lead manager is chosen (marginal effect is almost 20 percent). The existence of a lending relationship between the issuing firm and the potential lead manager has no statistically significant effect in this early period. The existence of a lending relationship increases in importance through the sample period. By the 2000-2003 period, previous lending relationships are almost as important in lead manager choice as previous underwriting relationships. In other words, when financial institutions *are legally able* to hire the same firm for both private lending and underwriting services, firms *do in fact* hire the same financial institution to do both.

I estimate a fixed effects regression that seeks to exploit the change in regulatory environment. Formally, the exact form of equations I estimate is:

$$Fee_{ij}, Spread_{ij} = \alpha_i + \alpha_t + Lend_{ij}\beta + X'_{ij}\Gamma + \varepsilon_{ij} \qquad (2)$$

where *Lend* takes on the value 1 if the lead manager on an issue has a recent loan to the issuing firm. *Lend* is restricted by law to be 0 for most firms before 1996, and then takes on the value 1 as firms hire a lead manager with which they have recent lending relationships. The parameter α_i is estimated explicitly, which means that β can be interpreted as the within-firm change in *Fee, Spread* that is due to the fact that the firm hires the same financial firm to jointly provide debt underwriting and lending.

One concern with the equation estimated in (2) is that some firms did not choose some banks, and these fees are unobserved. As Yasuda (2005) notes, the unobserved fees at financial firms not chosen are

[6] I use a simple probit model instead of a multinomial choice logit model because more than 1 lead manager can be chosen on a given deal. Amemiya (1974) shows that the proper maximum likelihood technique in such a situation is to estimate a probit for each lead manager, and allow errors to be correlated within each choice group. See Sufi (2005) and Corwin and Schultz (2005) for examples.

likely higher than the observed fee. This point urges caution in interpretation of the results. I am not testing whether the underwriting fee charged by the *selected* underwriter is lower than the (unobserved) underwriting fees that would have been charged by *other* underwriters *on the same issue*. It is likely that this is also true, given that the underwriting fee enters the choice function negatively. My empirical strategy tests whether the fee charged to a given firm by the *selected* underwriter after deregulation is lower than the fee charged to the same firm by the *selected* underwriter before deregulation. The fixed effects strategy produces an unbiased estimator of this change in fees. It is possible that comparing fees before and after deregulation overstates the welfare gains to firms if, for example, firms hire less qualified underwriters for cheaper fees. The yield spread regressions presented below show that lending commercial bank underwriters obtain yield spreads no higher (or lower) than investment banks, which suggests that they are no less qualified. Also, I explicitly control for underwriter reputation in all regressions; if underwriter reputation is positively correlated with fees, my regression strategy partials out the effect.

3.3.3 Fixed effects versus cross-section estimates

A key contribution of this chapter is that estimation of key parameters comes from within-firm variation over time in the ability, by law, of financial institutions to underwrite debt securities for firms with which they have a lending relationship. The previous literature estimates key parameters from between firm variation in hiring a recent lender to underwrite an issue at a given point in time. More specifically, the specification estimated in the previous literature is:

$$Spread_{ij} = \alpha_t + Lend_{ij}\beta + X'_{ij}\Gamma + \alpha_i + \varepsilon_{ij} \qquad (3)$$

The firm-specific error term that does not vary across time, α_i, is not estimated explicitly and is assumed to be part of the error term. An unbiased and consistent estimate of β is possible only if:

$$E[\alpha_i + \varepsilon_{ij} \mid Lend_{ij}, X_{ij}] = 0 \qquad (4)$$

This equation does not hold if the firm-specific error term, α_i, is correlated with the fact that a firm has an issue underwritten by a recent lender. If there are unobservable firm quality characteristics correlated

with the choice of commercial bank underwriter, these quality measures will be captured by α_i and condition (4) will not hold. In other words, condition (4) will not hold if commercial banks target firms based on unobservable quality; estimates of β will be biased and inconsistent. The story is quite simple: in a cross-section analysis in which commercial banks are legally restricted from widespread underwriting, they target precisely the firms that are higher quality. Higher quality issues obtain lower yield spreads and underwriting fees, and the econometrician falsely ascribes the lower yield spreads and underwriting fees to the fact that the commercial bank underwrites the issue. Indeed, if equation (4) holds and one finds that $\beta < 0$ then standard arbitrage behavior contradicts the existence of a control group; if two firms are identical and $\beta < 0$, then why does any firm not hire a lending financial institution to underwrite issues?

Fixed effects estimation requires a much weaker condition. More specifically, fixed effects estimation requires only that:

$$E[\varepsilon_{ij} \mid Lend_{ij}, X_{ij}] = 0 \qquad (5)$$

Equation (5) holds true as long as lending financial institutions don't have private information on one of a given firm's issues *as opposed to a different issue by the same firm.* In other words, equation (5) holds true as long as commercial banks do not "cherry-pick" high quality issues *within* a given firm. I do several robustness checks to demonstrate that this is not what is taking place.

Cross-section analyses are important in understanding how different firms may be affected by deregulation. For example, a cross section analysis before deregulation might show that large firms are charged lower fees than small firms. A cross section analysis after deregulation might show that this discrepancy has diminished. However, a fixed effects strategy that isolates within-firm variation before and after deregulation more accurately estimates the desired effect on firms from regulatory policy.

Finally, in all specifications, estimated standard errors are heteroskedasticity robust, and clustered at the firm level.

3.4 Results: Underwriting Fees and Yield Spreads

3.4.1 Underwriting Fees

This section presents evidence that borrowing firms face lower fees in the aftermath of deregulation, and that lower fees are a result of commercial banks jointly producing loans and debt underwriting services. Underwriting fees are a function of the underlying risk of the security and the costs of issuance. The exact specification of equations estimated in this section is:

$$Fee_{ij} = \alpha_i + \alpha_t + Lend_{ij}\beta + IssueVars_{ij}\Gamma_1 + FirmVars_{ij}\Gamma_2 + \varepsilon_{ij} \quad (6)$$

where Fee_{ij} is the underwriting fee on issue j by firm i. All specifications include firm fixed effects and a year indicator variable for each year (α_t). The key variable of interest, *Lend*, is an indicator variable taking on the value 1 if the firm hires an underwriter with which it has a recent lending relationship, defined both in terms of a loan in the past year, or a loan 1 to 2 years ago.

IssueVars are control variables that are specific to each issue. They include the following variables:

(a) *Moody's Credit Rating Indicator Variables*: lower credit rated issues could possibly have higher expenses given increased research costs and increased risk by the managers who must underwrite and market the lower rated issues.

(b) *Natural Log of Maturity of the Loan, in years:* Longer maturity debt instruments are less desirable given increased default and interest rate risk. Underwriters bear this risk partially, and so expenses are likely to increase.

(c) *The Amount of the Issue*: Following Altinkilic and Hansen (2000) I allow for a fixed component of the amount of the issue (1/amount) and a variable component (amount/book value of assets). The evidence presented there suggests a U shaped cost curve, with high fixed costs and increasing variable costs of issuance.

(d) *Secured and Callable Indicators*: Secured securities may increase or decrease the expenses based on required expertise or lower risk of issuance. Callable issues are riskier due to prepayment risk and so are likely associated with higher fees.

(e) *Number of syndicate members*: The number of syndicate members could increase expenses due to fixed costs per syndicate member. It could also decrease the total underwriting fee if more syndicates mean less risk per syndicate. As I show below, the average number of lead managers changes sharply through the sample; I include the number of syndicates in all regressions but remain agnostic on its effect.

(f) *Underwriter reputation and previous lead underwriter*: Underwriter reputation, measured as the market share of the underwriter in the previous year, can affect fees if reputable underwriters certify issues at lower cost, or if reputable underwriters extract surplus through fees for lower yield spreads. A previous lead underwriter is an underwriter that has underwritten a security for the same firm in the two years prior to the issue in question. Repeated interactions likely reduce risk and issuance costs.

FirmVars includes standard measures from Compustat of profitability (Income to Assets ratio, or *data18* divided by *data6*), size (natural log of total assets, or *data6*), and risk of the firm (book leverage, or *data9* + *data34*, all divided by *data6*). All Compustat measures for a given firm are for the fiscal year prior to the issue to avoid mechanical endogeneity.

