Three Essays on Banking and Loan Financing

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This thesis contains 48,027 words, including title page, tables, and footnotes.

Abstract

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This thesis consists of three essays on banking and loan financing.

In the first essay, we investigate loan price in mergers and acquisitions (M&As), using hand-matched loan information for a sample of 512 U.S. M&A transactions. We find the relative size of a deal constitutes a prominent determinant of the loan price measured by the all-in-drawn spread (AIDS). This result is robust to several specifications that address endogeneity concerns. Further analysis demonstrates higher AIDS is associated with lower post-transaction performance. We posit that deal size is a major concern for lenders because it involves greater information risk, greater business complexity, and more integration difficulties. Further, the loan price correctly factors in the risk of poor post-transaction performance.

In the second essay, we investigate the relation between the bank competition and the tightness of financial covenants in the loan contracts. Using statewide bank branch intensity as the proxy of bank competition during 1995 – 2013, we find that the financial covenant tightness is positively associated with the bank competition. We explain the association as the banks offer credit to riskier borrowing firms under intensified competition and thus use more restrictive financial covenants to manage the risks of the loan portfolios. Our empirical evidence verifies the argument by showing negative association between the bank competition and the quality of borrowing firms. We also investigate the cross-sectional heterogeneities of the positive association between bank competition and the tightness of financial covenants.

In the third essay, using data on the federal declaration of disasters in contiguous U.S. counties and the presence of brick and mortar bank branches in each county, we show that a greater presence of bank branches reduces the disasters' impairment on the number of employees, total annual payroll, and the number of establishments in the local business sector. The presence of bank branches also mitigates the disastrous impact on overall local employment and personal wealth. Our findings demonstrate that the physical presence of banking service enhances the resilience of a local economy to disasters significantly, in line with the findings of the previous literature that banks respond to the uprise in credit demand in disaster-affected areas.

Declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Copyright Statement

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Chapter 1

Introduction

1.1 Overview of the Thesis

This thesis consists of three independent but connected empirical research essays in loan financing and banking.

How to price a loan is one of the most crucial questions of debt-financing in corporate finance research.

To the borrowing firms, loan price is fundamental in terms of making the financing decision for the investment projects. Loan price captures the majority of the cost of private debt, which is crucial for the borrowing firms to compare with the cost of alternative funding sources (Stone, 1972). Loan price is also important to the value of the firm. The interest repayments are tax deductible, which is recognized as value-enhancing. However, loan price is directly associated with bankruptcy cost and thus restricts the firm's debt capacity (Turnbull, 1979), which may cause underinvestment issue. The repayments of the loans are also helpful to reduce agency cost of free cash flow (Jensen, 1986), which can be beneficial to the shareholders of the borrowing firms. Previous studies shed light on the relationship between the price term of the loan contracts and some risk-based factors (e.g., information asymmetries among the borrowers, leader lenders, and participant lenders (e.g., Boot and Thakor, 2000; Ivashina, 2009; Bharath, Dahiya, Saunders and Srinivasan, 2011; Cai, 2010, etc.), the borrower's characteristics such as organizational structure (Aivazian, Qiu and Rahaman, 2015), and earnings quality (Bharath, Sunder and Sunder, 2008)). However, these studies treat the loans as homogeneous, regardless of the purposes of loan financing.

Furthermore, mergers and acquisitions (M&As) are the largest and most complex corporate investments, and sizable loans are used to fund the M&As. Borrowing firms' M&As are concerned by the lenders, since the lenders may either benefit or lose because of the borrowers' M&As, depending on the M&As

decreasing or increasing the default risk (Chava, Livdan and Purnanandam, 2009). Given the complexity and risks in the M&As, in the first essay, we investigate (1) whether the characteristics of the M&As affect the pricing of loans; (2) whether the loan price correctly summarizes the risks associated with the borrowers' post-acquisition business.

We use 512 loan-funded M&A transactions (matched to 995 loan facilities) in the U.S. announced between 1994 and 2017 to empirically examine our research questions. Specifically, we manually collect the loan-funded M&A transactions by searching SEC 8-K filings to identify a M&A funded by loans or not. Then, we match the potentially loan-funded M&A transactions to Dealscan loan facility data. Considering the correlation between price term and non-price terms in the loan contracts, we use the seemingly unrelated regression model (SUR) to test the association between the characteristics of the M&As and the all-in-drawn spread (AIDS) of the loan facilities. Our analysis shows that the relative deal size of the M&As is positively and significantly associated with AIDS. Statistically, a one standard deviation increase in the relative deal size is associated with a 22.7 basis points increases in the acquiring firm's AIDS. This association is robust to a variety of robustness checks, including using OLS estimation, using loan facility-level data, and using Heckman self-selection model. To exclude the potential omitted variables problem related to price loans, we also control for additional variables (i.e., target firm's bankruptcy risks, offer premium, acquirer's uncertainty, and acquirer's corporate governance). However, the sign and statistical significance of the association between the relative deal size and AIDS are unaffected. We interpret such association as that larger transaction is associated with greater complexity (Alexandridis, Fuller, Terhaar and Travlos, 2013), higher information asymmetry or uncertainty (Hansen, 1987; Faccio and Masulis, 2005), and higher cost to achieve the expected synergies (Datta, 1991), increasing per-

ceived risks by the lenders (Gatev and Strahan, 2009). Moreover, we present evidence that post-acquisition stock return performance and operating performance are negatively and significantly associated with AIDS, which is robust to controlling for other characteristics of the M&As. This result is in line with Strahan (1999) who postulates that loan price is a sufficient indicator of the borrower's ex-post performance, since loan price compensates the risks that are hard to contract completely but taken by the lenders.

This chapter contributes to the extant literature in several ways. First, we provide empirical evidence on the loan financing cost in the M&As. Prior studies primarily focus on the means of payment. The literature on the sources of finance in M&As is limited at best (Martynova and Renneboog, 2009). Bharadwaj and Shivdasani (2003) and Schlingemann (2004) empirically examine the impacts of different sources of financing on the bidders' stock returns. Martynova and Renneboog (2009) use European M&A samples to test the determinants of debt financing in M&As. No previous studies present evidence on the loan financing cost in the M&As, which is due to the unavailability of data. We use hand-collected data through SEC 8-K fillings to construct a sample of loan-funded M&As, and empirically examine how the characteristics of the M&As affect the loan spread. Our finding is in line with Alexandridis et al. (2013) that the size of the M&A deals summarizes both observed and unobserved complexity of the transaction. Second, we provide new evidence to the loan pricing literature by showing that the features of major corporate investment affect the price of loan financing. Prior studies mainly shed light on that the features of the borrowers and the lenders, and the lending relationship can affect the loan price. However, we extend the literature by investigating at the M&A transaction level, showing that the features of the project can also affect the cost of loan financing. Third, our results are consistent with the view that the loan price is a sufficient indicator for the borrowers' future

performance (Strahan, 1999). This adds new evidence to the argument that the lenders have advantages in screening and monitoring the borrowers (e.g., Diamond, 1984; Bharadwaj and Shivdasani, 2003; Schlingemann, 2004).

The second essay investigates the relationship between the level of bank competition and the tightness of financial covenants in the loan contracts. Although the banking industry is highly regulated, the deregulation on the banking industry from 1970s in the U.S. raises heated debate on the consequences of intensified competition on the banks' risks. Some studies postulate that the increase in bank competition leads to greater risks to the banks. Since the intensified competition may reduce the profits of the banks, and, to avoid the drop of profitability, the banks have an incentive to offer credit to riskier borrowers, which increases the risks of the banks (e.g., Keeley, 1990; Hellmann, Murdock and Stiglitz, 2000; Repullo, 2004). As opposed to the view of positive relationship between competition and banks' risks, the theoretical analysis of Boyd and De NicolÓ (2005) suggests that the greater bank competition decreases the interest rate charged on the borrowers, then the default risk of the borrowers are lower. As a result, the banks' risks decrease because the banks' portfolios of loans are less risky under low interest rate. A sizable volume of empirical evidence are available regarding how the bank competition influences the price and non-price terms in the provision of small business loans and real estate loans (e.g., Rice and Strahan, 2010; Akins, Li, Ng and Rusticus, 2016, etc.).

Financial covenants are important non-price terms in loan contracts. Basically, monotoring on the borrowers is a main function of the financial intermediation. But the banks have the incentive to shirk the responsibility of monitoring on behalf of the depositors, because the presence of other claiments (Rajan and Winton, 1995). Theoretial analysis by Rajan and Winton (1995) suggests that the covenants in the loan contracts can motivate the banks to

mornitor.

However, extant literature does not have sufficient evidence on how bank competition influences the tightness of financial covenants. Financial covenants work as "trip wires", mitigating lenders' risks by contracting the future states of the borrowers under uncertainties (e.g., Aghion and Bolton, 1992; Dichev and Skinner, 2002, etc.). Moreover, the violation of financial covenants has great real impacts on the borrowing firms' corporate policies and performance (Chava and Roberts, 2008; Nini, Smith and Sufi, 2009; Roberts and Sufi, 2009; Nini, Smith and Sufi, 2012). Therefore, the tightness of financial covenants in the loan contracts decides how likely the creditors intervene the borrowing firms (Murfin, 2012; Demerjian and Owens, 2016). If the bank competition affects the risks of banks, then how the competition among banks affects the tightness of financial covenants, the loan contract level risk-mitigating non-price terms.

In the second essay, we examine the relationship between bank competition and tightness of financial covenants, using data of loan contracts under U.S. publicly listed companies between 1995 and 2013. Specifically, we use the number of bank branches within a state in each year to proxy for the competition in credit supply in the banking industry. We use a new proxy of the tightness of financial covenants developed in Demerjian and Owens (2016). After controlling for the characteristics of both the borrowing firms and the loan contracts, industry, and year effects, our baseline results show that the tightness of financial covenants is significantly associated with the degree of bank competition positively. Furthermore, we find that a higher borrower Ohlson-score (O-score) and worse borrower credit ratings are significantly associated with the greater bank competition. These results are consistent with our hypothesis that intensified bank competition forces the banks to take more risks by offering credit to riskier borrowers. Banks then use tighter financial

covenants to mitigate the risks of the loans. Moreover, we conduct a variety of cross-sectional tests to check the robustness of the relationship between bank competition and financial covenant tightness. The cross-sectional analysis shows that such an association is more significant during non-recession period, for smaller borrowers, for non-Big 3 lenders, and for bank lenders. An additional causal examination using the deregulation of 1994 Interstate Banking and Branching Efficiency Act confirms the positive relationship between bank competition and the tightness of financial covenants.

The second essay contributes to the extant literature by providing new evidence on how bank competition affects non-price terms of loan contracts. Previous literature sheds light on the consequences of the bank competition on loan price and collateral (e.g., Petersen and Rajan, 1995; Ruckes, 2004; Rice and Strahan, 2010, etc.). We provide evidence on the impact of the bank competition on the financial covenants of the loan contracts. Also, we add new evidence to the argument on the relationship between bank competition and bank risks. In line with Marcus (1984), Keeley (1990), Hellmann et al. (2000), Repullo (2004), and Jiang, Levine and Lin (2017) among others, we document the intensified competition among banks is associated with worse borrowers' quality. However, we shows the importance of the financial covenants as the device of controlling the unwanted borrower risks. Besides, a few studies (Hollander and Verriest (2016) and Bushman, Hendricks and Williams (2016)) provide preliminary evidence on how bank competition reduces the number of financial covenants in the loan contracts. We find bank competition increases the tightness of financial covenants, suggesting banks rely on the tighter control right to counteract the possible negative consequences of a race to lower-quality borrowers.

The third essay investigates the role of the bank branches in enhancing the resilience of local business and economy to disasters. Finance studies

show that a liberated credit market can affect the economic growth positively (e.g. Jayaratne and Strahan, 1996), however, there is limited evidence on the function of banking services in the local economy in negative shocks. Disasters, both human-caused or naturally caused, become increasingly challenging to the local business and economy. Therefore, to investigate whether the banking industry helps the society to resist the disasters can highlight the positive externality of financial market to the economy.

Extant studies have documented the negative consequences of disasters on the local economy and business (e.g., Garmaise and Moskowitz, 2009; Strobl, 2011; Cavallo, Galiani, Noy and Pantano, 2013; Schüwer, Lambert and Noth, 2018, among others). Those studies treat the disasters as exogenous shocks to local demand on the credit and document that banks supply credit to the affected areas after disasters. Previous studies assume that credit flow across areas without any frictions (e.g., Cortés and Strahan, 2017), which may not be true. Anecdotal evidence argues that the operation of the bank branches in the affected areas is essential as a part of the credit-supply infrastructure. Therefore, we hypothesize that the physical existence of bank branches mitigate the negative impact of the disasters.

In the third essay, we use the bank branch data provided by Federal Deposit Insurance Corporation (FDIC) and the federally declared disaster data provided by Federal Emergency Management Agency (FEMA) between 1994 and 2016 to empirically examine whether bank presence mitigates the impact of disasters on local business and economy. Specifically, we use the ex-ante number of brick and mortar bank branches in a county each year to proxy for the physical existence of the banking system. Next, we use a triple difference-in-difference (DID) model to estimate the effects of the disasters and the number of bank branches. Our baseline results show that the disasters negatively and significantly decrease the number of business-sector employees, the business-

sector total payroll, and the number of business establishments in the counties. For those affected counties, a greater number of physical bank branches significantly weakens the negative impact of the disasters. This finding is consistent with our hypothesis that a strong physical existence of banking service in the local areas offset the negative impact of the disasters. This effect still holds after we control for the total county-year deposits. Furthermore, the impact of the disasters and bank branches are more pronounced in the counties that are less frequently affected by disasters. Such effects do not disappear along with time.

This essay contributes to the literature in several ways. First, it provides evidence on the importance of physical bank branches. In an era of digital and online banking, the necessity of brick and mortar bank branches is highly debatable. This essay is in line with Agarwal and Hauswald (2010), Celerier and Matray (2018), Gilje (2019), and Nguyen (2019) among others, demonstrating the importance of the bank branches. Second, this essay sheds light on how the financial industry reacts to disasters. Cortés and Strahan (2017) and Cortés (2014) find that the banks can allocate the supply of credit through their internal capital market, which facilitates the recovery of local economy after disasters. Our findings show that a possible mechanism of the bank impact is the physical presence of the bank branches. Also, we provide evidence on the relation between the presence of the banking system and a variety of local economy indicators, highlighting the effect of the presence of banking industry on resilience to disasters.

1.2 Thesis Structure

The thesis structure follows the format accepted by the Manchester Accounting and Finance Group, Manchester Business School, at The University

of Manchester. It allows chapters to be incorporated into a format suitable for submission and publication in peer-reviewed academic journals. Therefore, this thesis is structured around three essays containing original research in chapters 2, 3, and 4. The chapters are self-contained, i.e., each chapter has a separate literature review, answers unique and original questions, and employs distinct analysis with different data sets. The equations, footnotes, tables, and figures are independent and are numbered from the beginning of each chapter. Page numbers, titles, and subtitles have a sequential order throughout the thesis.

The thesis continues as follows. Chapter 2 examines the determinants of loan price in the mergers and acquisitions, and the associations between loan price and post-merger performances. Chapter 3 investigates relationship between the bank competition and the tightness of financial covenants in the loan contract. Chapter 4 investigates whether the physical presence of the banking system in the local area alleviate the negative impact of disasters on local business and economy. Chapter 5 concludes. In chapters 2 – 4, I use the third person (we, our) rather than the first person (I, my), as these chapters are in the form of working, or submitted, papers co-authored with my supervisors.