Table 5, Panel A reports the results. Column (1) estimates the specification in equation (6) with only rating controls. The estimate implies that a firm that hires a commercial bank underwriter with which it has a lending relationship within the past year faces a underwriting fee that is 0.07 lower than when the same firm does not hire a recent lender. Columns (2) through (4) add control variables incrementally. Column (4) is the full specification. It shows that firms that hire recent lenders enjoy a 0.08 lower underwriting fee, which is about 10 percent evaluated at the mean. This result is significant at the 1 percent level, even after adjusting standard errors. Column (4) also indicates that higher maturity issues have higher fees and that the fixed cost component of the underwriting fee is more important than the variable cost. Secured debt issues have lower underwriting fees whereas callable securities have higher fees. Finally, while the number of lead arrangers does not influence the underwriting fee, a larger number of co-managers leads to higher fees. In the next section I show that more co-managers lead to lower yield spreads, which suggests firms pay higher fees to get larger market coverage and lower yield

spreads. The firm characteristics all have the expected signs, but are not statistically significant at the 5 percent level or below. This is not surprising, given that these are fixed effect specifications and these variables have limited variation within a given firm.

As noted above, investment banks, to a lesser degree, also jointly produce lending and debt underwriting services. Column (5) allows *Lend* to be 1 if the borrowing firm has a lending relationship with any underwriter, not just if the underwriter is a commercial bank. The strength of the coefficient is diminished, which suggests that investment banks do not offer the same price discounts when jointly providing debt underwriting services and lending.

Table 5, Panel B splits the firms into groups based on beginning of period characteristics. I rank all firms based on assets in the initial sample period (1990 for almost all firms) and split the sample into large firms (top half) and small firms (bottom half). I also split the sample based on initial sample period credit rating (*data280* in Compustat). Firms with an initial S&P long term credit rating of BBB or higher are considered investment grade and those below BBB are considered high yield. Table 5, Panel B shows that the main results are even stronger among large firms and investment grade firms. The strongest result suggests that investment grade firms receive a 12 percent discount at the mean (0.09/0.76) when a lending commercial bank underwrites a debt issue. The coefficient estimates for recent lending relationships are almost identical for small firms and high yield firms, but the standard errors increase enough to overrule statistical significance. However, I use caution in interpreting these results, because the sample size for small firms and high yield firms is substantially smaller, which is the primary reason the standard errors are larger. The estimates for small versus large firms and high yield versus investment grade firms are not statistically distinct.

Table 5, Panel C provides robustness checks. Column (1) addresses the concern that commercial banks with lending relationships with firms offer only a one time discount to "capture" underwriting business which is followed by higher fees. I split the CB lending relationship indicator variable into two separate variables based on the timing of the initial issue underwritten by a lending commercial bank. The variable *First year CB lending relationship* takes on the value 1 if it is the first year for a given firm

that any commercial bank with which the firm has a lending relationship underwrites a debt issue. *After first year CB lending relationship* takes on the value 1 if it is after the first year in which any commercial bank with a recent lending relationship with a given firm underwrites a debt issue. Column 1 shows that the initial effect is stronger, but the effect remains significant at the 10 percent level after the initial year in which a lending commercial bank underwrite an issue. In other words, firms enjoy lower fees by joint producers even after they initially hire them as debt underwriters. Column (2) evaluates only firms that at some point hired a commercial bank with which they had a recent lending relationship. The result is slightly weaker, but still significant at the 5 percent level.

Columns (3) and (4) split the sample based on when firms first hired a commercial bank underwriter with which they had a recent lending relationship. Column (3) estimates the core specification on the 49 firms that initially hire a commercial bank lender as underwriter in 1996 or before, and column (4) estimates the specification only on the 206 firms that initially hire a commercial bank underwriter in 1997 or after. The results show a slightly stronger effect among the later group, but the results are not statistically different from each other. Columns (5) and (6) address the concern that commercial banks with lending relationships "cherry-pick" the best firm-issues which drives the result that they charge lower fees. Column (5) follows all firms up to and through the first year that firms hire a recent commercial bank lender as underwriter. Column (6) then follows firms in years after they hire a recent commercial bank lender as underwriter. In other words, the identification in Column (5) is driven by the first time a commercial bank jointly produces a loan and underwrites an issue for a given firm. Implicitly, Column (5) is capturing the effect of the relaxation of regulatory restrictions. The results are driven by the initial year in which a lending commercial bank underwrites an issue, with an estimated coefficient of -0.10, or a 13 percent discount at the mean. The results are weaker in years after the initial year. Column (5) provides evidence that it is the initial commercial bank entry into underwriting, driven by relaxation of regulatory restrictions, driving the key results on underwriting fees.

3.4.2 Yield Spreads

This section addresses the question, do commercial banks with recent lending relationships obtain lower yield spreads for debt issues? The exact form of equations estimated in this section is:

$$Spread_{ij} = \alpha_i + \alpha_t + Lend_{ij}\beta + IssueVars_{ij}\Gamma_1 + FirmVars_{ij}\Gamma_2 + \varepsilon_{ij} \qquad (7)$$

The coefficient of interest is β, which measures the within-firm effect on the yield spread from having a recently lending commercial bank underwrite a debt issue. The issue and firm control variables are identical to the specification in (6), with the exception that I control for the size the loan using the natural log of the total amount of the loan in the yield spread regressions.

Table 6 provides evidence that cross-section estimates of the effect of a commercial bank underwriter on yield spreads are biased and inconsistent. In order to replicate the previous literature as close as possible, I use the full sample of debt issues from 1993-1997, and I exclude firms with a 1-digit SIC code of 4. I use only debt issues by firms with at least 2 issues in the sample in order to directly compare the OLS and fixed effects results. I also use controls similar in the previous literature. Column (1) reports an OLS specification that most closely follows the previous literature. No firm fixed effects are included, and errors are not clustered. Column (1) indicates that commercial banks obtain a yield spread that is 7 points lower, and this difference is significant at the 10 percent level.[7] Column (2) shows that the OLS result is not robust when the sample is expanded to all years, which is consistent with the work by Roten and Mullineaux (2002). More importantly, columns (3) and (4) show that the result is not robust to a fixed effects specification. A Hausman test comparing columns (1) and (3) or columns (2) and (4) rejects the null hypothesis that pooled OLS regressions yield consistent estimators. The conclusion from the Hausman test is that estimates in the OLS specification are biased and inconsistent. This suggests that results estimated from a cross section of issues should be viewed with caution and that only fixed effects estimates of parameter values are consistent.[8]

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[7] This estimate is almost exactly the same as the one reported by Naranyan, Rangan, and Rangan (2003).

[8] The Hausman test works under the assumption that the firm-issue specific error term (ε) is orthogonal to right-hand side variables. Under this assumption, the test compares a consistent estimator (fixed effects) and a possibly inconsistent estimator (OLS) to test the assumption that the firm-specific error term (α) is orthogonal to the right hand side variables.

It is important to note that not all coefficients change when I add fixed effects. The coefficient estimates for maturity, call status, shelf registration, and rating dummies are all similar in the fixed effects estimation. This provides evidence that the commercial bank indicator variable is correlated with the unobservable firm-specific error term; the effect is not just due to reduced power.

Table 7 estimates equations on the sample described in Section 3 and provides further evidence that commercial bank underwriters with recent lending relationships do not obtain lower or higher spreads in public markets. Column (1) includes only basic controls, and the coefficient on a recent CB lending relationship with the underwriter is basically 0. Column 2 includes all controls; the point estimate on recent lending relationship is negative, but it is neither statistically nor economically significant. The signs on controls follow predicted patterns. Lower rated issues have much higher yield spreads, as do long maturity issues and callable securities. Secured issues have lower spreads, which reflects the higher value of secured issues in states of default. A larger number of co-managers is associated with a decrease in the yield spread, which is possibly due to a wider market acceptance. Firms obtain lower yields when they are more profitable or less levered. Column (3) tests whether commercial banks affect yield spreads independent of previous lending relationships. Again, the coefficient is not statistically distinguishable from 0. Finally, columns 4 and 5 split the sample into large and small firms and find no effect of recent lending relationships with the lead manager in either sub-sample. The same is true if I split the sample into high yield and investment grade issues (not reported).

The evidence in Table 7 contrasts directly with the finding in the previous literature that commercial banks, with or without lending relationships with issuers, obtain lower yield spreads in debt markets. I provide evidence that findings in the previous literature are attributable to bias in coefficients induced by unobservable firm characteristics. The evidence suggests that commercial banks targeted higher quality firms (based on unobservable characteristics) in the early period, which explains why the yield spreads appear lower.

3.5 Capture Probabilities and Syndicate Structure

The evidence presented above suggests that commercial bank underwriters with lending relationships do not unfairly tie products and charge higher fees. This section seeks to further explore whether or not firms are more locked in to underwriters that also provide lending to the firm. The main statistic used in this section is the *capture probability*. The capture probability on a given issue represents the *ex-post realized* probability that the next issue by a given firm is underwritten by the same lead manager. It is a measure of how locked in the firm is to a given underwriter. Capture probabilities are motivated by models in which information asymmetry problems between a firm and *other potential* lead managers prevent the firm from breaking out of a relationship with the existing lead manager.[9] In the model by Rajan (1992), financial institutions expropriate firm project profits given this position of power over the firm.

As a caveat, capture probabilities may measure more than simple lock-in. If one lead manager focuses in the area of a given firm, the firm may choose to repeatedly hire the same lead manager. Also, repeated interactions with the same firm likely result in lower costs of underwriting. If some of the surplus is passed to the firm through lower fees, then capture probabilities might be high even though there is no expropriation of firm profits. With these caveats in mind, if capture probabilities increase sharply when a borrowing firm hires a lending institution, there is a need for further analysis to see if financial institutions are indeed using information advantages over the firm to capture future business.

For the data analysis in this section, I consider only debt issues by firms that have at least one future debt issue in the sample. This is necessary to obtain the *ex-post* capture probability. In addition, if more than one lead manager is present on an issue, I treat each lead manager separately and calculate a capture probability for each lead manager. The final sample in this section includes 3,779 debt issues and 4,406 lead managers (out of the original sample of 4,553 issues by 5,595 lead managers). As a robustness check, I also calculate the capture probability using the probability that a firm hires a given underwriter on its next 2 or 3 issues. All results are almost identical.

[9] The classic example of such a model is Rajan (1992) in which commercial banks use their information advantage over the firm to extract rents from profitable projects.

Table 8 presents cell means of the capture probability for different groups across time. The probability that a firm hires the same lead manager on its next issue is 40 percent and appears quite steady through the sample period (although there is a slight upturn in 1997 to 1999). High yield firms have higher capture probabilities than investment grade firms, and small firms have higher capture probabilities than large firms. These differences are statistically significant at the 5 percent level, and provide some support to the view that capture probabilities represent information advantages over firms. In the overall sample, debt issues underwritten by commercial banks are not associated with higher capture probabilities. The same is true for debt issues underwritten by a lead manager with which the borrowing firm has a recent lending relationship (past 2 years). For the total sample, commercial bank lead managers with recent loans to the issuing firm have a 38.5 percent probability of being selected on the next issue, compared to 39.2 percent for other firms. The trends in capture probabilities across time exhibit interesting variation. Between 1990 and 1996, commercial banks appear to have some success in capturing future business, especially if they have concurrent lending relationships with firms (45 percent versus 37 percent). However, by the late period, the trend is reversed. Capture probabilities from 2000 to 2003 are actually lower when the lead manager is a commercial bank with which the firm has a recent lending relationship (35 percent versus 39 percent).

Commercial bank underwriters with recent lending relationships appear no more likely to capture future business of a given firm than other underwriters. Figure 3 offers preliminary evidence to explain this fact. Figure 3 graphs the percentage of issues with more than one lead manager, and shows a sharp trend upward that moves almost in tandem with the percentage of issues underwritten by commercial banks with recent lending relationships. Before deregulation in 1996, the presence of more than 1 lead manager on an issue is extremely rare. After deregulation, it becomes the norm. Figure 3 provides evidence that borrowing firms are not replacing investment banks with commercial banks, but are simply adding them as lead managers. From 2000 to 2003, of the 459 lead managers on issues with only one lead manager, 180 have a lending relationship with the firm in the past 2 years (39 percent). Of the 1355 lead managers on the 588 issues with more than one lead manager, 841 of the lead managers have a recent

lending relationship with the issuing firm (62 percent). In other words, the evidence suggests that when previous lending relationships are present, the firm is much more likely to hire more than one lead manager.

The last 4 rows of Table 8 show the effect of such behavior on capture probabilities. In the overall sample, commercial bank underwriters with recent lending relationships are much more likely to capture the future business of the firm if the commercial bank is the only lead manager (45 percent). When commercial banks share the lead managing issues, the capture probability drops sharply (35 percent). This is driven almost entirely by the period after 1999, when firms begin hiring more than one lead manager. When the underwriter is not a commercial bank recent lender, the capture probabilities do not appear to vary with the number of lead managers. The results suggest that firms reduce the ability of commercial banks to lock-in future business by hiring more than one lead manager.

Table 8 and Figure 3 offer evidence that commercial bank underwriters with recent lending relationships are no more likely to capture future business AND are much more likely to be on issues with more than 1 lead manager. To more rigorously test these findings, I estimate the following fixed effects regression:

$$Captured_{ij} = \alpha_i + \alpha_t + Lend_{ij}\beta + Days_{ij}\gamma_1 + Share_{ij}\gamma_2 + X_{ij}\Gamma + \varepsilon_{ij} \qquad (7)$$

Captured is an indicator variable taking on the value 1 if the lead manager on issue *j* for firm *i* is a lead manager for issue *j+1* for firm *i*. *Days* is the natural logarithm of the number of days between the issue *j* and issue *j+1*. I employ this as a control under the assumption that the same lead manager is more likely to be chosen if the issues are closer together in time. I estimate a linear probability specification instead of maximum likelihood for two reasons. First, fixed effects estimation in a maximum likelihood setting has a variety of econometric problems. The fixed effect for each group is treated as an independent parameter to be estimated in maximum likelihood estimation; adding groups therefore adds parameters to be estimated, and consistency bounds are much harder to obtain in medium sized samples. Second, the

mean of the left hand side variable is 0.40, which suggests that maximum likelihood estimation using probit or logit specifications will likely yield similar results, an assumption that I confirm in the results.[10]

Table 9 presents the estimates. Column 1 and 2 confirm that commercial bank underwriters with recent lending relationships are not more likely to capture future business. The only control variable coefficient estimate that is significant at the 5 percent level is underwriter reputation suggesting that reputable underwriters are more likely to capture the future business of a borrowing firm. Column (3) shows that a larger number of lead managers reduces the probability that any one of the lead managers is chosen on the next debt issue for the same firm. The coefficient on previous lending relationships between the underwriter and issuer increases slightly when including the number of lead managers. The point estimate offers weak evidence (statistically significant at the 12 percent level) that, after controlling for the number of lead managers, commercial bank underwriters with recent lending relationships are more successful at retaining future business. Columns (4) and (5) include the OLS pooled estimates and the maximum likelihood probit specification for completeness. The results in the cross-section are similar.

The evidence suggests that firms hire more than one lead manager when lending relationships are present in order to reduce the lock in effect on future business. There are important alternative interpretations of the evidence. First, commercial bank lenders might be forcing their clients to add them to underwriting syndicates as lead managers for higher fees. The evidence presented in Section 3 provides evidence against this interpretation. Commercial bank lenders reduce overall fees and the number of lead managers does not increase fees. If lenders are "forcing" their way onto syndicates, it appears to help, not hurt, the firm. A second interpretation comes from Narayanan, Rangan, and Rangan (2004). Commercial banks with outstanding loans to a firm face a potential conflict of interest that could lead to misinformation when selling public securities. Using seasoned equity offerings from 1994 to

[10] Drucker and Puri (2003) estimate a nested logit model in which firms first decide whether or not to issue a seasoned equity offering, and then decide whether or not to hire the same lead manager. I use the linear model as opposed to a nested logit for two reasons. First, more than one lead manager can be chosen on a given deal. Second, almost all surviving firms continue to issue debt securities until the end of the sample period or until the firm ceases to exist. Firms trivially "decide" not to issue new securities because the sample period ends.

1997, the authors show that lending banks commit against opportunistic behavior by co-managing issues with reputable investment banks. In both interpretations, lending commercial bank underwriters are more likely to pair up with other lead managers. In my interpretation, the firm desires such an arrangement to prevent lock in by the lending commercial bank. In the interpretation of Narayanan, Rangan, and Rangan (2004), co-managing is the choice of the commercial bank. An obvious difference is that the authors examine equity markets instead of debt markets; both interpretations could hold in their respective markets and both could be partly true in both markets.

One way to distinguish between these stories is to examine whether *other* lead managers have lending relationships with the firm. The interpretation by Narayanan, Rangan, and Rangan (2004) implies that the *other* lead managers *do not* have lending relationships with the firm. If the other lead managers also have lending relationships, then they also cannot commit against opportunistic behavior. From 2000 to 2003, there are 434 debt issues with exactly 2 lead managers. Of these 434 debt issues, the issuing firm has a lending relationship in the past 2 years with *both* lead managers on 204 of the issues (or about 47 percent). Of the 120 debt issues with exactly 3 lead managers, the issuing firm has a recent lending relationship with all 3 lead managers on 50 of the issues (42 percent).

In debt markets, the evidence suggests that firms place more lead managers on issues when lending relationships are present for reasons other than those described by Narayanan, Rangan, and Rangan (2004) in equity markets. The evidence presented here suggests that underwriters add lead managers to prevent any one lending commercial bank from gaining too much power over the firm. A further exploration of this trend is matter for future research.