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Chapter 2

Loan Price in Mergers and Acquisitions

2.1 Introduction

Loan pricing is a central issue in the banking literature. A variety of risks drive loan price,[1] including credit risk, market risk, and liquidity risk (Gatev and Strahan, 2009). In particular, extant literature has identified several risk-based factors that determine loan price. These factors include moral hazard induced by the information asymmetry between the lead and participant banks in a loan syndication (Ivashina, 2009), lender-borrower previous lending relationship (Bharath, Dahiya, Saunders and Srinivasan, 2011; Boot and Thakor, 2000), previous syndication relationship between the lead and participant banks (Ivashina, 2009; Cai, 2010), the borrower's organizational structure (Aivazian, Qiu and Rahaman, 2015), and the borrower's accounting quality (Bharath, Sunder and Sunder, 2008). These studies emphasize the importance of borrower characteristics and the relations among lenders and borrowers in determining loan price. The authors assume that loans are homogeneous across different purposes and the characteristics of individual investment projects do not matter. This assumption is understandable. Canonical textbook teaching maintains that firms arrange their debt financing against their overall assets in place and growth opportunities, and the cost of debt is determined at the firm level rather than the project level (Brealey, Myers, Allen and Mohanty, 2012).[2]

Nonetheless, M&A transactions are arguably the largest and most complex type of corporate investments. They have a profound impact on both a company's growth opportunities and on the value of its existing assets. A sizable proportion of bank loans is made to finance mergers and acquisitions (M&As). For example, about 15% of the syndicated loans recorded

[1] Measured in the previous studies by the *All-In-Drawn Spread (AIDS)*. Please see Section 3.1 for detailed definition.

[2] In contrast, the cost of equity is estimated according to the security market line specific to a project.

in the Dealscan database are used for M&As from 1986 to 2003 (Bharath, Dahiya, Saunders and Srinivasan, 2011). This is equivalent to an estimated total amount of 6.2 trillion dollars.[3] In the current study, we aim to examine two issues: (1)how certain M&A characteristics impact the loan price conditional on the use of loan finance, considering an M&A is a large and complex transaction that changes a firm profoundly; and (2) does the loan price factor in post-transaction performance correctly, considering loan price is supposed to summarize the risks associated with the borrower's business (Strahan, 1999)?

Previous literature suggests the size of a M&A deal relative to the bidder size (i.e., relative deal size) is associated with multiple merger-related risks. Alexandridis, Fuller, Terhaar and Travlos (2013) postulate that greater deal size proxies for the unobserved complexity of a transaction which negatively impacts the acquiring firm's shareholder value. Consequently, they find acquirers offer lower premium in larger deals. Larger deals also increase the difficulty of due diligence from both the acquirer's and the lender's perspective. It is more difficult to assess the value and risk of incremental cash flows from a larger deal. In line with these arguments, Faccio and Masulis (2005) use the relative size as a measure of information asymmetry between the acquirer and the target. Hansen (1987), in his widely cited study, also postulates the acquirers are more concerned with deal uncertainties when the relative deal size is higher. Datta (1991) further postulates that post-transaction integration involves substantial costs to the merging firms. Indeed, larger deals involve more problems in ex-post integration and greater cost to achieve the expected synergies in those years post acquisitions (Shrivastava, 1986; Ahern, 2010). It can be costly for lenders to trace and measure the risks underlying the relative size of a deal. It also involves great inaccuracy in the forecasting. However, the

[3]This amount is likely to be an underestimate, because, to calculate this amount, we multiply the average size of all syndicated loans by the number of syndicated loans for M&A. However, the loans for M&A are usually larger than those for other purposes.

relative size is readily available and easy to measure. Therefore, we hypothesize that banks factor in the relative deal size when negotiating loan price, as an aggregate and prominent signal of the underlying risks. A larger deal involves greater risks and has higher loan price.

We are not aware of another study that examines loan price in the context of M&A transactions. The absence of prior analysis is probably due to the difficulty linking loan data to specific merger transactions. Indeed, we find there is no data readily available, and it has to be hand-matched. We design a rigorous procedure to link loan facilities from Dealscan to merger transactions from the SDC database (more details in Section 2.2.2). We collect data on 512 U.S. M&A transactions announced from 1994 to 2017 with loan financing information. Our analysis shows that relative deal size positively and significantly relates to the average AIDS of loans, ceteris paribus. A one standard deviation increase in the relative deal size increases an average acquirer's AIDS by 22.70 basis points. To ensure our results are robust to various endogeneity issues, we subject our analysis to various specifications, including the Seemingly Unrelated Regressions (SUR), analyses at both the deal level and the facility level, and the Heckman two-stage self-selection-robust procedure. Our results persist in all these alternative specifications. Aside from the relative deal size, we also find that acquirer pre-transaction leverage and the change in leverage significantly increase the AIDS. This result is consistent with the argument of Strahan (1999) that loan agreements tie the interest rate to key financial ratios such as leverage to mitigate adverse selection and moral hazard. The effect of the change in leverage is not robust in all our tests, however.

Previous literature also suggests that lenders have an information advantage that allows them to screen and monitor effectively (Diamond, 1984; Bharadwaj and Shivdasani, 2003). Strahan (1999) postulates that lenders use price to compensate themselves for taking the risks that are hard to contract on. He

suggests that loan price is a sufficient statistic of the borrower's post-contract performance which involves too many uncertainties for a complete contract (see Grossman and Hart, 1983; Hart and Moore, 1990; Hart, 2017, for the idea of contract incompleteness). Indeed, we find higher loan price is associated with significantly worse performance in the post-acquisition years. This finding is consistent for performance measures based on stock prices and those based on accounting information.

We contribute to two strands of literature. First, we examine the loan financing cost of merger transactions. Financing is a prime issue in M&A transaction, as important as valuation. The cost of loan financing impacts the potential of merger gains directly. Previous literature, however, focuses on the determinants or consequences of the means of payment (e.g., Faccio and Masulis (2005), among others). There are only a few papers that broach the financing issues of M&A transactions. Schlingemann (2004) finds that the sources of finance impact the cross-section of bidder announcement returns significantly. Martynova and Renneboog (2009) and Bharadwaj and Shivdasani (2003) find that the bidders using more debt to finance their cash offers can obtain higher gains. Martynova and Renneboog (2009) also examine the determinants of debt financing likelihood in a sample of European M&A transactions. Vladimirov (2015) analyzes how the cost and source of finance in cash offers impact acquisition premium and acquisition outcome when acquirers face financial frictions. Differing from these previous studies, we investigate how the characteristics of M&A deals determine the cost of loan financing. Our results show that the relative deal size is the primary factor that persistently impacts loan price. This finding is in line with the view of Alexandridis et al. (2013) that deal size summarizes the observed and unobserved complexity of a transaction that impact shareholder value negatively. Second, we contribute to the literature on loan pricing by demonstrating that the features of major cor-

porate investment determine the loan price. Extant studies have emphasized the relationship between lenders and borrowers (Bharath et al., 2011; Boot and Thakor, 2000), the relation among syndication partners (Ivashina, 2009), the borrower's organizational structure (Aivazian et al., 2015), and the accounting quality of the borrowing firms (Bharath et al., 2008). These studies treat loans by the same borrower as homogeneous across different purposes. We find that, for major corporate investments like M&As, the transaction characteristics also impact loan prices, after controlling all the determinants highlighted in the previous literature. In merger transactions, the risks associated with the scale of the transaction is a first-order concern. Third, we find evidence consistent with the view that the lenders price the remaining risks of the lendings that are not controlled by non-price loan terms (Strahan, 1999). We find that higher loan price is significantly associated with worse ex post performance of the merged firms. This is consistent with the arguement that lenders (or banks) are able to use their information advantage to screen the borrowers' investment projects (e.g., Diamond, 1991; Bharadwaj and Shivdasani, 2003), with the unobservable risks related to the M&A deals compensated by loan price (Strahan, 1999).

We organize the remainder of this paper as follows. Section 2.2 describes the data sampling procedure. Section 2.3 describes the variables and the econometric specification of our analysis. Section 2.4 reports and discusses our results. Section 2.5 concludes.

2.2 Data and Sample

2.2.1 Sample selection

We obtain an initial M&A sample from the SDC M&A database. We keep both completed and withdrawn deals announced in the U.S. during 1994 and 2017. The reason for choosing 1994 to begin with is that the SEC online filings of listed companies begin in 1994, allowing us to access 8-K filings to manually verify whether an M&A transaction is indeed funded by loans. In our sample, the acquiring firms are public, but the target firms can be public, private or subsidiary firms. Following previous M&A studies, the transaction value of the M&As should be larger than 1 million, and the transaction value should be bigger than 1% of the bidders' market value of equity. This initial sample contains 20282 transactions. Additionally, the records of M&A deals should have non-missing values of the means of payment, announcement and effective dates, and transaction value. To identify the sample of loan-financed M&As, we impose several criteria. First, we drop those M&As deals where we cannot find the acquiring firm's GVKEY from Compustat. We need the GVKEY to retrieve data from Compustat and CRSP to calculate necessary control variables based on acquirer characteristics. Second, we drop those M&A deals without any cash in the consideration because an acquiring firm does not need to borrow to fund a pure-stock transaction (we keep them for the Heckman procedure in Section 2.4.4 and Appendix II, however). This reduce 8405 observations. Third, we exclude transactions where the acquirers are in the utilities (SIC code 9900 – 9999) or financial industry (SIC code 6000 – 6799), reducing 2838 observations. Fourth, we keep those M&A deals indicated by SDC as being funded by borrowing, bridge loans, or lines of credit, which reduces 7496 observations. After these criteria, we have 1312

M&A transactions potentially financed by loans. To confirm a transaction is indeed loan financed, we rely on 8-K filings. We retrieve 8-K documents filed between the deal announcement date and the third month after the deal effective date. We then search through all the retrieved 8-K filings to find out which 8-K files are about M&A transactions.

We retrieve the data on loan facilities from Thomson Reuters DealScan.[4] A loan contract (called a loan package in Dealscan), contains one or more loan facilities. The loan facilities within the same package may contain different prices, and non-price terms, and their purposes may also differ. In a syndicated loan contract, the lender(s) may also be different across facilities. Dealscan provides information on a variety of loan terms, on the role of lenders (e.g., leading or participating banks in a syndicated loan), and on basic characteristics of borrowers.

2.2.2 Matching loan facilities to acquiring firms

We follow two steps to match Dealscan loan facilities to our sample of potentially loan-financed deals. The first step involves matching borrowers from Dealscan to our sample acquirers. The second step involves selecting the facilities used for a M&A transaction from all the facilities ever initiated by a borrower/acquirer.

Dealscan does not have a firm ID (e.g., GVKEY) that can be used to match the borrowers to the acquiring firms covered by SDC, or to the data provided by Compustat or CRSP. Chava and Roberts (2008) construct a Compustat-Dealscan linkage file covering the period from January 1983 to August 2017. We use this linkage file, together with the GVKEY-CUSIP link file from CRSP,

[4]Dealscan collects information on worldwide loan contracts. It covers up to three quarters of loans made in the U.S. Market (Carey and Hrycray, 1999). Dealscan gathers information of these loan contracts from SEC filings, other public documents (including 10-K, 10-Q forms, and registration statements), lenders, and proprietary sources.

to match borrowers to acquiring firms. Once this is done, for each acquiring firm, we have all the loan facilities it has ever taken. In the second step, from all the loan facilities ever taken by an acquiring firm, we find the loan facilities specifically used for a particular M&A transaction.

To do this, we read through the M&A-related 8-K filings selected earlier containing information about financing sources. The information on sources of finance are disclosed in sections titled "Item 1.01 Entry into a Material Definitive Agreement", "Item 2.01 Completion of Acquisition or Disposition of Assets", "Item 2.03 Creation of a Direct Financial Obligation or an Obligation under an Off-Balance Sheet Arrangement of a Registrant", and "Item 2 Acquisition or Disposition of Assets" (only before August, 2004). The information contained therein became more and more detailed over time. This information we use to decide which loan and related facility (facilities) is used in a corresponding M&A transaction.

Specifically, an 8-K file contains information on whether a deal is financed using new facilities (465 cases), existing facilities with amendment(208 cases), existing facilities without an amendment (119 cases), or a combination of these. Importantly, in most cases (634 cases), the 8-K file provides information on loan beginning date (or amendment date) which we use as the primary information for selecting Dealscan facilities. An 8-K file may also provide information on the lender, loan type, and amount, but not always. We use this information to facilitate our matching wherever possible. For amended existing loans, we use the amendment date to match because Dealscan records an amended facility as a "new" facility, and the amendment date is used as the beginning date for that facility. In the remaining cases where the loan begining/amendment dates are not disclosed in 8-K, we require the loan beginning date recorded in Dealscan to reside within one calendar year before the deal effective date.

2.3 Variables and Econometric Specifications

2.3.1 Variables of interest for the loan-price regression analysis

A. The All-in-drawn Spread

We use the All-in-drawn spread (AIDS) from Dealscan to measure loan price. Dealscan defines AIDS as "the amount the borrower pays in basis points over LIBOR for each dollar drawn down. It adds the spread of the loan with an annual (or facility) fee paid to the bank group". It measures the total cost of each dollar in a loan facility, including a set of fees and fixed spread, paid over LIBOR (Ivashina, 2009). In other words, AIDS summarizes all monetary cost of each dollar borrowed in the loan facilities that exeeds marketwide interest rate. Therefore, following prior loan price studies (e.g., Ivashina, 2009; Bharath et al., 2011, etc.), we use AIDS for our analysis to capture the total cost of loan financing in the M&A transactions.

B. Relative deal size

We calculate the relative deal size as the ratio of transaction value to the acquiring firm's market value of equity measured at the end of last fiscal year relative to deal announcement. We also use the ratio of the transaction value to the acquirer's book value of total assets at the end of the last fiscal year and obtain qualitatively the same results(unreported but available upon request) [5].

[5]We also use the acquiring firms' market value of equity 3-month prior to the M&A announcements to calculate the relative deal size. Using such a measure in regression analysis gets quite similar results to what we report latter. For brevity, they are not presented but available upon reqeust.

2.3.2 Control variables for the loan-price regression analysis

We include several deal characteristics that potentially relate to various risks associated with a transaction. Our interests here are twofold: 1) to examine whether any of these variables capture risk-related effects on M&A loan price additional to that captured by the relative deal size and 2) to ensure the effect of relative deal size is robust to controlling for the effects of these variables. First, we use a dummy variable to indicate whether a M&A transaction is a diversifying deal (equals 1) or not (equals 0). We include this variable because Morck, Shleifer and Vishny (1990) posit that a diversifying deal may reflect managerial motive and involves agency risk. We define a deal as diversifying if the acquiring and the target firm are from two different 2-digit SIC code industries. Second, we control for the target's public status by adding two dummy variables: one dummy variable is 1 for public targets and 0 otherwise, and the other is 1 for subsidiary firms and 0 otherwise. These variables are included according to the previous literature. Specifically, Officer, Poulsen and Stegemoller (2008) postulate that private firms are more opaque than public firms and involve more valuation uncertainty. Fuller, Netter and Stegemoller (2002) maintain that acquirers have less risk of overpaying private targets because of the private targets' liquidity demand. Further, Maksimovic and Phillips (2001) postulate that the acquisitions of company assets (including subsidiaries) enhance acquirer performance, which may, in turn, enhance loan quality. Third, we control for deal attitude by including a dummy variable for hostility (1 for hostile mergers and 0 otherwise), because target resistance either pushes up offer price in the interest of target shareholders or entrench the target management at the expense of shareholders (Baron, 1983; Schwert, 2000). Forth, an international setting is far more complex than

a domestic one, and it is more difficult to coordinate actions and monitor managers across boarders (Denis, Denis and Yost, 2002). We control for a cross-border M&As using a dummy variable (1 for cross-border mergers and 0 otherwise) accordingly. Fifth,Martynova and Renneboog (2009) posit that the choice of financing sources is related to a bidders' strategic preference for the means of payment. Therefore, we control for a dummy for stock payment (1 if the deal payment contains the bidder's stocks and 0 otherwise). Last, tender offers have a shorter duration and less competition from rival bidders; thus, have less risk of incompletion than negotiated offers. Meanwhile, tender offers lead to higher premium payment and more financial restrictions for the acquirers (Offenberg and Pirinsky, 2015). Tender offers also relate to better post-transaction performance (Agrawal, Jaffe and Mandelker, 1992; Agrawal and Jaffe, 2000). Thus, we further control for a tender offer dummy (1 for tender offers and 0 otherwise).