3.6 Conclusion and Future Work

Regulatory policy has induced a major change in debt underwriting markets. Firms now are able to hire the same financial firm to jointly provide private lending and debt underwriting services. The joint production of lending and debt underwriting services is now common, with almost 80 percent of issues underwritten by a lending financial institution by 2003. The predicted cost effects for issuing firms are ambiguous; lending financial institutions could use information scope economies to more cheaply

underwrite securities and pass savings on to the issuing firm. On the other hand, lending firms could gain significant market share and exploit information asymmetries between the issuing firm and other financial institutions to expropriate firm profits. Lending commercial banks may obtain lower yield spreads given their ability to better certify public issues. On the other hand, commercial banks could use private information on the firm to systematically fool public investors. Investors, predicting such behavior, may demand higher yield spreads on the firm's securities.

My analysis shows that commercial banks with recent lending relationships offer issuing firms an average fee discount of 10 to 15 percent relative to the underwriting fees charged before deregulation. This estimate is a result of within-firm variation driven by exogenous relaxation of regulatory restrictions. The strongest result suggests a cost savings of up to $200,000 per debt issue for investment grade firms. Lower fees are not a one-time discount to capture business; fees are lower on the initial issue underwritten by a lending commercial bank and stay lower in the years afterward. Issuing firms appear to use syndicate structure to prevent any one financial institution from gaining too much power over the firm. More specifically, firms hire more lead managers on debt issues when lending relationships are present. In doing so, firms are able to reduce the lock-in effect of hiring the same financial firm to produce both lending and debt underwriting services. The average number of lead managers has increased sharply after the 1997 and 1999 relaxation of restrictions on commercial bank underwriting activity, which is consistent with this interpretation.

The findings of this chapter suggest that lending commercial bank underwriters obtain yield spreads that are no different than investment banks. This finding is in contrast to the previous literature, and I explain the difference by showing that cross-section estimates of bank entry on yield spreads are biased and inconsistent. An important contribution of this chapter is therefore a methodological one; fixed effects estimates that isolate within-firm variation produce more reliable estimates of the effect of commercial bank entry on spreads and fees given the likely presence of important unobservable firm characteristics.

For future research, a more comprehensive examination of syndicate structure is warranted by the findings of this chapter. My findings on the evolution of syndicate structure are an important initial step to influence future research. Syndicate structure in debt underwriting markets has significantly changed in the since 1997, as the average number of lead managers per issue has more than doubled. I offer an interpretation of this evidence based on firms attempting to reduce the ability of financial institutions to lock in future business. This interpretation is supported by the data, but future work is needed to more fully evaluate this trend.

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Figure 1
Commercial Bank Entry into Debt Underwriting

Notes: An underwriter is a commercial bank if its parent is a U.S. based financial institution filing a Y-9C report with the Federal Reserve, or if its parent is a foreign international firm with an SIC code of 6020 or 6029. A Federal Reserve regulated commercial bank underwriter is a Section 20 subsidiary of a commercial bank.

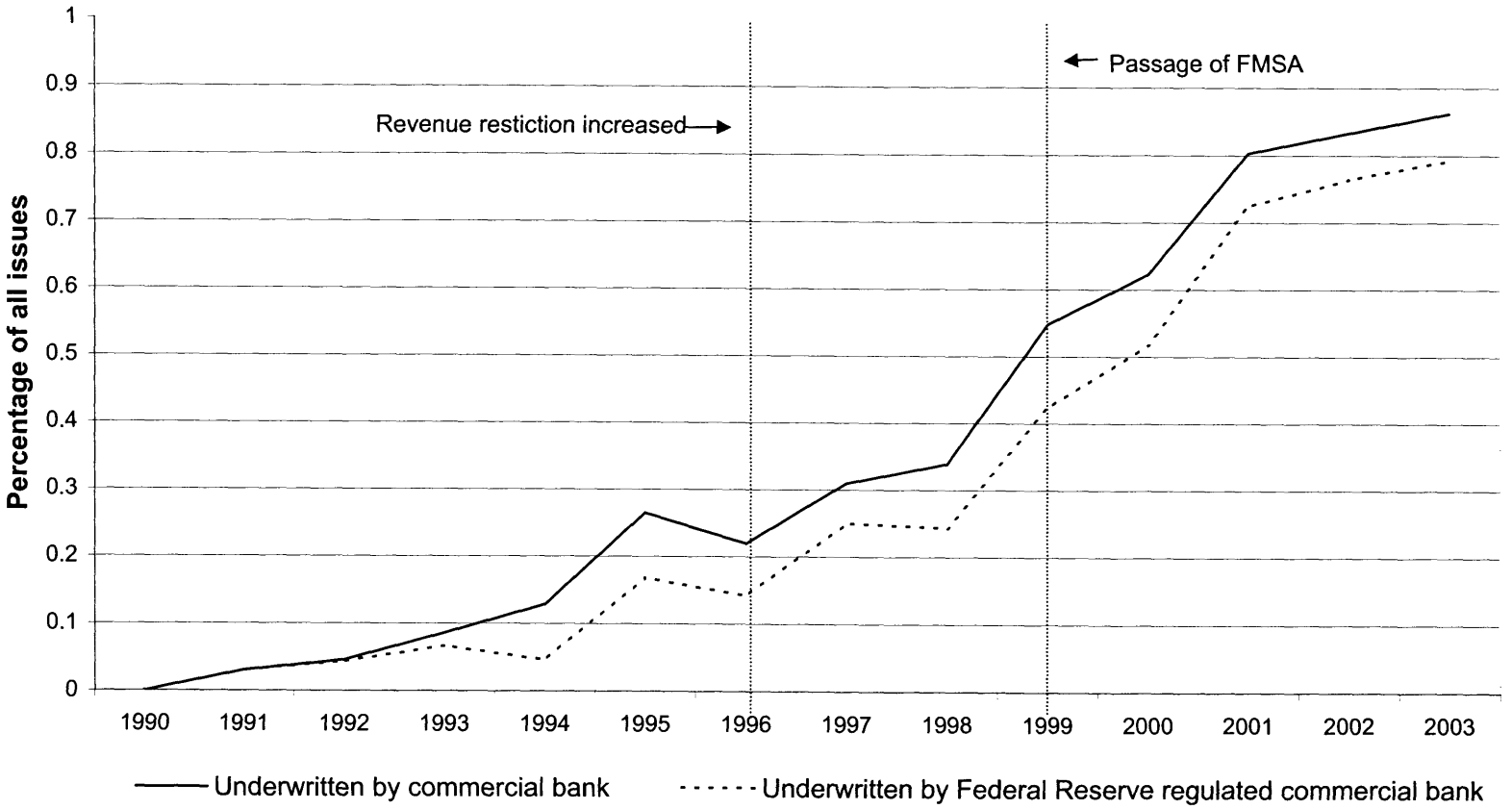

Figure 2
Joint Production of Private Lending and Debt Underwriting Services

Notes: A recent loan is a loan in the past 2 years with the underwriter of a debt issue. An underwriter is a commercial bank if its parent is a U.S. based financial institution filing a Y-9C report with the Federal Reserve, or if its parent is a foreign international firm with an SIC code of 6020 or 6029. A Federal Reserve regulated commercial bank underwriter is a Section 20 subsidiary of a commercial bank.

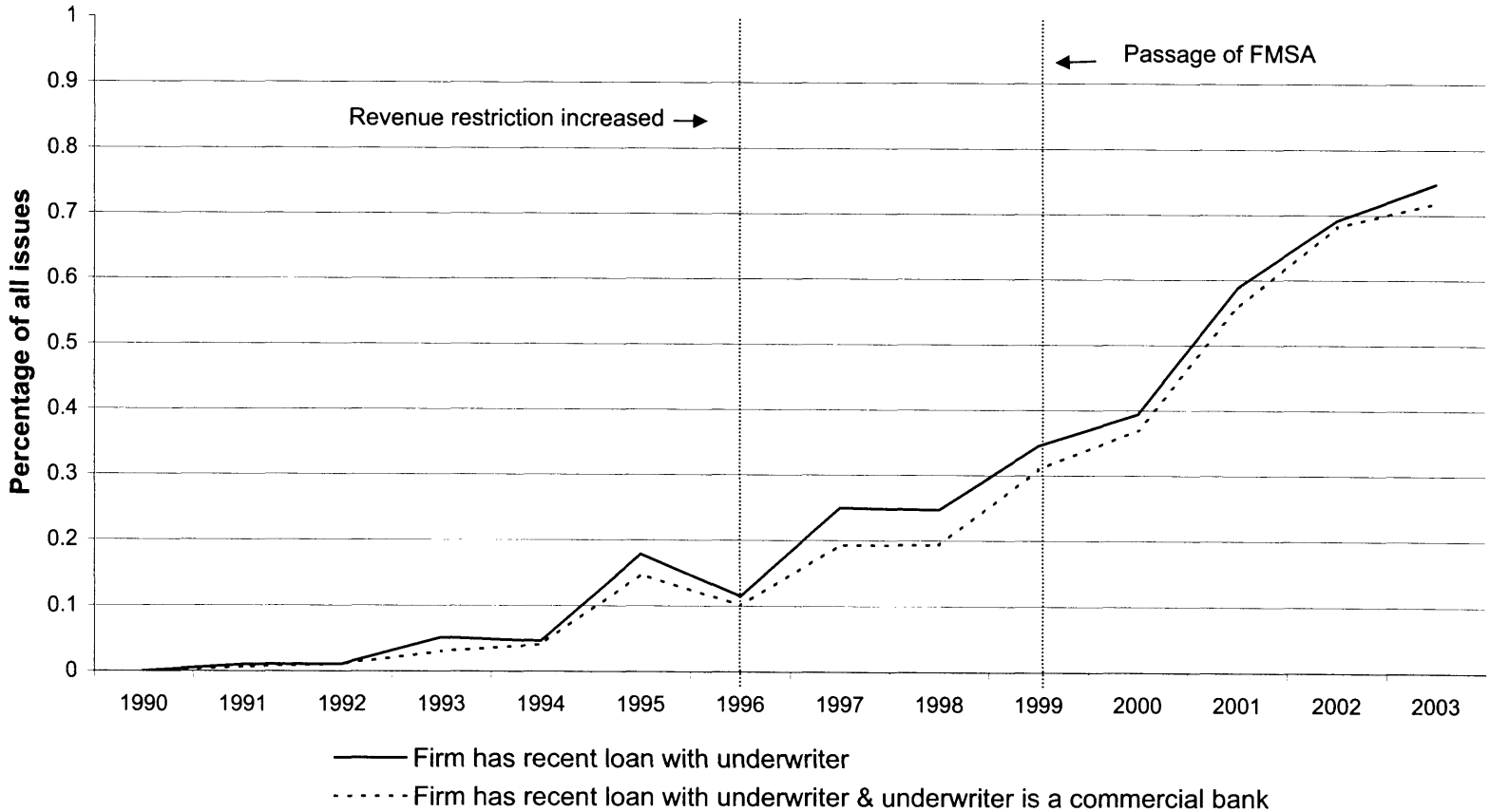

Figure 3
Recent Loans and Number of Lead Managers

Notes: This figure displays the increase in the number of issues with more than one lead manager, and demonstrates that this increase is driven by issues where the firm has a lending relationship with one of the lead managers.

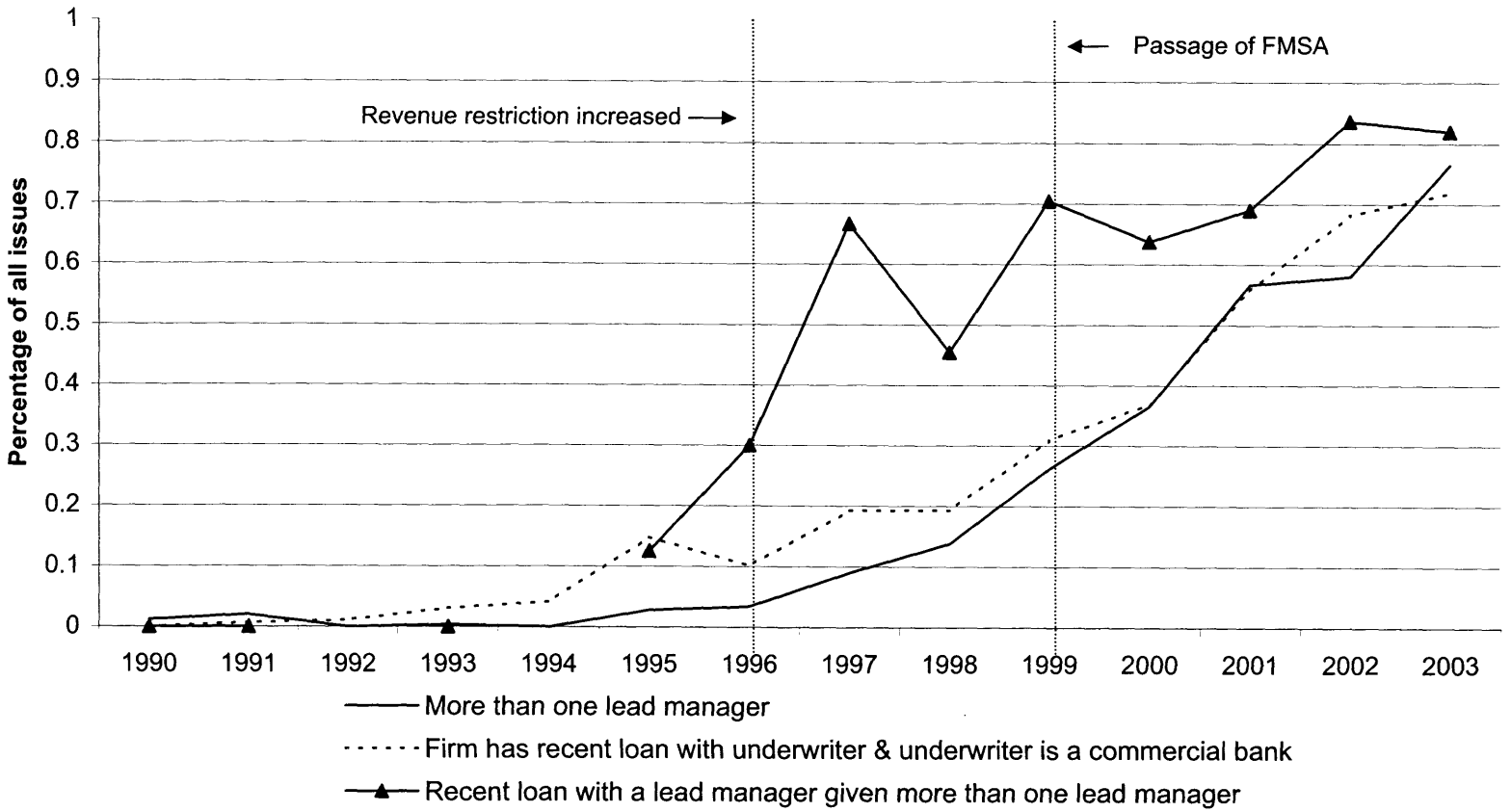

Table 1
Top Lead Managers in Debt Underwriting Markets

This table lists the top 5 lead underwriters, by market share of amount underwritten, for four different years of the sample. If more than one lead manager is present on an issue, the total amount is divided evenly among the lead managers. An underwriter is considered a commercial bank (CB) if its parent is either a U.S. financial firm filing a Y9C with the Federal Reserve or a foreign financial firm with an SIC code of 6020 or 6029.

1990

Rank	Name	Market Share	CB?	Top 5 Mkt Share	Herfindahl
1	Morgan Stanley	0.19		0.85	1509
2	Salomon Brothers	0.18			
3	Goldman Sachs	0.18			
4	Merrill Lynch	0.18			
5	First Boston Corp	0.12			

1996

Rank	Name	Market Share	CB?	Top 5 Mkt Share	Herfindahl
1	Goldman Sachs	0.21		0.64	1069
2	Morgan Stanley	0.12			
3	Salomon Brothers	0.12			
4	Merrill Lynch	0.11			
5	JP Morgan	0.08	Y		

1999

Rank	Name	Market Share	CB?	Top 5 Mkt Share	Herfindahl
1	Citigroup	0.17	Y	0.70	1131
2	Goldman Sachs	0.16			
3	Morgan Stanley	0.14			
4	Merrill Lynch	0.14			
5	JP Morgan	0.09	Y		

2003

Rank	Name	Market Share	CB?	Top 5 Mkt Share	Herfindahl
1	Citigroup	0.20	Y	0.62	1092
2	JPMorganChase	0.18	Y		
3	Bank of America	0.09	Y		
4	Merrill Lynch	0.08			
5	Credit Suisse	0.07	Y		

Table 2
Summary Statistics

This table presents summary statistics for a sample of 4,553 debt issues from 1990-2003 by 509 firms. All firm characteristics come from the Compustat Annual Industrial Database, and all issue characteristics come from the Securities Data Corporation. *Lending relationships* come from Dealscan; they are indicator variables that are 1 if the firm has a lending relationship with one of the lead managers on a given issue. An underwriter is considered a commercial bank if its parent is either a U.S. financial firm filing a Y9C with the Federal Reserve or a foreign financial firm with an SIC code of 6020 or 6029.