We also control for several acquiring/borrowing-firm characteristics. We control for the size of the borrowing firm because larger firms are in a better position to serve debt (Strahan, 1999; Faccio and Masulis, 2005). We measure size using the natural logarithm of the acquiring firm's total assets reported in the fiscal year ending before deal announcement. Firms with a higher leverage ratio are likely to have less cash to serve debt (Faccio and Masulis, 2005), potentially increasing loan price. We, therefore, control for the ratio of the sum of long-term debt and debt in current liabilities to book value of total assets, measured at the end of the fiscal year before deal announcement. A deal with greater relative size may lead to a greater increase in the acquiring firm's leverage. We, therefore, also control for the change in acquirer leverage in our regression analysis. Borrowing firms with more investment opportunities have a greater demand for bank loans (Martin and Santomero, 1997). Meanwhile, firms with more growth opportunities are more likely to under-invest when debt

overhangs (Myers, 1977). Thus we control for the acquiring firm's market-to-book ratio of equity. Risk-averse lenders usually desire tangible assets because these assets provide better loan security (Faccio and Masulis, 2005) and are easier to value (Strahan, 1999) than intangible assets. Firms can also use tangible assets as collateral to reduce loan risk. Hence we control for the acquiring firm's asset tangibility ratio. We use two variables to control for the acquiring firms' bankruptcy risk (Scott and Smith, 1986). One is the Altman Z-score (Altman, 1968). The other is the borrower's credit rating (Lim, Lee, Kausar and Walker, 2014). We encode the acquiring firm's S&P long-term credit ratings from 1 to 7 (1 = AAA, 2 = AA, ..., 6 = B or worse, 7 indicates firms without ratings) following Qian and Strahan (2007).

The third set of variables we control for relate to loan contract characteristics for the M&A transactions. First, we control for the loan size by adding the natural logarithm of the average amount of loan facilities used for a transaction scaled by the sum of the combining firms' total assets. We do this because lenders are more cautious when lending in large amounts, as large loans reduce diversification and increase banking risk (Diamond, 1984). Second, lenders use financial covenants to protect themselves (Rajan and Winton, 1995; Bradley and Roberts, 2015). We then add a dummy variable to control for the effects of financial covenants (1 for the inclusion of financial covenants in any of the facilities used for a M&A transaction and 0 otherwise). Third, we add a dummy variable for relationship lending, because Bharath et al. (2011) document that relationship lending lowers loan price by mitigating the information asymmetry between lenders and borrowers. This dummy variable is one if the acquiring firm has previously borrowed from the lender(s) in the three years before M&A announcement and 0 otherwise. Fourth, Ivashina (2009) finds syndicated loans involve additional risks due to the information asymmetry among the lead and the participant lender. Thus, we control for this effect by

including a dummy variable that is one if one or more of the facilities used for a M&A transaction is from syndication of lenders and zero otherwise. Last, lenders use performance pricing terms to mitigate the risks of adverse selection and moral hazards (Asquith, Beatty and Weber, 2005). We control for this effect using a dummy variable that is one if any of the facilities used for a M&A transaction contains performance pricing terms and 0 otherwise.

Last, since the default spread between the risky debt and the treasury securities may capture cyclical factors affecting default risk, we control for the default spread in our regressions.

2.3.3 Econometric specifications for the loan-price analysis

We use the seemingly unrelated regressions (SUR) model for our main analysis, based on the assumption that the loan price and non-price terms (i.e., maturity and the use of collateral) in a M&A transaction are likely to be influenced by unobserved common factors. For example, about half of the M&A transactions in our sample are funded by more than one loan facilities, and some of these facilities are initiated for multiple purposes aside from funding M&A transactions. These alternative uses of some of these loan facilities are not all disclosed, but they may influence all loan terms.[6] The SUR model allows the error terms of the system of equations to be statistically correlated, capturing the correlations among loan terms due to unmeasured factors. The SUR specification is also used in loan contract studies, e.g., Aivazian et al. (2015) and Ge, Kim and Song (2012). Some of the previous literature examines the determinants of loan price and non-price terms within the same loan facility, using the simultaneous equation model (SEM), assuming simul-

[6]Dealscan only reports a maximum of two purposes of a loan facility.

taneous and consistent mutual impacts on each other among loan terms (e.g., Bharath et al., 2011; Aivazian et al., 2015). Since we investigate loan price at the M&A transaction level instead of the facility level, it is hard to argue the loan terms of one facility impact those terms in other facilities at the same time (although they may be statistically correlated). Moreover, according to Wooldridge (2013, p143 – 144), a SEM specification is most relevant when different equations represents the decision process of different economic agents, and the outcome variables are determined in the equilibrium. However, the loan terms in our analysis are determined by the same pair of lender and borrower.

In our SUR model, the dependent variables of three equations are AIDS, maturity, and a collateral dummy, respectively. Both AIDS and maturity are averaged across the facilities for each deal, if the deal is funded by multiple loan facilities. We take either loan amount weighted average or arithmetic average of AIDS and maturity. Since using arithmetic averages gets quite similar results, the reported results are based on weighted averages of AIDS and maturity for brevity. The collateral dummy is one if any facility used to fund a M&A transaction is secured by collateral and zero otherwise. The $\mathbf{X_i}$ $(i = 1, 2, 3)$ is the vector of independent variables for each equation. All dependent variables do not appear on the right-hand side of the equations, but ϵ_i can be correlated.

$$\begin{cases} AIDS & = \mathbf{X_1}\boldsymbol{\alpha} + \boldsymbol{\epsilon_1} \\ Maturity & = \mathbf{X_2}\boldsymbol{\beta} + \boldsymbol{\epsilon_2} \\ Collateral & = \mathbf{X_3}\boldsymbol{\gamma} + \boldsymbol{\epsilon_3} \end{cases} \tag{2.1}$$

The vectors of independent variables are not entirely the same across equa-

tions.[7] The variables excluded from each equation (and appear in other equations) are broadly in line with Bharath et al. (2011) and Aivazian et al. (2015). In the AIDS equation, we include the acquiring firm's ratio of EBITDA to sales,[8] current assets ratio, and the natural logarithm of interest coverage ratio, all measured before the M&A announcement. A higher EBITDA to sales ratio means higher profitability and predicts higher future cash flows and better loan quality. As is shown by Bharath et al. (2011) among others, higher profitability is associated with lower borrowing costs. A higher current asset ratio lowers loan price as it reduces liquidity risk and improves loan quality. In the previous literature (e.g., Bharath et al., 2011), however, these variables hardly bear on the choice of debt maturity directly. We, therefore, exclude them from the maturity equation. Profitability may be used to evaluate creditability in cash-flow based loans and may substitute for hard assets as collateral. We, therefore, include EBITDA/Sales in the collateral equation. Interest coverage ratio directly reflects the acquiring firm's ability to service interest payment and, therefore, is an important determinant of loan price. The interest coverage ratio's links to maturity and collateral, however, are not as obvious. Previous studies on debt maturity usually do not include interest coverage as a determinant (e.g., Barclay and Smith Jr, 1995; Huang and Shang, 2019)

In the maturity equation, we include the natural logarithm of acquiring firm's asset maturity as a unique determinant excluded from other equations. Hart and Moore (1994) postulate that the firm attempts to match its debt maturity to the economic life of the assets. Therefore, the firm's asset maturity affects the choice of maturity of debts, but is unlikely to influence other loan

[7] This is for economic reasons which we discuss below. Econometric wise, the vectors are allowed to be the same, in which case the OLS estimator gives consistent estimation (see Wooldridge, 2010, p143–144). When we set the vectors to be the same as the OLS estimator, we obtain similar results. We use the Feasible General Least Square (FGLS) estimator for estimation.

[8] EBITDA denotes the Earnings Before Interest Tax Depreciation and Amortization.

terms. For the collateral equation, we add the industry mean of firm asset tangibility ratio as a unique determinant. The industry mean of firm tangibility ratio in each year is based on Bharath et al. (2011) who posit that borrowers in the industries with more tangible assets are more likely to be required to put up a collateral. Meanwhile, the industry average asset tangibility is hardly of direct relevance for loan price and maturity choice. In each equation, we also control for the characteristics of the acquiring firms, those of the M&A transactions, those of the loan contracts, and industry and year effects. The unique variables included in each equation are most relevant for their corresponding loan terms and bear no obvious impact on other loan terms. Given the loan terms are contracted jointly for a loan facility, we cannot strictly rule out the relevance of these unique variables to other loan terms, which represents a possible caveat in the current SUR specification. In an unreported robustness check, we force the set of determinants to be the same across all three equations and used OLS for estimation. Our results do not change qualitatively. We include the detailed definitions of these control variables in the appendix at the end of this paper.

2.4 Empirical Analysis

2.4.1 Sample distribution and summary statistics

Table 2.1 presents the distribution of our sample along four dimensions. Panel A contains the distribution by announcement years. The peak years are from 1997 to 1999, when 141 transactions were announced (approximately 27% of our sample). The trough years are 2000 – 2003 and 2008 – 2011. Panel B reports that 86% of the acquiring firms made only one transaction in our sample and 14% of the acquiring firms have multiple M&A transactions. Panel

C list the number of M&A transactions by the number of loan facilities used. There are 235 transactions linked to only one facility (45.9% of the sample), and 153 transactions use two facilities (29.88% of the sample). The largest number of facilities used in one M&A transaction is five. Panel D shows that 71% of the loan facilities have their inception date between the M&A announcement date and effective date. There are 17 facilities that begin on the announcement date, and 288 (27%) begin before the announcement date. No facility begins after the effective date.

Table 2.2 reports the summary statistics of the variables used in our analysis. The (weighted average) AIDS and the arithmetic average AIDS have very similar sample statistics. The mean of the arithmetic average AIDS (AIDS) is 194 (187) basis points higher than the London Interbank Offered Rate (LIBOR). The mean and median of the relative size ratio are 0.62 and 0.37 respectively. A quarter of M&As are funded by the lenders who have previous lending relation with the acquiring firm. Around two-thirds of M&As in our sample contain performance pricing terms in their loan contracts. Thirty five percent of the transactions take place between two firms from different 2-digit SIC industries (the Diversify Deal Dummy), and fifty five percent of the target firms are publicly listed, while 16% of the targets are subsidiaries. Thirteen percent are cross-border M&As. Three percent are hostile deals. Tender offers contribute 26% to the sample.

Table 2.2 also presents the characteristics of acquiring firms and loan contracts. Acquiring firms in our sample, on average, are large or medium firms, with the mean value of total assets reaching 2314.35 million dollars. Acquiring firms' average leverage ratio is 0.26, indicating robust debt capacity. The average acquirer's Altman Z-score is 4.88, reflecting low bankruptcy risks. On average, the market-to-book ratio is 3.50, and EBITDA is 19% of total sales, showing solid growth and profitability. 28% of total assets of the acquiring

firms are tangible assets, and the current assets are about twice of current liabilities. The average credit rating score is 5.99, somewhere below BB. In terms of loan-contract characteristics, the average facility amount is 505 million dollars and average maturity is 54.31 months. Sixty percent of the acquiring firms offer collateral to secure loans. And there are 77% of the M&A transactions are funded by loan facilities with financial covenants. Notably, almost all of the M&As are funded by syndicated loans, and this is because M&A transactions are often too large for a single bank to fund.

Regarding acquisition performance, we observe that acquirers under perform the CRSP value-weighted market index by 5% in the three years after transaction. The industry-adjusted ROA of an average acquirer is 4% before and 5% after the transaction.

2.4.2 Univariate analysis of loan price

Table 2.3 presents the univariate analysis on the (weighted average) AIDS. We examine how AIDS differs between sub-groups divided according to our variables of interest (i.e., the relative deal size) as well as several other M&A characteristics. The AIDS is significantly (at the 1% level) higher for the transactions with larger relative size. Large transactions (with relative deal size greater than the sample mean) have an average AIDS of 228.36 basis points above LIBOR, whereas small transactions (relative deal size is less than the sample mean) have an average AIDS of 166 basis points above LIBOR, indicating that larger transactions have higher loan price.

Table 2.3 also reports the differences in the AIDS between subsamples defined using a set of other M&As characteristics. We find the AIDS is significantly (at the 1% level) higher for the deals where the consideration includes stock payment than those deals paid all by cash (mean values are 214.70 vs.

175.62 basis points above LIBOR), which suggests that stock payment is used for riskier deals. We find no significant difference in the AIDS between diversifying deals and non-diversifying deals. The AIDS is significantly different between the acquisitions of public targets and those of non-public targets. Public targets are associated with an average AIDS about 32 basis points lower ($t = 3.25$), indicating the factors associated with a target's public status, e.g., information asymmetry (Officer et al., 2008) and the targets' liquidity demand (Fuller et al., 2002), potentially influence loan price. Subsidiary target is associated with significantly lower AIDS than public and private targets (181.13 vs. 218.70), indicating it is less complex to acquire the assets of a subsidiary than to acquire the whole of a firm. Cross-border transactions have significantly lower average AIDS than domestic transactions (163.18 basis points vs. 190.48; $t = 2.10$), which contradicts the prediction based on Denis et al. (2002). Hostile deals have significantly lower (at the 1% level) AIDS than friendly ones (105.59 vs. 189.19 basis points above LIBOR). It is possible that hostile deals remove inefficient management, enhancing deal and loan quality. Tender offers have significantly lower loan price than negotiated deals (152.91 basis points above LIBOR vs. 199.18; $t = 4.17$). The use of tender offer is a strong indication of an acquiring firm's favorable evaluation of the deal and the ease of completing the deal, which is likely to overweight the concerns of overpaying the target. In our subsequent multivariate analysis, we control for these effects.

2.4.3 Multivariate analysis of loan price

We report the results of our SUR analysis in Table 2.4. The regressions are at the M&A deal level. The Breusch-Pagan χ^2 statistic at the bottom of the table is significant at the 1% level, rejecting the null hypothesis that error terms

of the equations are uncorrelated. This result validates our use of the SUR model. The coefficient of the relative deal size ratio in the AIDS regression under column 1 is 0.164 and significant at the 1% level($z = 5.28$), indicating a one standard deviation increase of the relative size ratio (i.e., 0.74) raises an average acquirer's AIDS by 22.70 basis points. This result demonstrates that lenders are concerned about large transactions and their associated risks (Alexandridis et al., 2013; Datta, 1991; Faccio and Masulis, 2005; Hansen, 1987). It is also in line with the observation of Moeller, Schlingemann and Stulz (2004) that acquiring firms receive lower gains from large deals, which in turn lower loan quality. This result is robust to the inclusion of industry and year effects.

Several acquiring firms' characteristics and loan-contract characteristics also exhibit significant effects on AIDS. The coefficient on the natural logarithm of the acquiring firm's total assets is significantly (at the 5% level or above) negative in the AIDS regression, consistent with the common observation that large firms have better debt capacity and loan quality. The acquiring firms with higher leverage have significantly (at the 1% level with $z = 7.51$) higher AIDS than those with lower leverage, consistent with what Faccio and Masulis (2005) find. The acquiring firms' market-to-book ratio is statistically insignificant. We further note that the tangibility ratio has a negative (-0.333) and significant (at the 5% level) coefficient in the AIDS equation, consistent with the idea that higher asset tangibility relates to better value certainty and debt quality (Faccio and Masulis, 2005; Strahan, 1999). Lower credit rating indicates greater default risk and, therefore, relates to higher AIDS. Indeed, in the AIDS equation, the credit rating score has a positive (0.069) and significant (at the 1% level) coefficient (recall we encode this score as an inverse measure of creditability). The Altman Z-score does not have a statistically significant coefficient in the AIDS equation. It is possible the credit rating score

subsumes the effect of bankruptcy. A larger relative deal size may lead to more loan financing, which increases the acquiring firm's leverage from before to after the transaction. To rule out the possibility that the relative size effect is due to change in leverage, we explicitly control for the change in leverage in the AIDS equation. We notice that the change in leverage indeed significantly increases the loan price (the coefficient is 0.613 and significant at the 1% level ($z = 3.66$). However, the relative deal size effect is not affected by the inclusion of the change in leverage. We also explicitly control for the amount of loan facilities scaled by acquirer post-transaction total assets. This variable measures the change in acquirer leverage due to the use of loan. The coefficient on this variable, however, is statistically insignificant. It could be that the facility amount impact loan price through the change in leverage, and its effect is subsumed by the later effect.[9]

The coefficient on relationship lending dummy is statistically insignificant, at odds with the finding of Ivashina and Kovner (2011). These results suggest M&A transactions considerably alter the risk profile of the acquiring firm, making the effect of relationship lending weak. The performance pricing dummy has a negative and marginally significant ($z = -1.81$) coefficient in all specifications. Further, we do not find the loan syndication to have a statistically significant coefficient.