			Distribution		
	Mean	St. Dev	10th	50th	90th
Firm characteristics (509 firms)					
# issues per firm	9	11	2	5	22
Total assets (book, $ mln)	15983	28967	1600	8223	31362
Income to total assets ratio	0.14	0.06	0.08	0.14	0.22
Debt to total assets ratio (book leverage)	0.35	0.14	0.20	0.35	0.51
S&P debt rating (AAA=1, AA+=2, etc.)	7.13	2.69	4.00	7.00	11.00
Industry composition (SIC 1 digit code)					
Mining, construction, agriculture (0, 1)	0.08				
Manufacturing (2, 3)	0.44				
Trans, comm., gas, & electricity (4)	0.30				
Trade (5)	0.10				
Services (7, 8)	0.07				
Issue characteristics					
Underwriting fee, % of total issue amount	0.76	0.54	0.35	0.65	1.00
Yield spread to benchmark (basis points)	125	93	45	97	232
Maturity (years)	14	10	5	10	30
Amount of issue ($ mln)	196	164	20	150	450
Secured	0.16	0.36	0	0	1
Callable	0.40	0.49	0	0	1
Moody's rating (AAA=1, AA+=2, etc.)	7.2	2.9	4	7	10
# of lead managers	1.2	0.6	1	1	2
# of co-managers	2.3	2.6	0	2	5
Lending relationship variables					
Commercial bank underwriter	0.34	0.47	0	0	1
Lending relationship, past year	0.21	0.40	0	0	1
With commercial bank	0.19	0.39	0	0	1
Lending relationship, 1 to 2 years ago	0.15	0.35	0	0	1
With commercial bank	0.15	0.35	0	0	1
Other controls					
Underwriter reputation (market share)	0.11	0.06	0.02	0.12	0.19
Recent underwriter (last two years)	0.48	0.50	0	0	1

Table 3
Joint Production of Lending and Debt Underwriting over Time

This table shows the number of firms that have ever hired a "CB recent lender" as a lead manager on a debt issue. A lead manager on a debt issue is classified as a "CB recent lender" if the lead manager is a commercial bank AND the issuing firm has a lending relationship with the lead manager within the past 2 years.

Period:	1990-1992	1993-1996	1997-1999	2000-2003
Timing of Joint Production				
# Firms with issues	259	345	334	282
# Firms with at least 1 issue by CB recent lender	4	49	103	211
% of firms with recent loan with CB potential underwriter who HIRE CB underwriter	0.08	0.24	0.41	0.93
Firm characteristics, conditional on having hired CB recent lender as underwriter				
Total assets				
Have never hired recent CB lender as underwriter	8697	7604	9173	11019
Have hired recent CB lender as underwriter	47881*	12581	12598	17587
Book leverage				
Have never hired recent CB lender as underwriter	0.34	0.33	0.30	0.35
Have hired recent CB lender as underwriter	0.56*	0.34	0.38*	0.36
Income to assets ratio				
Have never hired recent CB lender as underwriter	0.15	0.14	0.16	0.15
Have hired recent CB lender as underwriter	0.15	0.16	0.14*	0.14
Credit rating				
Have never hired recent CB lender as underwriter	6.9	7.5	6.9	7.5
Have hired recent CB lender as underwriter	7.0	7.2	8.2*	7.7

Table 4
Lead Manager Choice Probit Regressions

This table reports coefficient estimates for the probability that a given underwriter is chosen as the lead manager on a debt issue. The choice set includes all debt underwriters with at least 1 percent market share in a given year. Standard errors are clustered on the borrowing firm, so that the errors are allowed to be freely correlated among issues and potential underwriters for a given firm. The mean of the dependent variable is 0.10.

Dep. Var.: {0,1} chosen as underwriter	(1)	(2)	(3)	(4)	(5)
Time period:	1990-1992	1993-1996	1997-1999	2000-2003	Total
Previous relationship (last two years)					
Lending relationship	0.043	0.067*	0.103*	0.135*	0.113*
	(0.062)	(0.020)	(0.016)	(0.013)	(0.010)
Debt underwriting relationship	0.188*	0.200*	0.230*	0.185*	0.200*
	(0.024)	(0.020)	(0.019)	(0.023)	(0.014)
Reputation (market share)	0.650*	0.527*	0.681*	0.874*	0.694*
	(0.038)	(0.036)	(0.048)	(0.072)	(0.028)
Ln[amount of issue]	-0.002	0.005*	0.011*	0.025*	0.011*
	(0.004)	(0.001)	(0.002)	(0.004)	(0.001)
Ln[maturity (years)]	-0.004	-0.001	-0.002	0.000	-0.002
	(0.003)	(0.002)	(0.002)	(0.003)	(0.001)
Secured indicator	-0.005	-0.007	-0.016	0.034	0.004
	(0.005)	(0.004)	(0.010)	(0.013)	(0.004)
Callable indicator	0.008	0.002	-0.001	0.013	0.007*
	(0.006)	(0.003)	(0.004)	(0.007)	(0.002)
Firm characteristics					
Ln[total assets]	-0.012*	-0.015*	-0.017*	-0.015*	-0.015*
	(0.002)	(0.001)	(0.002)	(0.003)	(0.001)
Income to total assets ratio	0.008	-0.024	-0.051*	-0.024	-0.034*
	(0.013)	(0.010)	(0.018)	(0.027)	(0.010)
Book leverage	0.017	-0.026	-0.113	-0.021	-0.063
	(0.040)	(0.027)	(0.045)	(0.064)	(0.029)
N	9672	14791	13738	13169	51370
Psuedo R^2	0.16	0.17	0.16	0.17	0.17

* Statistically significant from 0 at the 1 percent level.

Table 5, Panel A
Underwriting Fee Fixed Effects Regressions

This table presents coefficient estimates from a fixed effects specification relating the underwriting fee (mean 0.76) to the presence of recent lending relationships between the underwriter and the issuing firm. *Lending relationship* variables take on the value 1 if the issuing firm has a lending relationship with 1 of the lead managers of the debt issue. Standard errors are heteroskedasticity robust, and clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)
Previous lending relationships					
CB lending relationship, within past year	-0.07*	-0.07**	-0.08**	-0.08**	
	(0.03)	(0.03)	(0.03)	(0.03)	
CB lending relationship, 1-2 years ago	0.02	0.01	0.02	0.03	
	(0.03)	(0.03)	(0.03)	(0.03)	
Any lending relationship, within 1 year					-0.05*
					(0.03)
Any lending relationship, 1-2 years ago					0.02
					(0.03)
Underwriter reputation (market share)		0.04	-0.06	-0.03	-0.02
		(0.15)	(0.14)	(0.14)	(0.14)
Recent underwriter (last two years)		-0.01	0.00	-0.01	0.00
		(0.02)	(0.02)	(0.02)	(0.02)
Issue characteristics					
Ln[maturity (years)]		0.22**	0.20**	0.20**	0.20**
		(0.02)	(0.02)	(0.02)	(0.02)
1/(Amount of Issue)		0.07**	0.07**	0.07**	0.07**
		(0.01)	(0.01)	(0.01)	(0.01)
Amount of Issue/Book Assets		0.32	0.23	0.15	0.15
		(0.27)	(0.22)	(0.20)	(0.20)
Ln[# lead managers]			-0.01	-0.01	-0.02
			(0.04)	(0.04)	(0.04)
Ln[1 + # co-managers]			0.06*	0.06**	0.06**
			(0.02)	(0.02)	(0.02)
Secured indicator			-0.21**	-0.21**	-0.21**
			(0.08)	(0.07)	(0.07)
Callable indicator			0.09**	0.09**	0.09**
			(0.02)	(0.02)	(0.02)
Firm characteristics					
Ln[total assets]				-0.07	-0.07
				(0.05)	(0.05)
Income to total assets ratio				-0.60	-0.60
				(0.32)	(0.32)
Book leverage				0.07	0.07
				(0.17)	(0.17)
Issue rating dummies (Moody's)					
Aa	-0.54	-0.46	-0.42	-0.40	-0.40
A	-0.57	-0.48	-0.49	-0.47	-0.47
Baa	-0.54	-0.42	-0.47	-0.46	-0.46
Ba	0.07	0.23	0.18	0.17	0.18
B or lower	0.77*	0.90*	0.81**	0.80**	0.80**
N	4533	4533	4533	4533	4533
Number of firms	509	509	509	509	509
Adjusted R^2	0.47	0.56	0.57	0.57	0.57

*Statistically significant from 0 at 5 percent level, **Statistically significant from 0 at 1 percent level

Table 5, Panel B
Underwriting Fee Fixed Effects Regressions, by Size and Credit Rating

This table presents coefficient estimates of regressions relating underwriting fees to lending relationships on sub-samples of the data. Small firms (large firms) are firms in the bottom (top) half of the size distribution, based on beginning of period total assets. High yield firms (investment grade firms) are firms with a S&P LT credit rating of BBB or lower (BBB+ or higher), based on beginning of period credit rating. Standard errors are heteroskedasticity robust, and clustered at the firm level.

	(1) Small Firms	(2) Large Firms	(3) High Yield	(4) Inv.Grade
Previous lending relationships				
CB lending relationship, within past year	-0.07	-0.08**	-0.06	-0.09**
	(0.06)	(0.03)	(0.05)	(0.03)
CB lending relationship, 1-2 years ago	-0.02	0.02	0.02	0.01
	(0.05)	(0.04)	(0.05)	(0.03)
Underwriter reputation (market share)	-0.84*	0.27*	0.12	-0.15
	(0.37)	(0.13)	(0.39)	(0.14)
Recent underwriter (last two years)	-0.03	0.01	-0.05	0.01
	(0.04)	(0.02)	(0.03)	(0.02)
Issue characteristics				
Ln[maturity (years)]	0.13**	0.22**	0.10**	0.21**
	(0.04)	(0.02)	(0.03)	(0.02)
1/(Amount of Issue)	0.04	0.07**	0.08**	-0.01
	(0.08)	(0.01)	(0.01)	(0.11)
Amount of Issue/Book Assets	0.01	-0.09	0.17	-0.61
	(0.14)	(0.60)	(0.24)	(0.40)
Ln[# lead managers]	0.04	-0.03	0.12	-0.05
	(0.08)	(0.04)	(0.07)	(0.04)
Ln[1 + # co-managers]	0.04	0.07**	0.06	0.07**
	(0.03)	(0.02)	(0.03)	(0.02)
Secured indicator	0.07	-0.23**	-0.09	-0.28**
	(0.09)	(0.08)	(0.05)	(0.09)
Callable indicator	0.15**	0.06**	0.13**	0.09**
	(0.06)	(0.02)	(0.04)	(0.02)
Firm characteristics				
Ln[total assets]	-0.20**	0.06	-0.08	-0.02
	(0.06)	(0.06)	(0.07)	(0.07)
Income to total assets ratio	-1.11	-0.28	-0.97	-0.06
	(0.60)	(0.33)	(0.60)	(0.32)
Book leverage	0.35	0.03	-0.01	0.05
	(0.27)	(0.20)	(0.26)	(0.18)
Issue rating dummies (Moody's)				
Aa	-0.73*	-0.38	-0.34	-0.32
A	-0.62*	-0.50	-0.38	-0.43
Baa	-0.73*	-0.45	-0.41	-0.43
Ba	-0.35	0.30	0.07	0.48
B or lower	0.24	0.91**	0.57**	1.14**
N	1231	3298	1273	3098
Number of firms	254	255	199	293
Adjusted R^2	0.70	0.51	0.79	0.40

*Statistically significant from 0 at 5 percent level, **Statistically significant from 0 at 1 percent level

Table 5, Panel C
Underwriting Fee Fixed Effects Regressions, Robustness Checks

This table presents coefficient estimates from a robustness checks to the fixed effects specification in Table 5, Panel A. A firm is considered "treated" from the first time it hires a commercial bank underwriter with which the firm has a recent lending relationship. Column (1) examines whether fees are only lowered at initial treatment, and then increases afterwards. *First year CB lend rel.* is an indicator variable for the first year that a commercial bank jointly produces a loan and debt underwriting for a given firm. Column (2) examines only firms that at some point treated. Column (3) and column (4) examine firms treated up to 1996 and after 1996, respectively. Column (5) examines firm-issues up to and through the first year a firm was treated. Column (6) examines firm-issues after the first year a given firm was treated. Standard errors are heteroskedasticity robust, and clustered at the firm level. Rating dummies are included but not reported.

	(1) Timing	(2) Some treatment	(3) Early treatment	(4) Late treatment	(5) Initial treatment	(6) Post treatment
Previous lending relationships						
CB lend rel., within past year		-0.06*	-0.05	-0.08*	-0.10*	-0.06
		(0.03)	(0.03)	(0.04)	(0.04)	(0.04)
CB lend rel., 1-2 years ago		0.02	0.04	0.04	0.03	0.05
		(0.03)	(0.04)	(0.04)	(0.05)	(0.05)
First year CB lend rel.	-0.07**					
	(0.03)					
After first year CB lend rel.	-0.06					
	(0.04)					
Underwriter rep. (market share)	-0.04	0.21	0.39	0.25	0.08	0.98**
	(0.14)	(0.15)	(0.36)	(0.17)	(0.14)	(0.37)
Recent underwriter (2 years)	-0.01	0.02	-0.06	0.04	0.02	-0.04
	(0.02)	(0.02)	(0.04)	(0.02)	(0.02)	(0.04)
Issue characteristics						
Ln[maturity (years)]	0.20**	0.21**	0.20**	0.21**	0.17**	0.29**
	(0.02)	(0.02)	(0.04)	(0.03)	(0.03)	(0.06)
1/(Amount of Issue)	0.07**	0.09**	0.41	0.09**	0.04**	0.18**
	(0.01)	(0.01)	(0.28)	(0.01)	(0.01)	(0.05)
Amount of Issue/Book Assets	0.15	1.17*	0.82	1.38**	1.26**	-1.46
	(0.20)	(0.45)	(0.70)	(0.50)	(0.48)	(1.15)
Ln[# lead managers]	-0.01	-0.04	-0.03	-0.05	-0.05	-0.04
	(0.03)	(0.04)	(0.11)	(0.04)	(0.05)	(0.08)
Ln[1 + # co-managers]	0.06**	0.05*	0.08	0.05*	0.03	0.08*
	(0.02)	(0.02)	(0.04)	(0.02)	(0.02)	(0.04)
Secured indicator	-0.21**	-0.25**	-0.41**	-0.15**	-0.18**	-0.03
	(0.07)	(0.08)	(0.15)	(0.05)	(0.06)	(0.10)
Callable indicator	0.09**	0.08**	0.13**	0.07*	0.10**	0.19*
	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.09)
Firm characteristics						
Ln[total assets]	-0.07	-0.03	-0.22*	0.03	0.05	0.01
	(0.05)	(0.07)	(0.11)	(0.07)	(0.08)	(0.07)
Income to total assets ratio	-0.60	-0.57	-1.03	-0.25	-0.56	1.03
	(0.32)	(0.39)	(0.62)	(0.42)	(0.39)	(0.87)
Book leverage	0.07	0.21	0.40*	0.21	0.37	0.20
	(0.17)	(.21)	(0.17)	(0.24)	(0.20)	(0.37)
N	4529	3049	802	2247	2141	908
Number of firms	509	255	49	206	255	145
Adjusted R^2	0.57	0.51	0.65	0.49	0.58	0.56

*Statistically significant from 0 at 5 percent level, **Statistically significant from 0 at 1 percent level

Table 6
Bias in OLS estimates of Commercial Bank Effect on Yield Spread

This table presents evidence that OLS coefficient estimates of the effect of a commercial bank debt underwriter on yield spreads is biased and inconsistent. The sample is limited to firms that have at least 2 debt issues in the sample, and firms with an SIC one digit code of 4 are eliminated. Column (1) replicates a similar regression reported in the previous literature, where the full sample of debt issues from 1993 to 1997 is used. Column (2) shows that the OLS result is not robust when later years are included, and columns (3) and (4) perform fixed effects specifications (grouped on cusip) to show that the results in (1) are biased due to the unobservable firm specific error term.

Dep. Var.: Yield spread (mean 131)	(1) OLS 1993-1997	(2) OLS 1990-2003	(3) FE 1993-1997	(4) FE 1990-2003
Commercial bank underwriter	-7.1*	3.7	0.4	3.4
	(3.8)	(2.6)	(4.2)	(2.5)
Underwriter reputation (market share)	-5.5	-15.9	-13.0	-16.6
	(30.0)	(20.2)	(33.8)	(18.6)
Ln[maturity (years)]	9.4***	16.8***	11.3***	15.0***
	(2.0)	(1.5)	(1.8)	(1.3)
Ln[amount of issue]	0.4	2.0**	-0.7	1.7
	(1.3)	(1.0)	(1.6)	(1.1)
Secured indicator	35.6***	32.4***	-4.3	13.9
	(8.3)	(7.6)	(9.1)	(8.7)
Callable indicator	19.7***	26.6***	17.6***	21.4***
	(3.7)	(2.8)	(3.8)	(2.6)
Shelf registration	-25.3***	-9.8***	-16.2***	-2.5
	(4.0)	(3.5)	(4.9)	(3.6)
Issue rating dummies (Moody's)				
Aa	21.4	21.9*	15.5	16.9
A	38.5***	50.2***	19.7	28.0*
Baa	68.6***	100.7***	53.0***	73.0***
Ba	191.0***	229.1***	133.1***	164.3***
B or lower	343.5***	339.0***	224.8***	244.9***
N	1548	3893	1548	3893
Number of firms	446	575	446	575
Adjusted R^2	0.81	0.68	0.90	0.82

*,**,*** Statistically significant from 0 at 10, 5, and 1 percent level

Table 7
Yield Spread Fixed Effects Regressions

This table presents coefficient estimates from a fixed effects specification relating the yield spread (mean 125) to the presence of previous lending relationships between the underwriter and the issuing firm. *Lending relationship* variables take on the value 1 if the issuing firm has a lending relationship with one of the lead managers of the debt issue. Standard errors are heteroskedasticity robust, and clustered at the firm level.