Turning to the deal characteristics (namely the diversify deal dummy, the public target dummy, the subsidiary target dummy, the cross-border deal dummy, the hostile deal dummy, and the tender offer dummy), we do not find any of them has a significant impact. Such absence of effects indicates that these deal characteristics are of secondary concerns for the lenders compared

[9]Fishman (1989) posits that the means of payment in an acquisition is significantly affected by the risk of deal incompletion. Since the effectiveness of a loan is contingent upon the completion of a deal, it would be interesting to study how the risk of incompletion impact loan price. Unfortunately, we only have seven withdrawn deals in our sample, which does not allow us to conduct a serious analysis.

to the relative deal value.

As is expected, the coefficient on $ln(1 + interest\ coverage)$ is negative (-0.047) and significant at the 1% level ($z = 2.61$). The coefficient on $EBITDA/Sales$ is -0.396 and statistically significant at the 10% level, indicating higher acquirer profitability is associated with lower loan price. The coefficient on the *current ratio* has the expected negative sign (-0.012) but is statistically insignificant.

From columns 2 and 3, we note that the relative deal size has a significantly positive impact on the loan maturity but does not significantly impact the use of collateral (Although the sign is as expected). In particular, the relative deal szie has a coefficient of 0.078 (significant at 5% level) in the maturity regression under column 2, and insignificant coefficient (0.045) in the collateral equation. Additionally, in the maturity equation, the coefficient of hostile deal dummy is 0.329 and significantly at 5% level. Hostile deals may cause the target resistance, which may lengthen the completition of the deal and may generate extra costs for completing the transaction. Thus, the acquring firms prefer loans with longer maturity. However, a caveat emerging for the power of statistical significance, as only 13 hostile deals in our sample. The coefficient of tender offer is -0.151 and significant at 5% level, indicating that the maturity of loans for funding tender offer M&As is shorter than that for funding other types of M&As. Due to the shorter duration and fewer rival bidders, the acquiring firms have lower demand on long-term credit. So the acquring firms in the tender offers prefer to choose shorter loans. The credit rating score gets a coefficient of 0.106, which is statistically significant at 1% level. This result means that the acquring firms with worse credit ratings or without ratings receive longer maturity loans. The reason may be that worse credit ratings or no ratings restrict the acquiring firms' access to credit. Once they get funded by a lender, the acquring firms have incentive to ask for longer maturity to

keep the relationship with the lenders. Meanwhile, the costs of information collection and monitorting on worse rated borrowers are higher, therefore, the lenders may offer longer maturity of loans to save such costs. The lenders may also have motivation to provide longer agreemtns for worse rated or unrated borrowers, because the lenders can charge more on those credit-constraint borrowing firms to seek monopoly rents (Petersen and Rajan, 1995).

Among a variety of loan contract characteristics, we only find performance pricing terms dummy and syndicated loan dummy have statistically significant associations with the maturity. The coefficient of performance pricing terms dummy variable is 0.195 (significant at 1% level), indicating that the loans with performance pricing terms have longer maturity than those without such terms. Performance pricing temrs reduce the potential renegotiation costs during the life of the loans for both lenders and borrowers (Asquith et al., 2005). Therefore, the loans with performance pricing terms are more likely to have longer maturity to take advantage of lower renegotiation costs. Syndicated loan dummy gets a coefficient of 0.448, which is significant at 1% level, indicating that the maturity of loans provided by a syndication of lenders is longer than that of bilateral loans. The risks of the lending are shared by multiple lenders, and the cost of negotiation is higher among the syndication. So, because of the lower risks and in order to avoid higher negotiation cost among the lenders, the lenders of syndicated loans are more likely to offer longer maturity. In addition, the market-wide default spread has a significantly negative impact on the maturity (-14.409, significant at 5%). It indicates that when the market risk is higher, the lenders are risk-aversed and thus shorten the maturity to reduce their exposure to risks.

In collateral equation, the natural logarithm of acquiriing firms' total assets get a coefficient of -0.117 (significant at 1% level). This is in line with the view that the assets of larger firms are well-established with more stable

access to cash flows to repay the debt (Strahan, 1999). Thus, the lenders are less likely to ask a larger firm for collateral. The coefficient of tangibility ratio is −0.309 and significant at 5% level, which means that the acquring firms with more tangbile assets are less likely to be asked for providing collateral to secure the loans. In line with Strahan (1999), tangible assets are easier to lenders to evaluate. then the lenders suffer fewer from information asymmetries. Therefore, the borrowing firms that own more tangible assets are more transparent to the lenders. The lenders are less likely to require collateral for the lending because of the less concern on the information asymmetry problem. Credit rating score has a coefficient of 0.064 that is significant at 1% level, which indicates that worse rated borrowing firms are more likely to be asked for providing collateral. The coefficients of leverage and leverage change are 0.754 and 0.409, respectively, where both are significant at 1% level. Higher leverage is associated with higher bankruptcy likelihood, therefore, it is more likely that the lenders request a collateral to secure the loan when the acquiring firms and the M&A transactions relates to more bankruptcy risks.

Among the characteristics of the loan contracts, we find that the inclusion of financial covenants has a positive association with the collateral term (0.201, significant at 1% level). Financial covenants are used to mornitor the borrowing firms' operation during the life of the loans. It may reflect the uncontractible future risks of the borrowers. Therefore, both financial covenants and collateral are used to reduce ex post credit risks of the lendings. Performance pricing terms dummy has a significant coefficient of 0.115 (at 5% level). Performance pricing terms are assoicated with adverse selection and moral hazard problem that cannot be contracted ex ante (Asquith et al., 2005). So, performance pricing terms may capture the ex ante uncontractible risks, which incentizes the lenders to request collateral. We also find a positive coefficient of market-wide default spread (−17.979, significant at 1% level). It indicates

that the lenders are more likely to request collateral when the market risk is higher. However, we do not get any significant impacts of the characteristics of the M&As on the collateral term.

2.4.4 Robustness tests

Apart from using deal-level data, we also use facility-level data to perform robustness checks. Here, we measure loan-contract characteristics for each facility. We report the results in Table 2.5. Column 1 contains OLS estimates, assuming maturity and collateral dummy are predetermined. The coefficient of the relative size ratio is positive (0.105) and statistically significant at the 1% level. We find both maturity and collateral are positively and significantly (at the 1% level) related to AIDS. Loans with longer maturity usually involve greater risks, which pushes up the loan price. The interpretation of the positive association between collateral and loan price has two folds. On the one hand, collateral and higher loan price could be substitutes; on the other, lenders are more likely to ask for collateral to secure riskier loans. The coefficient on collateral reflects the net effect.

In column 2, 3, and 4, we report the estimates of the SUR model at the loan facility level. In the AIDS equation, the relative deal size has a coefficient of 0.122 which is statistically significant at the 1% level ($t = 6.30$). At the bottom of the table, the Breusch-Pagan χ^2 test statistic indicates significance at the 1% level, rejecting the null hypothesis that the error terms are uncorrelated across equations. This test further confirms that the SUR model is an appropriate specification in our context of analysis.

Since we include only the loan-financed M&A transactions in the sample for loan-price analysis, the self-selection issue (Heckman (1979)) may bias our estimates. Therefore, we use the Heckman (1979) self-selection model to test

the robustness of our results, using data at the M&A level. We report the results in column 5. The execution of the Heckman (1979) model requires a two-step procedure. The first step is to estimate the probability of loan finance (reported in Appendix II). The dependent variable of the second stage is the natural logarithm of the (weighted average) AIDS. All other variables are identical to those in the baseline model except that we also include the Inverse Mills Ratio (IMR) obtained from the first stage. The Wald tests indicate that the null hypothesis $\rho = 0$ cannot be rejected at the 10% level, suggesting self-selection is unlikely to affect our results. Consistently, the coefficient on the IMR is statistically insignificant ($t = 0.19$). The coefficient on the relative deal size is qualitatively the same as in our baseline SUR tests.

In Table 2.6, we further control for several additional variables. Due to data availability, adding these variables reduces our sample size considerably. From a theoretical point of view, however, they may impact the loan price. In particular, we include the target firm's Altman Z-score in column 1 because the target default likelihood may impact loan price for the combined firm. In column 2, we add the offer premium to the regression for the concern that overpayment to the target shareholders may harm post-transaction performance and reduce loan quality. In column 3, we add the acquiring firm's pre-transaction stock return volatility to control for the inherited value uncertainty of the acquirer. In columns 4 and 5, we add the E-index (Bebchuk, Cohen and Ferrell, 2009) and the CEO duality measure (Brickley, Coles and Jarrell, 1997) to explicitly control for the quality of acquirer's corporate governance. We find that the effect of relative deal size persists in all the regressions. The additional variables discussed above has no significant effects on AIDS apart from the acquirer's pre-transaction stock-return volatility.

2.4.5 Loan price and post-acquisition performance

In Table 2.7, we report our estimates on how loan price is associated with post-transaction performance. For the stock-market price performance, we estimate the following regression using OLS,

$$Post\ Performance_i = \alpha + \beta ln(AIDS_i) + \mathbf{X_i}\eta + \epsilon_i \tag{2.2}$$

For the accounting-based performance measure (i.e., ROA), we follow the specification of Healy, Palepu and Ruback (1992). Specifically,

$$Post Performance_i = \alpha + \beta ln(AIDS_i) + \gamma Pre Performance_i + \mathbf{X_i}\eta + \epsilon_i \tag{2.3}$$

, where i indexes M&A transactions. *Post Performance* is the acquirer performance after the deal completion and *Pre Performance* is the acquirer performance before the deal announcement. γ measures the extent to which an acquirer's pre-acquisition business persists after the transaction. β and η measure the effect of any explicitly specified variable on acquirer post-transaction performance. α measures the effect of the transaction on acquirer performance aside from those explicitly controlled for. According to Strahan (1999), loan price summarizes any risks that cannot be addressed by other loan terms. If lenders on average price the loan correctly, the AIDS should be a sufficient statistic for the combined firm's post-transaction performance. We, therefore, expect β to be significantly negative. We measure post-completion performance using four variables, namely, the combined firm's buy-and-hold return over the three years after deal completion (HPR36), the combined firm's buy-and-hold-abnormal return relative to the CRSP value-weighted market portfolio return (including distribution) (BHAR36) measured over the three years post-completion, the combined firm's return on assets (ROA), and the combined firm's ROA adjusted by industry median in each year (Adj. ROA)[10]. The *ROAs* and adjusted *ROAs* are also measured over the three years be-

[10]We get similar results when we measure performance over the 60 months post the deal completion.

fore the deal announcement or after the deal completion. The $HPR36$ and $BHAR36$ are based on stock market data, and the ROA and $Adj.ROA$ are based on financial-statement data. In all the equations in Table 2.7, we find the loan price variable $ln(AIDS)$ have negative coefficients, and all coefficients are statistically significant at the 10% level or above. For example, in column 8, the coefficient on $ln(AIDS)$ is -0.024 and significant at the 1% level, which suggests that a one-standard-deviation increase in AIDS leads to a 1.44 percentage point decrease in the combined firm's adjusted ROA in the three years post-transaction. In a nut shell, the results that the loan price significantly predicts the combined firm's post-transaction indicate that lenders price the loan correctly on average. Broadly, these results are consistent with the view that lenders have information advantage about the borrowers as is postulated by Diamond (1984) and Bharadwaj and Shivdasani (2003).

2.5 Conclusive Remarks

Financing cost is a primary consideration in M&A transactions because it impacts M&A gains directly. Previous literature has studied the determinants of debt financing likelihood in M&As (Martynova and Renneboog, 2009) and how the use of debt financing impacts M&A performance (Schlingemann, 2004; Bharadwaj and Shivdasani, 2003). In this paper, we specifically study loan price in M&A transactions. We find that the relative deal size has a significant and robust positive effect on loan price. This positive effect is consistent with the notion that greater deal complexity and information risk associated with large transactions (e.g., Alexandridis et al., 2013; Datta, 1991; Faccio and Masulis, 2005; Hansen, 1987). We also find higher loan price is associated with poorer post-transaction performance, which demonstrates that the loan price correctly incorporates the information on the quality of acquisitions.

Our study also demonstrates that the characteristics of major corporate investment projects can affect loan price significantly. We are not aware of another study from the extant literature that examines loan price or non-price terms in the context of major corporate investment such as M&A transactions. Previous studies have emphasized the importance of relationship lending, relationship syndication, borrowers' organizational structure, and accounting quality in determining loan prices (Bharath et al., 2011; Boot and Thakor, 2000; Ivashina, 2009; Ivashina and Kovner, 2011; Aivazian et al., 2015, among others). These studies assume the funded projects are homogeneous. We contribute to the literature by showing that the variation in the characteristics of large corporate investments impact loan price significantly.

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Table 2.1: Sample distribution

Panel A: Distribution of M&A by years

Announcement Year	# of M&As	Percent%
1994	8	1.56
1995	31	6.05
1996	26	5.08
1997	51	9.96
1998	53	10.35
1999	37	7.23
2000	11	2.15
2001	17	3.32
2002	13	2.54
2003	12	2.34
2004	15	2.93
2005	17	3.32
2006	21	4.10
2007	27	5.27
2008	19	3.71
2009	3	0.59
2010	9	1.76
2011	16	3.13
2012	23	4.49
2013	15	2.93
2014	22	4.30
2015	35	6.84
2016	29	5.66
2017	2	0.39
Total	512	100.00

Panel B: Distribution of acquring firms by the number of M&As they each make

# of M&As done by an acquirer	# of firms	Percent%
1	377	86.07
2	50	11.42
3	9	2.05
4	2	0.46
Total	438	100.00

Panel C: Distribution of the M&As by the number of loan facilities used in each transaction

# of facilities used for one M&A	# of M&As	Percent%
1	235	45.90
2	153	29.88
3	68	13.28
4	20	3.91
5	34	7.03
Total	512	100.00

Panel D: Distribution of loan facilities by the beginning date relative to M&A announcement

	# of facilities	Percent%
Ann. date before facility beginning date	735	71.12
Ann. date and facility beginning date are same	17	1.61
Ann. date after facility beginning date	243	27.27
Total	995	100.00

This table reports the distribution of our loan funded M&A sample. *Panel A* shows the distribution by year of announcements of M&As. *Panel B* tabulates the number of M&A transactions made by an acquiring firm. *Panel C* reports the distribution by the number of loan facilities used in a M&A transaction. *Panel D* shows the distribution by loan beginning dates relative to M&A announcement dates.

Table 2.2: Summary statistics

	# of M&As	Mean	S.D.	p5	p25	Median	p75	p95
Loan price								
AIDS	512	187.07	112.32	30.00	100.00	175.00	252.50	400.00
Arithmetic average AIDS	512	193.96	107.07	42.50	112.50	175.00	254.17	400.00
Ln(AIDS)	512	5.06	0.67	3.74	4.72	5.16	5.53	5.99
Non-price loan terms								
Maturity	512	54.32	19.20	12.00	42.00	60.00	64.75	84.00
Ln(Maturity)	512	3.89	0.53	2.48	3.74	4.09	4.17	4.43
Collateral	512	0.60	0.49	0.00	0.00	1.00	1.00	1.00
Size of M&A transactions								
Relative deal size	512	0.62	0.74	0.07	0.20	0.37	0.78	1.68
Characteristics of M&As								
Stock payment dummy	512	0.29	0.46	0.00	0.00	0.00	1.00	1.00
Diversify deal	512	0.35	0.48	0.00	0.00	0.00	1.00	1.00
Public target deal	512	0.55	0.50	0.00	0.00	1.00	1.00	1.00
Subsidiary target deal	512	0.16	0.37	0.00	0.00	0.00	0.00	1.00
Cross-border deal	512	0.13	0.33	0.00	0.00	0.00	0.00	1.00
Hostile deal	512	0.03	0.16	0.00	0.00	0.00	0.00	0.00
Tender Offer	512	0.26	0.44	0.00	0.00	0.00	1.00	1.00
Characteristics of acquiring firms								
Total assets	512	2314.35	4413.69	50.46	234.88	713.92	2214.40	10167.00
Ln(Total assets)	512	6.57	1.62	3.92	5.46	6.57	7.70	9.23
Market-to-Book Ratio	512	3.50	3.76	1.02	1.56	2.47	3.86	8.86
Tangibility ratio	512	0.28	0.23	0.04	0.10	0.20	0.40	0.79
Altman Z-Score	512	4.88	4.18	1.20	2.66	3.79	5.54	12.60
Credit rating score	512	5.99	1.34	3.00	5.00	7.00	7.00	7.00
Leverage	512	0.26	0.20	0.01	0.09	0.23	0.36	0.63
Δ Leverage	512	0.10	0.14	-0.10	0.00	0.09	0.18	0.37
Characteristics of loan contracts								

Facility amount	512	504.62	776.17	15.00	88.75	222.50	550.00	2000.00
Facility amount/total assets	512	0.42	0.37	0.07	0.19	0.31	0.56	1.16
Facility maturity	512	54.29	19.11	12.00	42.00	60.00	64.75	84.00
Financial covenant dummy	512	0.77	0.42	0.00	1.00	1.00	1.00	1.00
Performance pricing terms dummy	512	0.68	0.47	0.00	0.00	1.00	1.00	1.00
Syndicated facility dummy	512	0.96	0.18	1.00	1.00	1.00	1.00	1.00
Relationship lending dummy	512	0.25	0.43	0.00	0.00	0.00	0.50	1.00
Extra control variables								
EBITDA/Sales	512	0.19	0.14	0.04	0.09	0.15	0.23	0.49
Current ratio	512	2.22	1.38	0.69	1.35	1.91	2.69	4.69
Ln(1 + Interest coverage)	512	2.40	1.35	0.77	1.51	2.14	2.88	5.38
Total assets maturity	512	3555.76	14477.36	21.47	97.31	338.29	1417.90	12009.62
Ln(Total assets maturity)	512	5.92	1.91	3.07	4.58	5.82	7.13	9.39
Market-wide default spread	512	0.02	0.01	0.02	0.02	0.02	0.03	0.03
Industry level average of tangibility	512	0.29	0.18	0.11	0.16	0.22	0.37	0.67
Target's Altman Z-Score	213	4.60	3.88	0.87	2.51	3.66	5.43	11.22
Offer premium	226	1.25	0.40	0.56	1.01	1.22	1.47	1.85
Acquirer's ex ante stock return volatility	450	0.11	0.05	0.05	0.08	0.10	0.13	0.21
E-index	198	2.95	1.22	1.00	2.00	3.00	4.00	5.00
Separated CEO and chair	344	0.49	0.50	0.00	0.00	0.00	1.00	1.00
Performance measures								
HPR36	391	1.29	0.96	0.16	0.67	1.08	1.66	3.04
BHAR36	391	−0.05	0.92	−1.11	−0.63	−0.23	0.26	1.68
ROA (Post-completion 3-year average)	418	0.02	0.06	−0.11	0.01	0.03	0.06	0.10
Adj. ROA (Post-completion 3-year average)	418	0.04	0.11	−0.12	−0.02	0.02	0.06	0.25
ROA (Pre-announcement 3-year average)	418	0.05	0.06	−0.06	0.02	0.05	0.08	0.15
Adj. ROA (Pre-announcement 3-year average)	418	0.05	0.11	−0.07	0.00	0.03	0.08	0.27

Table 2.3: Univariate analysis

	Dummy variable=0/ Continuous variable < sample mean			Dummy variable=1/ Continuous variable ≥ sample mean				
	N	Mean	Median	N	Mean	Median	T	χ^2
Size of the M&A transactions								
Relative deal size	339	166.00	150.00	173	228.36	221.69	−5.92***	28.36***
Characteristics of the M&As								
Stock payment dummy	362	175.62	154.52	150	214.70	200.00	−3.43***	3.84*
Diversify deal	334	187.36	175 .00	178	186.53	175.00	0.08	0.58
Public target deal	228	204.87	200.00	284	172.77	150.00	3.25***	16.7***
Subsidiary target deal	431	181.13	156.19	81	218.70	221.02	−2.84***	5.90**
Cross-border deal	448	190.48	175.00	64	163.18	150.00	2.10**	4.74**
Hostile deal	499	189.19	175.00	13	105.59	75.00	3.06***	2.01
Tender offer	378	199.18	185.77	134	152.91	125.00	4.17***	9.80***

This table presents the mean and median equality tests of AIDS for the subsamples divided according to the relative deal size and other M&A characteristics respectively. The T statistics is to test the equality of mean, and the χ^2 is to test the equality of median. ***, **, and * indicate the significance at the 0.01, 0.05, and 0.1 level, respectively. Detailed definitions of the variables are described in Table 2.8.

Table 2.4: Baseline: SUR using M&A transaction level data

	Ln(AIDS)	Ln(Maturity)	Collateral
	(1)	(2)	(3)
Size of M&A transactions			
Relative deal size	0.164***	0.078**	0.045
	(5.28)	(2.29)	(1.59)
Characteristics of M&A transactions			
Stock payment dummy	0.010	0.051	0.071
	(0.19)	(0.93)	(1.53)
Diversify deal	−0.044	−0.044	−0.032
	(−1.00)	(−0.90)	(−0.79)
Public target deal	0.036	0.015	−0.012
	(0.63)	(0.23)	(−0.22)
Subsidiary target deal	0.071	0.030	0.020
	(1.09)	(0.42)	(0.34)
Cross-border deal	0.027	−0.054	0.031
	(0.45)	(−0.83)	(0.56)
Hostile deal	−0.052	0.329**	0.019
	(−0.39)	(2.22)	(0.16)
Tender Offer	−0.030	−0.151**	0.048
	(−0.50)	(−2.26)	(0.87)
Characteristics of acquiring firms			
Ln(Total assets)	−0.139***	0.054	−0.117***
	(−6.04)	(1.55)	(−5.52)
Market-to-Book Ratio	−0.008	−0.008	−0.002
	(−1.24)	(−1.18)	(−0.33)
Tangibility ratio	−0.333**	−0.222	−0.309**

	(−2.45)	(−1.42)	(−2.47)
Altman Z-Score	0.000	0.006	−0.005
	(0.03)	(0.92)	(−0.82)
Credit rating score	0.069***	0.106***	0.064***
	(3.23)	(4.45)	(3.24)
Leverage	1.116***	0.251	0.754***
	(7.25)	(1.55)	(5.54)
Δ Leverage	0.613***	0.245	0.409***
	(3.66)	(1.33)	(2.64)
Characteristics of loan contracts			
Facility amount/total assets	0.105	−0.059	0.017
	(1.47)	(−0.75)	(0.25)
Financial covenant dummy	0.061	0.031	0.201***
	(1.08)	(0.50)	(3.82)
Performance pricing terms dummy	−0.101*	0.195***	0.115**
	(−1.96)	(3.44)	(2.41)
Syndicated facility dummy	0.009	0.448***	−0.062
	(0.08)	(3.58)	(−0.59)
Relationship lending dummy	−0.009	0.025	0.043
	(−0.19)	(0.47)	(0.97)
Extra control variables			
EBITDA/Sales	−0.396*		−0.278
	(−1.91)		(−1.48)
Current ratio	−0.012		
	(−0.74)		
Ln(1 + Interest coverage)	−0.047***		
	(−2.61)		
Market-wide default spread	−2.547	−14.409**	−17.979***
	(−0.38)	(−1.96)	(−2.92)

Ln(Total assets maturity)		−0.032	
		(−1.28)	
Industry level average of tangibility			0.875
			(1.16)
Constant	5.335***	2.385***	0.819
	(12.61)	(5.18)	(1.39)
Industry	Yes	Yes	Yes
Year	Yes	Yes	Yes
Breusch-Pagan χ^2		165.99	
N		512	

This table reports the results of seemingly unrelated regression (SUR) model, using M&A transaction level data. Z statistics are listed in parentheses. Industry fixed effects are controlled for at the 2-digit SIC level, and year fixed effects are included according to the year of M&A announcement. ***, **, and * indicate the significance at 0.01, 0.05, and 0.1 level, respectively. Detailed definitions of the variables are described in Table 2.8.

Table 2.5: Robustness tests

	OLS	SUR			Heckman
	(1)	(2)	(3)	(4)	(5)
	Ln(AIDS)	Ln(AIDS)	Ln(Maturity)	Collateral	Ln(AIDS)
Non-price loan terms					
Ln(Maturity)	0.080***				0.095*
	(2.79)				(1.77)
Collateral	0.405***				0.447***
	(9.11)				(8.73)
Size of M&A transactions					
Relative deal size	0.105***	0.122***	0.051*	0.032*	0.124***
	(4.15)	(6.30)	(1.90)	(1.81)	(3.65)
Characteristics of M&A transactions					
Stock payment dummy	−0.014	0.025	0.023	0.089***	−0.008
	(−0.33)	(0.69)	(0.46)	(2.72)	(−0.19)
Diversify deal	−0.074**	−0.091***	−0.066	−0.025	−0.052
	(−1.99)	(−2.81)	(−1.48)	(−0.87)	(−1.30)
Public target	0.030	0.032	0.025	−0.005	0.046
	(0.56)	(0.74)	(0.42)	(−0.13)	(0.82)
Subsidiary target	0.048	0.058	0.004	0.024	0.080
	(0.84)	(1.19)	(0.06)	(0.55)	(1.12)
Cross-border deal	0.087*	0.099**	−0.013	0.031	−0.004
	(1.71)	(2.26)	(−0.21)	(0.79)	(−0.07)
Hostile deal	−0.226	−0.192*	0.120	0.036	−0.130
	(−1.51)	(−1.96)	(0.89)	(0.40)	(−0.81)
Tender offer	−0.063	−0.072	−0.174***	0.008	−0.026
	(−1.02)	(−1.64)	(−2.88)	(0.19)	(−0.25)
Characteristics of acquiring firms					
Ln(Total assets)	−0.090***	−0.122***	0.059*	−0.085***	−0.103***
	(−4.40)	(−7.34)	(1.86)	(−5.68)	(−4.05)

Market-to-book ratio	−0.002	−0.001	−0.001	0.001	−0.012
	(−0.45)	(−0.36)	(−0.26)	(0.42)	(−0.57)
Tangibility ratio	−0.078	−0.240**	−0.244*	−0.349***	−0.227
	(−0.73)	(−2.40)	(−1.68)	(−3.88)	(−1.58)
Altman Z-Score	0.005	0.002	0.005	−0.007	0.001
	(0.86)	(0.49)	(0.88)	(−1.59)	(0.18)
Credit rating score	0.020	0.065***	0.128***	0.088***	0.014
	(0.90)	(4.20)	(5.93)	(6.25)	(0.63)
Leverage	0.661***	0.957***	0.298**	0.667***	0.677***
	(4.68)	(8.88)	(2.11)	(7.10)	(4.06)
Δ Leverage	0.582***	0.785***	0.320**	0.440***	0.358**
	(3.66)	(6.65)	(1.98)	(4.12)	(2.18)
Characteristics of loan contracts					
Facility amount/total assets	0.027	0.044	0.017	0.038	0.063
	(0.61)	(1.00)	(0.28)	(0.95)	(0.95)
Financial covenant dummy	−0.060	0.061	0.067	0.286***	−0.017
	(−1.22)	(1.53)	(1.22)	(7.94)	(−0.31)
Performance pricing terms dummy	−0.259***	−0.226***	0.161***	0.054*	−0.160***
	(−6.67)	(−6.79)	(3.51)	(1.78)	(−3.31)
Syndicated facility dummy	0.125	0.139*	0.324***	−0.036	0.034
	(1.47)	(1.95)	(3.31)	(−0.56)	(0.33)
Relationship lending dummy	−0.050	−0.019	0.086*	0.059*	−0.013
	(−1.06)	(−0.54)	(1.72)	(1.79)	(−0.26)
Extra control variables					
EBITDA/Sales	−0.455**	−0.483***		−0.059	−0.357
	(−2.21)	(−3.09)		(−0.42)	(−1.40)
Current ratio	−0.023	−0.023*			−0.017
	(−1.35)	(−1.82)			(−0.91)
Ln(1 + Interest coverage)	−0.064***	−0.064***			−0.045**
	(−3.39)	(−4.43)			(−2.16)
Market-wide default spread	6.121	−0.658	−10.025	−14.990***	8.831

	(0.95)	(−0.14)	(−1.55)	(−3.51)	(1.29)
Ln(Total assets maturity)			−0.024		
			(−1.07)		
Industry level average of tangibility				1.213**	
				(2.17)	
Inverse Mill's ratio					0.033
					(0.19)
Constant	4.641***	5.542***	2.536***	0.022	4.602***
	(15.28)	(18.76)	(6.30)	(0.05)	(8.57)
Industry	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.63				
Breusch-Pagan χ^2			244.15		
ρ					0.20
Sig. of ρ					0.65
N of facilities	995		995		
N of loan funded M&As					445
N of all M&As					6632

This table reports the results of robustness tests. Column (1) reports the estimates of OLS, and (2) to (4) report the estimates of SUR modes, using loan facility level data. Column (5) reports the estimates of second-stage in Heckman self-selection model, where first-stage regression estimates are reported in Table 2.9. Industry fixed effects are controlled for at the 2-digit SIC level, and year fixed effects are included according to the year of M&A announcements. ***, **, and * indicate the significance at 0.01, 0.05, and 0.1 level, respectively. Detailed definitions of the variables are described in Table 2.8.