	(1)	(2)	(3)	Small Firms (4)	Large Firms (5)
Previous lending relationships					
CB lending relationship, within past year	-1.0	-3.2		2.8	-4.5
	(3.8)	(3.7)		(8.9)	(3.8)
CB lending relationship, 1-2 years ago	1.1	-0.7		10.5	-3.5
	(4.4)	(4.4)		(9.8)	(4.8)
Commercial bank underwriter			0.9		
			(3.6)		
Underwriter reputation (market share)	6.0	-2.2	0.3	23.0	-0.3
	(22.4)	(20.5)	(22.6)	(43.0)	(23.1)
Recent underwriter (last two years)	1.3	1.3	1.5	7.7	-0.6
	(1.9)	(1.8)	(1.9)	(4.4)	(2.0)
Issue characteristics					
Ln[maturity (years)]		13.0**	13.0**	10.2**	14.0**
		(1.3)	(1.3)	(3.0)	(1.3)
Ln[Amount of issue]		3.7	3.7	3.0	4.0
		(2.9)	(2.9)	(2.9)	(3.6)
Ln[# lead managers]		8.3	6.6	6.3	10.6
		(6.6)	(6.7)	(12.0)	(7.6)
Ln[1 + # co-managers]		-4.9*	-5.0*	-7.5	-3.8
		(2.5)	(2.5)	(5.7)	(2.8)
Secured indicator		-6.3	-6.4	1.0	-6.4
		(6.0)	(5.9)	(16.9)	(6.3)
Callable indicator		14.6**	14.6**	17.5**	12.8**
		(2.6)	(2.6)	(6.7)	(2.6)
Firm characteristics					
Ln[total assets]		3.0	2.8	-20.1*	12.0*
		(5.4)	(5.4)	(10.0)	(6.1)
Income to total assets ratio		-134.9**	-134.0**	-201.9	-116.0*
		(47.6)	(47.7)	(119.9)	(50.4)
Book leverage		55.7*	56.5**	60.4	49.7
		(27.5)	(27.5)	(37.8)	(32.8)
Issue rating dummies (Moody's)					
Aa	8.6*	19.5*	19.5*	-9.8	21.2*
A	25.0**	32.0**	31.6**	-16.2	35.7**
Baa	64.2**	68.5**	67.9**	15.6	73.3**
Ba	169.2**	172.7**	172.5**	91.7	190.3**
B or lower	267.8**	261.7**	261.1**	205.1**	262.38**
N	4533	4533	4533	1231	3398
Number of firms	509	509	509	254	255
Adjusted R^2	0.75	0.77	0.77	0.82	0.73

*Statistically significant from 0 at 5 percent level, **Statistically significant from 0 at 1 percent level

Table 8
Capture Probabilities

This table reports the probability that a lead manager on a given debt issue for a given firm is hired on the next debt issue by the same firm. I refer to this probability as the "capture probability." The sample includes only those debt issues after which the firm has at least one more issue. If there is more than one lead manager on an issue, each lead manager is considered separately. A lending relationship is any lending relationship with the lead manager within the past 2 years of the issue. The sample includes 4,406 lead managers on 3,779 debt issues. Standard errors in parentheses.

	Total	1990-1996	1997-1999	2000-2003
Full sample	0.390	0.373	0.439	0.370
	(0.007)	(0.011)	(0.014)	(0.015)
High yield firms	0.421	0.422	0.473	0.367
	(0.014)	(0.022)	(0.027)	(0.026)
Investment grade firms	0.377	0.354	0.423	0.372
	(0.009)	(0.012)	(0.017)	(0.018)
Small firms	0.480	0.452	0.513	0.488
	(0.016)	(0.024)	(0.028)	(0.034)
Large firms	0.365	0.352	0.412	0.341
	(0.008)	(0.012)	(0.016)	(0.016)
Not underwritten by commercial bank	0.392	0.368	0.446	0.404
	(0.009)	(0.011)	(0.018)	(0.026)
Underwritten by commercial bank	0.386	0.415	0.426	0.353
	(0.013)	(0.034)	(0.023)	(0.018)
Issues without any lending relationship	0.391	0.367	0.430	0.427
	(0.009)	(0.011)	(0.017)	(0.025)
Issues with any lending relationship	0.388	0.462	0.455	0.338
	(0.014)	(0.046)	(0.025)	(0.018)
Issues without CB lending relationship	0.392	0.369	0.441	0.389
	(0.008)	(0.011)	(0.016)	(0.021)
Issues with CB lending relationship	0.385	0.452	0.431	0.352
	(0.016)	(0.052)	(0.030)	(0.020)
Issues with 1 lead manager, no CB lend. Rel.	0.392	0.367	0.426	0.487
	(0.009)	(0.011)	(0.018)	(0.033)
Issues with 1 lead manager, CB lend. Rel.	0.446	0.460	0.450	0.430
	(0.027)	(0.054)	(0.040)	(0.048)
Issues with >=2 lead manager, no CB lend. Rel.	0.391	0.426	0.492	0.318
	(0.020)	(0.073)	(0.035)	(0.027)
Issues with >=2 lead manager, CB lend. Rel.	0.349	0.333	0.407	0.334
	(0.020)	(0.211)	(0.045)	(0.022)

Table 9
Capture Probability Regressions

This table presents coefficient estimates from a fixed effects specification relating the capture probability to the presence of previous lending relationships between the underwriter and the issuing firm. *Lending relationship* variables take on the value 1 if the issuing firm has a lending relationship with one of the lead managers of the debt issue. Standard errors are heteroskedasticity robust, and clustered at the firm level.

Dep. Var.: Capture Probability (mean 0.39)	(1) FE	(2) FE	(3) FE	(4) OLS	(5) PROBIT
Previous lending relationships					
CB lending relationship, within past year	0.029	0.045	0.051	0.035	0.035
	(0.033)	(0.033)	(0.033)	(0.034)	(0.036)
CB lending relationship, 1-2 years ago	0.017	0.021	0.025	0.016	0.017
	(0.038)	(0.038)	(0.038)	(0.038)	(0.040)
Number of lead managers			-0.042*	-0.019	-0.019
			(0.017)	(0.015)	(0.016)
Underwriter reputation (market share)		0.660**	0.642**	0.691**	0.730**
		(0.167)	(0.168)	(0.160)	(0.167)
Ln[Number of days to next debt issue]		-0.011	-0.011	0.005	0.006
		(0.008)	(0.008)	(0.008)	(0.009)
Issue characteristics					
Ln[Amount of issue]		-0.006	-0.002	-0.001	-0.001
		(0.016)	(0.016)	(0.015)	(0.016)
Ln[maturity, years]		0.014	0.012	0.025*	0.026
		(0.010)	(0.010)	(0.012)	(0.012)
Secured indicator		-0.059	-0.057	-0.033	-0.036
		(0.043)	(0.043)	(0.041)	(0.044)
Callable indicator		-0.023	-0.022	-0.047	-0.049
		(0.022)	(0.022)	(0.025)	(0.026)
Firm characteristics					
Ln[total assets]		-0.042	-0.037	-0.070**	-0.074**
		(0.042)	(0.042)	(0.012)	(0.013)
Income to total assets ratio		0.495	0.501	-0.054	-0.071
		(0.389)	(0.394)	(0.258)	(0.270)
Book leverage		0.105	0.064	-0.027	-0.035
		(0.173)	(0.173)	(0.099)	(0.101)
Issue rating dummies (Moody's)					
Aa	-0.027	-0.003	0.000	-0.112	-0.116
A	-0.042	-0.027	-0.026	-0.137*	-0.149
Baa	-0.031	-0.021	-0.017	-0.086	-0.093
Ba	-0.009	0.004	0.007	-0.026	-0.031
B or lower	-0.104	-0.077	-0.074	-0.035	-0.040
N	4406	4406	4406	4406	4406
Number of firms	466	466	466	466	466
Adjusted R^2	0.23	0.24	0.24	0.07	0.06

*Statistically significant from 0 at 5 percent level, **Statistically significant from 0 at 1 percent level