Table 2.6: Tests with additional control variables

	(1)		(2)		(3)		(4)		(5)	
	OLS	SUR	OLS	SUR	OLS	SUR	OLS	SUR	OLS	SUR
Non-price loan terms										
Ln(Maturity)	0.168**		0.172**		0.084		0.160		0.075	
	(2.12)		(2.13)		(1.50)		(1.53)		(1.27)	
Collateral	0.482***		0.508***		0.429***		0.460***		0.419***	
	(5.23)		(5.88)		(8.22)		(4.79)		(6.58)	
Size of M&A transactions										
Relative deal size	0.186***	0.262***	0.170***	0.219***	0.131***	0.166***	0.310***	0.397***	0.186***	0.226***
	(3.70)	(4.57)	(4.05)	(4.30)	(4.28)	(5.06)	(2.77)	(4.08)	(4.51)	(5.07)
Additionally controlled variables										
Target's Altman Z-Score	−0.006	−0.008								
	(−0.53)	(−1.05)								
Offer premium			−0.015	−0.026						
			(−0.13)	(−0.28)						
Acquirer's ex ante stock return volatility					1.451***	1.844***				
					(2.99)	(3.74)				
E-Index							−0.041	−0.000		
							(−1.08)	(−0.01)		
Separated CEO and chair									0.011	0.035
									(0.18)	(0.72)
Characteristics of M&A transactions										
Stock payment dummy	−0.053	−0.099	−0.029	−0.051	−0.021	−0.004	−0.082	−0.004	−0.087	−0.046
	(−0.63)	(−1.10)	(−0.39)	(−0.59)	(−0.41)	(−0.08)	(−0.87)	(−0.05)	(−1.30)	(−0.74)
Diversify deal	−0.099	−0.192**	−0.095	−0.207***	−0.066	−0.073	0.037	0.026	−0.029	−0.037
	(−1.10)	(−2.54)	(−1.04)	(−2.79)	(−1.52)	(−1.57)	(0.48)	(0.36)	(−0.54)	(−0.70)
Public target deal			−0.323	−0.679*	0.018	0.038	−0.047	−0.052	0.056	0.073
			(−1.53)	(−1.66)	(0.30)	(0.64)	(−0.41)	(−0.59)	(0.63)	(1.03)
Subsidiary target deal			0.000	0.000	0.078	0.108	0.134	0.062	0.047	0.060

			(.)	(.)	(1.16)	(1.57)	(1.04)	(0.56)	(0.55)	(0.74)
Cross-border deal	0.287	1.006	0.206	0.935	−0.001	−0.013	−0.168	−0.083	0.068	0.107*
	(0.59)	(1.58)	(0.44)	(1.47)	(−0.03)	(−0.20)	(−1.56)	(−0.86)	(1.02)	(1.69)
Hostile deal	0.021	0.068	−0.022	0.018	−0.191	−0.035	−0.439	−0.519*	−0.128	−0.064
	(0.11)	(0.37)	(−0.11)	(0.10)	(−1.18)	(−0.24)	(−1.18)	(−1.75)	(−0.76)	(−0.42)
Tender Offer	0.060	0.139	0.050	0.127	−0.017	−0.024	−0.061	−0.035	−0.083	−0.083
	(0.52)	(1.62)	(0.45)	(1.51)	(−0.26)	(−0.39)	(−0.48)	(−0.35)	(−1.04)	(−1.21)
Characteristics of acquiring firms										
Ln(Total assets)	−0.125***	−0.163***	−0.120***	−0.168***	−0.055**	−0.100***	−0.017	−0.111**	−0.070*	−0.142***
	(−3.05)	(−4.44)	(−2.96)	(−4.66)	(−2.03)	(−4.03)	(−0.26)	(−2.33)	(−1.87)	(−4.60)
Market-to-Book Ratio	−0.004	−0.004	−0.003	−0.008	−0.003	−0.009	−0.014	−0.026*	−0.015	−0.019**
	(−0.33)	(−0.39)	(−0.32)	(−0.90)	(−0.47)	(−1.32)	(−0.96)	(−1.88)	(−1.26)	(−2.33)
Tangibility ratio	−0.372	−0.625***	−0.415	−0.738***	−0.213	−0.354**	0.116	−0.100	−0.360*	−0.491***
	(−1.42)	(−2.59)	(−1.64)	(−3.13)	(−1.48)	(−2.34)	(0.32)	(−0.32)	(−1.78)	(−2.61)
Altman Z-Score	−0.012	−0.009	−0.015	−0.012	−0.001	−0.001	0.000	0.004	0.009	0.013
	(−0.88)	(−0.77)	(−1.14)	(−1.08)	(−0.18)	(−0.17)	(0.01)	(0.40)	(0.98)	(1.48)
Credit rating score	0.008	0.058*	0.003	0.042	0.034	0.079***	0.049	0.093***	0.029	0.057**
	(0.22)	(1.76)	(0.08)	(1.30)	(1.37)	(3.56)	(1.16)	(2.65)	(0.99)	(2.35)
Leverage	0.702**	1.256***	0.680**	1.216***	0.539***	0.861***	0.787**	1.241***	0.968***	1.436***
	(2.31)	(4.90)	(2.41)	(4.89)	(2.87)	(4.96)	(2.11)	(3.97)	(3.65)	(6.45)
Δ Leverage	0.492	0.507*	0.458	0.514**	0.332	0.460**	0.180	0.334	0.655***	0.901***
	(1.61)	(1.91)	(1.55)	(1.99)	(1.65)	(2.42)	(0.46)	(1.14)	(2.72)	(4.26)
Characteristics of loan contracts										
Facility amount/total assets	0.063	0.099	0.045	0.075	0.039	0.066	0.119	0.229	0.112	0.116
	(0.60)	(0.96)	(0.46)	(0.75)	(0.52)	(0.89)	(0.61)	(1.53)	(1.21)	(1.33)
Financial covenant dummy	−0.011	0.084	−0.054	0.023	−0.073	0.053	0.072	0.112	−0.081	−0.023
	(−0.10)	(0.92)	(−0.51)	(0.27)	(−1.23)	(0.91)	(0.74)	(1.28)	(−1.26)	(−0.35)
Performance pricing terms dummy	−0.284***	−0.115	−0.275***	−0.117	−0.136**	−0.092*	−0.164*	−0.108	−0.137**	−0.063
	(−2.74)	(−1.41)	(−2.87)	(−1.48)	(−2.54)	(−1.69)	(−1.67)	(−1.27)	(−2.24)	(−1.05)
Syndicated facility dummy	−0.172	0.031	−0.165	0.010	0.050	0.029	−0.313	−0.188	−0.080	−0.057
	(−0.80)	(0.15)	(−0.88)	(0.06)	(0.42)	(0.24)	(−1.08)	(−0.77)	(−0.48)	(−0.34)

Relationship lending dummy	−0.046	−0.147*	−0.050	−0.144**	−0.010	0.006	−0.038	−0.051	−0.011	0.031
	(−0.49)	(−1.94)	(−0.57)	(−2.01)	(−0.18)	(0.12)	(−0.37)	(−0.68)	(−0.18)	(0.54)
Extra control variables										
EBITDA/Sales	−0.045	−0.234	−0.119	−0.289	−0.327	−0.414*	0.018	−0.483	−0.194	−0.441
	(−0.08)	(−0.64)	(−0.25)	(−0.80)	(−1.20)	(−1.88)	(0.04)	(−1.20)	(−0.61)	(−1.64)
Current ratio	−0.024	−0.023	−0.024	−0.023	−0.012	−0.010	−0.061	−0.062**	−0.013	−0.014
	(−0.61)	(−0.92)	(−0.63)	(−0.94)	(−0.58)	(−0.56)	(−1.22)	(−2.03)	(−0.56)	(−0.65)
Ln(1 + Interest coverage)	−0.034	−0.031	−0.020	−0.018	−0.058**	−0.056***	0.015	0.006	−0.043	−0.043*
	(−0.93)	(−1.01)	(−0.54)	(−0.60)	(−2.33)	(−2.84)	(0.33)	(0.20)	(−1.51)	(−1.93)
Market-wide default spread	9.318	−0.059	8.326	−3.079	3.331	−4.025	7.478	2.991	16.831*	9.676
	(0.69)	(−0.01)	(0.62)	(−0.30)	(0.40)	(−0.57)	(0.50)	(0.32)	(1.71)	(1.23)
Constant	4.360***	5.393***	4.732***	6.359***	4.113***	4.834***	3.242***	4.746***	3.971***	5.162***
	(5.83)	(7.29)	(6.22)	(7.62)	(10.25)	(10.90)	(3.54)	(5.08)	(7.86)	(10.27)
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.69		0.70		0.65		0.64		0.69	
Breusch-Pagan χ^2		98.52		106.35		148.58		71.19		100.46
N	213	213	226	226	450	450	198	198	344	344

This table reports the estimates of both OLS and SUR model in terms of additionally controlled variables of interests, using M&A transaction level data. The dependent variable in all columns is the natural logarithm of AIDS. The sample size varies because of the data availability in calculating the additional control variables. Industry fixed effects are controlled for at the 2-digit SIC level, and year fixed effects are included according to the year of M&A announcements. ***, **, and * indicate the significance at 0.01, 0.05, and 0.1 level, respectively. Detailed definitions of the variables are described in Table 2.8.

Table 2.7: Loan price and acquisition performance

	(1) HPR36	(2) HPR36	(3) BHAR36	(4) BHAR36	(5) ROA	(6) Adj. ROA	(7) ROA	(8) Adj. ROA
Ln(AIDS)	−0.197**	−0.190**	−0.185**	−0.168*	−0.029***	−0.021***	−0.028***	−0.024***
	(−2.46)	(−2.14)	(−2.34)	(−1.91)	(−4.39)	(−2.91)	(−3.74)	(−2.75)
Relative deal size		−0.037		−0.062			−0.003	0.004
		(−0.45)		(−0.73)			(−0.44)	(0.65)
Stock payment dummy		−0.255**		−0.214*			0.006	0.008
		(−2.02)		(−1.71)			(0.68)	(0.79)
Diversify deal		−0.181		−0.172			−0.001	−0.001
		(−1.65)		(−1.59)			(−0.18)	(−0.10)
Public target deal		−0.118		−0.136			−0.007	−0.017
		(−0.90)		(−1.05)			(−0.76)	(−1.43)
Subsidiary target deal		−0.106		−0.136			0.001	−0.004
		(−0.55)		(−0.70)			(0.13)	(−0.34)
Cross-border deal		−0.242		−0.204			−0.008	−0.008
		(−1.63)		(−1.32)			(−1.06)	(−0.88)
Hostile deal		−0.029		−0.090			−0.001	0.003
		(−0.14)		(−0.42)			(−0.08)	(0.14)
Tender Offer		−0.177		−0.167			−0.001	0.008
		(−1.04)		(−0.98)			(−0.07)	(0.61)
ROA (Pre-announcement 3-year average)					0.181***		0.187***	
					(2.82)		(2.77)	
Adj. ROA (Pre-completion 3-year average)						0.500***		0.508***
						(8.16)		(8.24)
Constant	3.456***	3.832***	1.704**	2.066***	0.153***	0.103***	0.160***	0.118***
	(4.65)	(5.12)	(2.34)	(2.85)	(4.61)	(2.74)	(4.58)	(2.85)
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.11	0.12	0.05	0.06	0.15	0.58	0.14	0.58
N	391	391	391	391	418	418	418	418

This table reports the OLS estimates of the regressions of ex post performance measures on loan price. *HPR36* is the holding period return (HPR) measured in the 36 months subsequent to the completion of the M&As. *BHAR36* is buy-and-hold abnormal return (BHAR) measured in the 36 months subsequent to the completion of the M&As (the estimates from the regressions of HPR and BHAR in the subsequent 60 months are qualitatively the same, not reported but available upon request). Dependent variables *ROA* in column (5) and (7) is the *ROA* averaged over the 3 years subsequent to the deal completion. *Adj. ROA* in column(6) and (8) is the industry-adjusted *ROA* averaged over the three years subsequent to the deal completion. The sample size varies because of data availability in calculating the performance measures. Industry fixed effects are controlled for at the 2-digit SIC level, and year fixed effects are included according to the year of M&A announcement. Standard errors are corrected by clustering at the acquirer level. ***, **, and * indicate the significance at 0.01, 0.05, and 0.1 level, respectively. Detailed definitions of the variables are described in Table 2.8.

Appendix

Appendix I, Variable Definition

Table 2.8: Variable Definitions

Variable	Definition
Loan price	
AIDS	All-in-drawn spread. Dealscan defines the spread as "the amount the borrower pays in basis points over LIBOR for each dollar drawn down. It adds the spread of the loan with an annual (or facility) fee paid to the bank group". In M&A transaction level data, if a M&A is funded by multiple loan facilities, it takes the weighted average value of AIDS of the facilities, weighted by each facility amount. "AIDS" refer to the "weighted average of AIDS". "arithmatic average AIDS" for arithmatic average.
Ln(AIDS)	The natural logarithm of AIDS.
Non-price loan terms	
Maturity	The number of months of a loan facility's maturity. In M&A transaction level data, if a M&A is funded by multiple loan facilities, we take the average value of the maturities.
Ln(Maturity)	The natural logarithm of Maturity.
Collateral	A dummy variable equals 1 when a facility used for a M&A is required to provide collateral, 0 otherwise. In M&A transaction level data, if a M&A is funded by multiple loan facilities, the dummy equals 1 as long as one of the facilities is required to provide collateral, 0 otherwise.
Size of M&A transactions	
Relative deal size	The ratio of M&A transaction value to the acquiring firm's market value of equity at the end of the fiscal year before M&A announcement.
Characteristics of M&A transactions	
Stock payment dummy	A dummy variable equals 1 if the M&A consideration contains the acquirer's stocks.
Diversify deal	A dummy variable equals 1 if an acquiring firm and the target firm have different 2-digit SIC, 0 otherwise.
Public target deal	A dummy variable equals 1 to indicate the publicly-listed target firm, 0 otherwise.

Subsidiary target deal	A dummy variable equals 1 to indicate the subsidiary target firm, 0 otherwise.
Cross-border deal	A dummy variable equals 1 if an acquiring firm and the target firm are from different countries, 0 otherwise.
Hostile deal	A dummy variable equals 1 to indicate the hostile transaction, 0 otherwise.
Tender offer	A dummy variable equals 1 if the transaction is a tender offer, 0 otherwise.
Characteristics of acquiring firms	
Total assets	The acquiring firm's book value of total assets at the end of fiscal year prior to the announcement of the M&A (in million dollars).
Ln(Total assets)	The natural logarithm of total assets.
Market-to-book ratio	An acquiring firm's ratio of the sum of market value of equity and the book value of liabilities to book value of total assets at the end of fiscal year prior to the announcement of the M&A.
Tangibility ratio	Acquiring firm's ratio of PPE to total assets at the end of fiscal year prior to the announcement of the M&A.
Altman Z-Score	Acquiring firm's Altman Z-Score at the end of fiscal year prior to the announcement of the M&A. Altman Z-Score = 1.2 × working capital/total assets + 1.4 × (retained earnings/total assets) + 3.3 × (earnings before interest and tax/total assets) + 0.6 × (market value of equity/total liabilities) + 1.0 × (sales/total assets).
Credit rating score	An index ranging from 1 to 7, representing AAA (1), AA (2), A (3), BBB (4), BB (5), below BB (6) and no rating (7), respectively.
Leverage	Acquiring firm's ratio of the sum of long-term debt and debt in current liabilities to the book value of total assets at the end of fiscal year prior to the announcement of the M&A.
ΔLeverage	The difference of leverages between the value at the end of fiscal year prior to the M&A announcement and at the end of fiscal year after the M&A announcement.
Characteristics of loan contracts	
Facility amount	The value of a loan facility amount in million dollars. In M&A transaction level data, if a M&A is funded by multiple loan facilities, it takes the average value of the amount of facilities.

Ln(Facility amount)	The natural logarithm of facility amount.
Facility amount/total assets	The ratio of loan facility amount to the acquring firm's total assets at the end of fiscal year prior to the announcement of the M&A.
Financial covenants dummy	A dummy variable equals 1 if the loan facility includes financial covenants, 0 otherwise. In M&A transaction level data, if a M&A is funded by multiple loan facilities, it takes 1 as long as one of the loan facilities includes financial covenants, 0 otherwise.
Performance pricing terms dummy	A dummy variable equals 1 if the loan facility includes performance pricing terms, 0 otherwise. In M&A transaction level data, if a M&A is funded by multiple loan facilities, it takes 1 as long as one of the loan facilities includes performance pricing terms, 0 otherwise.
Syndicated facility dummy	A dummy variable equals 1 if the loan facility is funded by a syndication of lenders. In M&A transaction level data, if a M&A is funded by multiple loan facilities, it takes 1 as long as one of the loan facilities is syndicated loan, 0 otherwise.
Relationship lending dummy	A dummy variable equals 1 if the acquiring firm has previously borrowed from the leader lender over the last three years before the M&A announcement, 0 otherwise. In M&A transaction level data, if a M&A is funded by multiple loan facilities, it takes 1 as long as one of the loan facilities is relationship lending, 0 otherwise.
Extra control variables	
EBITDA/Sales	Acquiring firm's ratio of EBITDA to sales at the end of fiscal year prior to the announcement of the M&A.
Current ratio	Acquiring firm's ratio of cash and other assets that are expected to be realized in next 12 months or used in the production of revenue to total current liabilities at the end of fiscal year prior to the announcement of the M&A.
Ln(Interest coverage)	The natural logarithm of (1 + EBITDA/interest expenses) of the acquiring firm at the end of fiscal year prior to the announcement of the M&A.
Total assets maturity	The weighted average of maturity of current assets and Net PPE. Total assets maturity = current assets/(current assets + net PPE) × current assets/cost of goods sold + net PPE/(current assets + net PPE) × net PPE/Depreciation.

Ln(Total assets maturity)	The natural logarithm of total assets maturity.
Market-wide default spread	Moody's Seasoned Baa Corporate Bond Yield Relative to the Yield on 10-Year Treasury Constant Maturity one month before the M&A announcement.
Industry level average of tangibility	The average of tangibility ratio in an acquiring firm's 2-digit SIC level industry in a year.
Target's Altman Z-Score	Target firm's Altman Z-Score at the end of fiscal year prior to the announcement of the M&A.
Offer premium	The ratio of transaction value to the sum of market value (6 weeks before acquisition announcement) and total liability of the target firm.
Acquirer's ex ante stock volatility	Acquiring firm's 24-month monthly return volatility prior to the announcement of the M&A.
E-index	Acquiring firm's E-index prior to the announcement of the M&A (Bebchuk et al., 2009).
Separated CEO and chair	A dummy variable equals 1 if the CEO of the acquiring firm is not the board chair at the moment of M&A announcement, 0 otherwise.
Determinants of using loans	
Cash flow/transaction value	The ratio of the sum of cash flow from operating, investment, and financing at the end of fiscal year prior to the announcement of the M&A to the M&A transaction value.
(Long-term debt + transaction value)/Total assets	The acquiring firm's ratio of the sum of the long-term debt and M&A transaction value to the total assets at the end of fiscal year prior to the announcement of the M&A.
Run-up	The cumulative daily abnormal returns of an acquiring firm over the window $[-60, -20]$ preceding the M&A announcement day, and daily abnormal returns are computed as the difference between the realized returns and the market model benchmark returns. Market return is the CRSP value-weighted market portfolio return (include dividends).
Beta$[-300, -60]$	The equity beta of the acquiring firm, estimated using the market model over the period from 300 to 60 days before the M&A announcement. Market return is the CRSP value-weighted market portfolio return (include dividends).
Acquirer's age	The age of an acquiring firm at the M&A announcement year, computed as the difference between the announcement year and the first year of occurrence in Compustat.

HHI of institutional investor ownership	The Herfindahl-Hirschman Index of institutional ownership retrieved from Thomson Reuters Database.
Performance measures	
HPR36	The holding period return (HPR) in subsequent 36 months of the completiton of the M&As.
BHAR36	Buy-and-hold abnormal return (BHAR) in subsequent 36 months of the completiton of the M&As, calculated as the difference between the monthly HPR of the acquiring firm stock and the monthly HPR of CRSP value-weighted market portfolio return (includes distributions).
ROA	Acquiring firm's return on assets, calculated as the ratio of the net income to total assets.
Adj. ROA	Acquiring firm's return on assets, adjusted by the median ROA of the peer firms in the same 2-digit SIC in a year (excluding the firm in question).

Appendix II, Predicting the probability of loan financing in M&A transactions (Heckman first stage)

In the first stage of the Heckman procedure reported in Table 2.5, we estimate the probability of loan financing using a probit model. There is a rich set of theoretical and empirical work guiding our estimation. We are not the first one to empirically model the sources of finance in M&A transactions. Martynova and Renneboog (2009) study how companies choose among various financing sources in the European context, including debt. Martynova and Renneboog (2009) do not distinguish between public and private debt. In the current study, we focus on estimating the likelihood of (private) loan financing in M&A transactions.

We explain the rationale to include the following determinants and present the detailed results of these variables in Table 2.9 The first set of determinants are firm characteristics related to risk, information or agency issues. The pecking order theory (Myers and Majluf, 1984) postulates that companies prefer internal funds to external ones because internal funds involve lower adverse selection costs. Therefore, whenever possible, an acquirer prefers to use internal funds. This implies that acquirer's internal cash flow scaled by the transaction value should negatively impact the use of loan. Previous literature has highlighted a firm's asset tangibility as a measure of debt capacity (Frank and Goyal, 2009). Tangible assets can be set aside as collaterals to secure loans, increasing the probability of loan financing. We, therefore, use the tangible assets in proportion to total assets as a measure of debt capacity. Martynova and Renneboog (2009) also use another variable as a proxy for debt capacity, which is calculated as (long-term debt + transaction value)/Total assets at the end of fiscal year prior to the announcement of the M&As. We include this variable in our regression too. A strand of literature demonstrates that over-

valued firms tend to use their stocks to acquire less overvalued targets(Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004). We expect overvalued acquirers less likely to use loan when they can time the stock market. We measure the degree of overvaluation by the pre-acquisition acquire stock-price run-up. Moreover, the agency problem of debt overhang (Myers, 1977) also renders the lenders more reluctant to provide credit. A manager working for the best interest of shareholders may under-invest if a new project only makes the outstanding debt safer instead of benefiting the shareholders. Such a debt overhang problem is especially relevant for high-growth firms. Therefore, we use the market-to-book ratio of assets to measure the severity of the debt overhang problem. Strahan (1999) posits that lenders are less willing to supply credit when a potential borrower is riskier. To reflect this effect, we use the acquirer's pre-transaction market beta and the acquirer's age as proxies for firm risk. We expect these risk measures to harm the likelihood of loan financing. The acquiring firm's size may bear on the choice of loan finance too because larger firms often have access to a myriad of financing sources, for example, large firms usually have access to the bond market while small and medium-sized firms tend to rely on loan financing (Strahan, 1999). Consequently, we expect larger acquirers to rely less on loan financing. Meanwhile, larger firms usually have greater debt capacity, which may well increase the use of loan. Therefore, the effect of firm size has two folds. We use the amount of total assets to measure firm size. A strand of literature shows that managers can take more debt either to entrench themselves by making the firm more difficult to takeover (Stulz, 1988; Harris and Raviv, 1988; Zwiebel, 1996) or to commit themselves to good performance and make a takeover less attractive to potential bidders (because the marginal gain of replacing the current management will be reduced.) (Jensen and Meckling, 1976; Safieddine and Titman, 1999). Since the managerial intention is not observable, we use

a high concentration ratio of institutional ownership to indicate a high degree of monitoring from outside shareholders. A higher concentration is associated with tighter monitoring by institutional investors because the investors would have less incentive to free-ride on each others effort. If more debt commits managers to good performance, greater institutional ownership concentration should substitute for higher debt as the marginal improvement in firm value under higher debt would be low. Institutional share holdings concentration, therefore, should negatively impact the loan likelihood. If more debt entrenches current management, managers will find it more difficult to increase debt for the entrenchment purpose under greater institutional ownership concentration. Therefore, regardless of the implications of a higher debt level, greater institutional ownership concentration relates to less loan financing.

Apart from firm characteristics, transaction characteristics may also influence the choice of loan financing. Larger transactions often rely on external financing more because internal cash is insufficient. Meanwhile, larger transactions involve greater risks and information asymmetry (Alexandridis et al., 2013; Faccio and Masulis, 2005; Hansen, 1987; Datta, 1991; Shrivastava, 1986; Ahern, 2010), which make it more difficult to issue public debt and public equity. Therefore, how relative deal size impacts the probability of loan financing is an empirical question. Acquiring a target in a different industry may involve more risks because of the lack of experience with the new business line. However, the diversification into a different industry may also reduce risk exposure to specific industries because cash flows are not perfectly correlated across industries (Roll, 1988). Therefore, how diversifying acquisitions impact loan finance is an empirical question. A cross-border deal often involves a high level of risk because of uncertainties associated with politics, policies, economics, and culture in a different country. Lenders are often reluctant to extend credits across country borders. Therefore, we expect cross-border deals

to be less likely to use loan financing. The target firm's public status may also influence the likelihood of loan finance because private targets are more opaque than public ones and have greater informational risk (Officer et al., 2008). We add a dummy variable indicating public target in our regression. Hostile deals are often related to the removal of inefficient managers while friendly deals related to strategic synergies. Their implications on performance are hardly distinguishable; however, according to Schwert (2000). We include a dummy variable indication hostile deals in our regression analysis but do not expect it to have a significant impact on loan finance. Previous literature also finds tender offers and subsidiary acquisitions are related to superior performance (Agrawal et al., 1992; Agrawal and Jaffe, 2000; Maksimovic and Phillips, 2001). Since better performance improves loan quality and encourages lending, we expect subsidiary targets and tender offers to be associated with a high likelihood of loan financing.

In Table 2.9, we report the estimates of the probability of loan financing (i.e.,the first stage results of the Heckman procedure in Table 2.5). Consistent with the pecking order theory Myers and Majluf (1984), the coefficient on Cash flow/Transaction value is -0.068 and statistically significant at the 1% level. The greater the internal cash flow relative to transaction value, the less likely the acquirer borrowing externally. Unlike what Frank and Goyal (2009) posit, we don't find a significant coefficient ($z = 1.44$) on the asset tangibility ratio, although the sign is as predicted (0.289). The variable (long-term debt + transaction value)/total assets has a positive coefficient (0.069) and significant at the 5% level, which suggests that an acquirer with greater debt capacity tends to use more loans to finance a transaction. Consistent with the market-timing hypothesis, the acquirer's pre-transaction stock price run-up has a negative and marginally significant coefficient (-0.234), suggesting overvalued acquirers rely more on external equity than loan. The acquirer's

market-to-book ratio has a significantly (at the 1% level) negative coefficient (-0.070), consistent with the view under the debt overhang problem of Myers (1977) that high growth firms reduce loan financing to avoid the under investment problem. The acquirer pre-transaction market beta (Beta $[-300, -60]$) has a negative coefficient of -0.239 which is significant at the 1% level ($z = -4.66$), in line with the view that lenders are more reluctant to supply credit to risker firms Strahan (1999). The other risk measure, age, is insignificantly associated with raising loans. The coefficient on the acquiring firm's size (measured by $ln(TotalAssets)$) is significantly ($z = -4.19$) negative at -0.089. At first sight, this may be counter-intuitive because larger firms usually have greater debt capacity. A second thought, however, indicates large firms also have access to other sources of finance and are not solely dependent on loans (Strahan, 1999). The institutional ownership concentration negatively and significantly impacts the likelihood of loan financing. The coefficient is -1.478 and significant at the 1% level, indicating higher institutional ownership concentration either constraints the entrenchment effect of debt (Stulz, 1988; Harris and Raviv, 1988; Zwiebel, 1996) or substitute for the commitment effect of debt (Jensen, 1986; Safieddine and Titman, 1999).

Turning to the deal characteristics, we find the relative deal size has a significant positive effect on loan financing. The coefficient is 0.103 ($z = 2.29$), suggesting that, when internal cash is likely to be insufficient for large deals, the acquirers resort to external fund from loan financing. A deal that diversifies into another industry does not involve significantly different likelihood of loan financing. This can be due to the argument we made earlier that, although businesses in a new industry involve more uncertainties, the diversification effect (Roll, 1988) reduces risk simultaneously. The coefficient on the cross-border dummy is significantly ($z = -3.34$) negative at -0.263. This result suggests that although cross-border acquisitions may have some international

diversification effect, what dominates is the higher risk involved in conducting business in a different country. Consequently, it is harder to obtain loans from lenders. The coefficient on the public target dummy is statistically insignificant, contrary to the view that public targets involves lower informational risk (Officer et al., 2008) which enhances loan financing. The coefficient on the hostile deal dummy is statistically insignificant, in line with the argument of Schwert (2000) that hostile deals are indistinguishable from friendly ones in terms of value implication. The subsidiary-target dummy has a significantly ($z = 2.67$) positive coefficient of 0.224. The tender offer dummy has a coefficient of 0.781 and statistically significant at the 1% level ($z = 9.63$). These evidence are in line with the thought that asset acquisitions and tender offers are value enhancing, which in turn enhances the acquirers' capability of access loan financing.

Altogether, we find the prediction of loan-financing probability are largely in line with the previous literature regarding information asymmetry and agency costs.

Table 2.9: Predicting the probability of loan financing in M&A transactions (Heckman first stage)

	Loan funded or not
Cash flow/transaction value	-0.068^{***}
	(-5.97)
Tangibility ratio	0.289
	(1.44)
(Long-term debt + transaction value)/total assets	0.069^{**}
	(2.45)
Run-up	-0.234^{*}
	(-1.74)
Market-to-book ratio	-0.070^{***}
	(-3.47)
Beta [−300, −60]	-0.239^{***}
	(-4.66)
Acquirer's age	0.003
	(1.20)
Ln(Total assets)	-0.089^{***}
	(-4.19)
HHI of institutional investor ownership	-1.478^{***}
	(-5.01)
Relative deal size	0.103^{**}
	(2.29)
Diversify deal	−0.094
	(-1.57)
Cross-border deal	-0.263^{***}
	(-3.34)
Public target	0.015
	(0.23)
Subsidiary target	0.224^{***}
	(2.67)
Hostile deal	−0.229
	(-1.23)
Tender offer	0.781^{***}
	(9.63)
Constant	-1.140^{***}
	(-3.54)
Industry	Yes
Year	Yes
Wald χ^2	552^{***}
N of all M&As	6502

This table reports the results of probit model regarding the likelihood of loan financing. The sample size reduction of loan funded M&As is due to the data availability in calculating regressors. Z statistics are reported in the parentheses. Industry fixed effects are controlled for at 2-digit SIC level, and year fixed effects are included according to the year of M&A announcements. Standard errors are corrected by clustering at acquirer level. ***, **, and * indicate the significance level at 0.01, 0.05, and 0.1 level, respectively.

Chapter 3

Bank Competition and the Tightness of Financial Covenants

3.1 Introduction

The enactment of the 1994 Interstate Banking and Branching Efficiency Act (IBBEA) has led to the intensification of bank competition in the U.S. banking industry, as banks are allowed to expand in different states of the U.S.. Since the 2008 financial crisis, the impact of the bank competition on the banks risk-taking behaviours has caused much scholarly attention, however, the views are conflicting in extant literature. On the one hand, higher competition in the banking industry increases the deposit rates, which might decrease the profits of the banks, therefore, the banks have incentives to take more risks to avoid a fall in profitability (Keeley, 1990; Hellmann, Murdock and Stiglitz, 2000; Repullo, 2004). On the other hand, higher bank competition can lower the interest rate, making it less likely for the borrowing firms to default. In other words, the banks' loan portfolios consist of the borrowing firms with less default risk, which means the banks are less risky (Boyd and De NicolÓ, 2005). Nevertheless, there is limited evidence on how the bank competition influences the financial covenant terms in the loan agreements, especially the tightness of financial covenants.

Aghion and Bolton (1992) suggest that a common contract is incomplete because of the existence of uncontractable future states under uncertainty. The covenants restrict the managerial behavior and align the interest of shareholders of the borrowing firms with that of creditors (Jensen and Meckling, 1976; Smith and Warner, 1979), meanwhile at the same time, motivating the lenders to monitor the borrowers (Rajan and Winton, 1995). In the perspective of incomplete contracting theory, the covenants are able to make uncertain future states contractible by arranging the control right of the borrowers ex ante among the shareholders of the borrowers and creditors (Aghion and Bolton, 1992).

Specifically, financial covenants are used as the "trip wires", allowing the lenders to intervene in the borrowing firms' corporate policies (Dichev and Skinner, 2002). Once the borrowing firm breaches the thresholds, the lender would take actions to protect the loan. The violation of financial covenants is common, though the managers of the borrowing firms intend to avoid being in such a position (Dichev and Skinner, 2002). Recent empirical evidence shows that the contracting or violation of the financial covenants has significant real impacts on the borrowing firms' corporate policies and firm value (Chava and Roberts, 2008; Nini, Smith and Sufi, 2009; Roberts and Sufi, 2009; Nini, Smith and Sufi, 2012). Therefore, the financial covenant contracting is important not only for the lenders in terms of risk management, but also for the interest of the shareholders and the managers in the borrowing firms.

Accounting for the likelihood of the lenders intervening the borrowing firms' corporate policies through the financial covenants, the tightness of the financial covenants is what we are interested in. The tightness of the financial covenants indicates how likely it is that a borrower breaches the financial metric thresholds set by the financial covenants. This is positively correlated to the number of financial covenants and the slacks in the financial metrics at the borrower's current state (Demerjian and Owens, 2016). Recent empirical studies start to quantify the tightness of financial covenants in the loan contracts. Demiroglu and James (2010) document that financially distressed borrowers are associated with larger slacks in the metrics of financial covenants, and the investment and debt issuance are less affected by the covenant violations in the borrowers with tighter financial covenants than those in the borrowers with less tight fincnaicl covenants. Murfin (2012) quantifies the tightness of the financial covenants by estimating the probability of violation at the loan inception dates using regression-based methodology. He finds that the lenders set tighter financial covenants for the new loan contracts if the lenders experience recent

defaults, preventing the possible loss from the decrease of screening ability. We use a recent developed proxy by Demerjian and Owens (2016), the probability of financial covenant violation at the loan inception date, to capture the tightness of the financial covenants. The new proxy has several advantages over traditional measurements, which is discussed in the data section below.

We hypothesize that there is a positive relationship between the tightness of financial covenants and the degree of bank competition. The increase in competition decreases the banks' franchise value, thus motivating the banks to take more risks (Keeley, 1990; Hellmann et al., 2000; Repullo, 2004). A recent theoretical model in Martinez-Miera and Repullo (2010) suggests a U-shape relationship between bank competition and bank failure risk, where the marginal impact depends on the dominant effect of the safer borrower under low rates or the decreased profit of the bank. Evidence from the lightly regulated UK banking industry during 1885 to 1925 shows lower competition among banks is associated with smaller loan amount, more collateral and better quality of the clients (Braggion, Dwarkasing and Moore, 2017). Jiang, Levine and Lin (2017) document the positive relationship between bank competition and risk proxies of banks with the deregulation in the banking industry in U.S. The international evidence such as Beck, Demirgüç-Kunt and Levine (2006) shows more concentrated banking system is less likely to incur a financial crisis, which means the higher competition in banking industry makes the banking system more fragile. Especially, the deregulation in banking industry from 1970s allows the banks competing beyond boundaries of the states, therefore, with the increase in competition, the banks can also diversify their risks geographically with the expansion (Goetz, Laeven and Levine, 2016). Therefore, a potential consequence is that the banks would offer credit to more riskier borrowers under higher bank competition, where the risk-taking behaviour is strengthened by the ability of diversifying risks geographically.

Bank competition may result in riskier loan portfolios. However, the overall risks of the banks do not necessarily increase because risk-mitigating techniques can be used by the banks (Berger, Klapper and Turk-Ariss, 2009). The borrowing firms with good credit ratings are precious within an area, therefore, with the bank competition intensifying, the banks may provide loans to the riskier clients. At the same time, prudence requires banks to mitigate the risks of the repayment of the loans granted to the riskier clients, which may result in tighter financial covenants agreed in the loan contract. The tighter financial covenants allocate higher ex ante control right of the banks to intervene the borrowing firms' corporate policies, especially when the borrowing firms step out of the "trip wires". For example, the performance of the poorly performing firms improves after they get syndicated loans (Delis, Kokas and Ongena, 2017), which implies the monitoring effect from the lenders. Financial covenants enable the lenders getting more information from the borrowers and motivate the monitoring from the lenders. Thus, we expect that the banks use tighter financial covenants in the loan contracts when the bank competition is higher.

Using a sample of the loan contracts whose inception dates are between 1995 and 2013, we investigate the relationship between the bank competition and the tightness of financial covenants. The empirical results show a statistically significant positive association between the financial covenant tightness and the bank competition. Specifically, higher bank competition within a state is positively associated with the higher probability of financial covenant violation. The positive association is also applied to the tightness of performance covenants and capital covenants, respectively. Furthermore, we find that the higher competition among banks is significantly associated with the borrowers with higher Ohlson score (O-score) and worse credit ratings. In other words, our results indicate that the banks lend money to the riskier borrowers

when they are confronted with higher local competition, but tighter financial covenants are used in the loan contract to restrict the borrower's behaviour to lower the risks.

Additionally, we investigate several cross-sectional heterogeneities. First, we test whether the impact of the bank competition on financial covenant tightness has different patterns during recession and non-recession period. The results show the significant impact is mainly driven by non-recession period. Banks avoid increasing the risks of their loan portfolios during the recession, but seek more risky clients and use tighter financial covenants to control the risks in a non-recession period. Second, we test whether the size of the borrowers differentiates the financial covenant tightness under the bank competition. We find that the smaller borrowers are associated with higher financial covenant tightness in both performance and capital covenants, but larger borrowers only get significant tighter capital covenants when the bank competition is higher. This finding may imply that a bank might find it difficult to take the control right of a large borrower, thus tighter capital covenants are used to encourage shareholders to monitor the managerial behaviors rather than getting contingent control right allocation through performance covenants. Smaller borrowers usually have less bargaining power and higher information asymmetry to the banks, the banks are more likely to give both types of tighter financial covenants to protect the repayment of loans that is granted to the smaller firms. Third, we investigate whether the size of the banks affects the financial covenant tightness differently under higher bank competition. The results show that the Big 3 lenders (JP Morgan, Citi, Bank of America), three banks taking a considerable shares in the U.S. loan market, rely on tighter capital covenants with the increase of bank competition, while Non-Big 3 lenders provide more restrictive financial covenants in both types. Fourthly, we test whether the association between financial tightness covenants and the bank

competition is driven by non-bank lenders, since non-bank lenders usually offer credit to riskier borrowers to get higher premium (Lim, Minton and Weisbach, 2014). The results show that the bank competition only influences the tightness of financial covenants in loans lent by banks, while non-bank loans are not affected.

To identify the causal relationship between the bank competition and the tightness of financial covenants, we conduct a Difference-in-Difference test using the enforcement of Interstate Banking and Branching Efficiency Act as an exogenous variation in the state-wise bank competition. IBBEA removes the restrictions on the banks' geographic expansion of branching in the U.S., which is commonly identified as the exogenous change on the bank competition at state level (e.g., Rice and Strahan (2010)). We find that the financial covenant tightness increases once the state removes one restriction on interstate branching. This supports the positive association between financial covenant tightness and the bank competition. However, the tightness of capital covenants does not show significant results. This might be attributed to a fact that the banks supply loans to smaller firms, therefore, tighter performance covenants are used to monitor and allocate the contingent control right to the banks ex ante.

This paper contributes to the literature in two aspects. First, we provide evidence regarding how banks manage risks of the lendings when the competition is intensified. Prior studies document positive relationship between bank competition and bank stability, measured by banks' accounting numbers at bank level, but banks also conduct risk-taking behaviors in lending (e.g., Akins, Li, Ng and Rusticus, 2016, among others). Our results show that banks extend credit to riskier borrowers but offer tighter financial covenants at the same time. This might explain the conflicting findings in prior research. Banks lend to more riskier borrowers when they face greater competition from rivals,

however, tighter financial covenants enable the banks to secure the safety of the lendings timely by renegotiation, intervention in borrowers' corporate policies, or terminating the contracts once the financial covenants are violated (Roberts and Sufi, 2009; Nini et al., 2009, 2012). Thus, such a risk-taking behavior does not necessarily lead to deterioration of accounting numbers in banks' financial statements.

Second, we add to the debate on the relationship between bank competition and bank risk-taking, by investigating the non-price term (i.e., financial covenants) of listed companies' private debt contracts. In line with the theoretical predictions of Marcus (1984), Keeley (1990), Hellmann et al. (2000), and Repullo (2004), our results show that borrowing firms' quality decreases with the increase in bank competition. However, we also find banks' prudent behavior (i.e., providing tighter financial covenants) when they take risks under greater competition.

This paper relates to several studies on the bank competition and covenants in the loan contracts. First, our paper relates to Hollander and Verriest (2016), which mainly investigates the relationship between geographic distance and covenant intensity. They find that the geographic distance between the headquarters of the borrowing firms and the headquarters of the lenders worsens the information asymmetry issue in the loan contracting. Particularly, they document that both the existence of the bank branch of the lender and the number of the bank branches within a geographic area can influence the covenant intensity by alleviating the information asymmetry problem. We also use the number of the bank branches to capture the statewide bank competition, but we use an advantageous proxy for financial covenant tightness rather than counting the number of financial covenants. Moreover, we find that higher bank competition is associated with tighter financial covenants in the loan contract, which is in contract to their findings. The conflicting empirical evi-

dence might reflect the different dimensions captured by the covenant intensity and financial covenant tightness. Second, this paper relates to the literature about the loan terms and the bank competition. For instance in Bushman, Hendricks and Williams (2016), using disclosure files of the public listed banks in the U.S., the authors construct a proxy based on textual analysis techniques to capture the competition confronted by the banks. They document a negative association between covenant intensity and the bank competition proxy. Our analysis distinguishes from theirs in three aspects. The first point is that our sample has wider coverage on the lenders, not only the public banks. The second point is that, unlike their firm-year level self-reported competition proxy, the bank competition proxy in our study varies across states for one lender in a year, reflecting the different intensity of competition that banks are confronted in different geographic areas. The third point is that we investigate on the financial covenant tightness, not only the number of covenants in the loan contracts. In addition, this study relates to the literature of interstate bank deregulation, e.g., Rice and Strahan (2010), Jiang, Levine and Lin (2016), and Jiang et al. (2017) etc.. Those studies mainly investigate the impact of the exogenous bank competition increase on small business finance, the banks' risks or earnings quality, whereas we concentrate on the impact of the change in the state level bank competition on financial covenant tightness in the large bilateral or syndicated loans.

The paper is organized as follows. Section 3.1 is the introduction part. Section 3.2 describes the data and show summary statistics of the sample. Section 3.3 presents the results of empirical analysis, and section 3.4 show the causality test using IBBEA. Section 3.5 discuss some robustness checks. Section 3.6 is the conclusion.

3.2 Data Description and Summary Statistics

3.2.1 Data description

Our proxy of the bank competition is based on the number of the bank branches within a state in a year. The number of bank branches within a geographic area generally is positively correlated with the intensification of competition among banks (Degryse and Ongena, 2005; Hollander and Verriest, 2016). We collect the number of the main offices and the branches (FDIC secured institutions) in each state of the U.S. from FDIC-Branch Office Deposits database. This database discloses such information on June 30 annually from 1994. It provides the geographic information for the headquarters of the bank institutions, the main offices and a variety of the branches. We count the number of *Full Service Brick and Mortar* offices and branches of the commercial banks, while the foreign banks and the saving banks are excluded.

The reason of choosing full service brick and mortar offices and branches is that the bank branches with physical presence in a geographic area arguably affect the loan contracting, since such branches can alleviate the cost of information collecting. For instance, Hollander and Verriest (2016) document that the borrowing firms get statistically significant less covenants in loan contracts when a branch of the lenders exists within 50 miles from the borrower. Moreover, even after the enforcement of IBBEA, the regulations of restricting the entry of out-of-state banks are decided by the state governments (Rice and Strahan, 2010), therefore, it is reasonable to measure the bank competition within state boundaries accounting for the various state level institutional background. Because this state-year level variable is highly skewed, we transform it with taking natural logarithm. Loans with borrowers headquartered in Alaska and Hawaii are exlcuded because they are not located in contigu-

ous America territory, of which the economy and business are largely different from the mailand states. Following previous banking literature, loans with borrowers headquartered in Delaware and South Dakota are removed because the state governments enacted laws to encourage the formation and entry of credit card banks in 1980s (e.g., Jayaratne and Strahan, 1996; Goetz et al., 2016). Such laws might contaminate our competition measure (i.e., the yearly number of bank branches within a state). Since the number of bank branches in a state may reflect the outcome of demand and supply side of banking service, to address this concern, we regress the natural logarithm of the number of bank branches on the natural logarithm of state GDP at the end of last year, and take the residual as the proxy of the bank competition (*Residual: Ln(No. of branches in a state)*). However, our results still hold when we use *Ln(No. of branches in a state)*.

We use a recently developed proxy of financial covenant tightness, *the probability of financial covenant violation*. This proxy is developed and provided by Demerjian and Owens (2016), which uses all loan contracts with financial covenants in Dealscan database without missing values in terms of the financial metrics of the covenants. This proxy has several advantages against the traditional ones such as the number of financial covenants and the slacks in metrics of covenants. First, its economic implication is obvious. It is the estimated probability of the borrower violating the financial covenants in current fiscal quarter. Second, they use standardized definition of accounting items used in computing financial metrics, which enables the comparison of financial covenant tightness among different borrowing firms. Thirdly, unlike Murfin (2012) using linear methods with strong assumption on the correlations among multiple financial covenants, the probability of covenant violation is estimated by non-parametric methods, which accounts for the effects of the number of financial covenants and does not need linear assumptions in terms of the deter-

minants of violations. The data of probability of violation ends by 2014, but only 60 loan packages covered in that year, therefore, we choose loan contracts that start before December 31, 2013. Moreover, the estimated probability of violation of performance covenants and capital covenants is provided, respectively by Demerjian and Owens (2016). According to Christensen and Nikolaev (2012) performance covenants are whose financial metrics are based on income statement information, while capital covenants are those with financial metrics based on only balance sheet information.

Other loan contract terms, the basic information of the borrowing firms and the lenders are from Dealscan. The characteristics of the borrowing firms are from Compustat. We use the linkage file of Dealscan and Compustat in Roberts and Sufi (2009). As the linkage file ends by 2012, we manually match the loans beginning in 2013 to the companies in Compustat by comparing the borrowing firms' names. Market-wide control variables are from FRED website. Accounting for the disclosure dates of FDIC and the time period of the probability of covenant violation data, our final sample includes 9210 loan packages with non-missing values in all variables, where the inception dates of the loan packages are during January 1, 1995 to December 31, 2013.

3.2.2 Control variables

We control for a set of borrowing firms' characteristics that might affect the tightness of financial covenants. Larger firms arguably are more transparent to the lenders (Demiroglu and James, 2010), and larger firms are asked for fewer number of covenants in the loan agreements (Bradley and Roberts, 2015). Thus, we control for the size of the borrowing firms using the natural logarithm of total assets at last fiscal year end prior to loan inception dates. Higher leverage is associated with higher bankruptcy risks, and it is related to more

covenants (Bradley and Roberts, 2015). Then, we add the pre-loan leverage ratio as a control variable. Borrowing firms' better profitability may indicate lower credit risk (Demiroglu and James, 2010), so we control for the ratio of EBITDA to sales. Higher current ratio takes more concerns off the lenders about the borrowing firms' liquidity, which should be negatively associated with tightness of financial covenants (Prilmeier, 2017). Thus, we control for the current ratio in the regressions. Market-to-book ratio indicates the growth opportunity of a firm. Bradley and Roberts (2015) document a negative relationship between the market-to-book ratio and the inclusion of covenants in the loan contracts. Following previous studies, we control for market-to-book ratio in our regression models. Older firms presumably are more persistent in operation and are easier for the lenders to collect information. For example, Demiroglu and James (2010) document a negative association between borrowing firms' age and the number of covenants included in the loan contracts. Following their specification, we control for borrowing firms' age in the regressions. Receiving credit rating or not proxies for the agency or information cost in the lendings, as the unrated borrowers are more informationally asymmetric to the lenders (Demiroglu and James, 2010). Then, we put a S&P rated dummy at the right-hand side to control for such effects.

Following previous studies in loan contract terms, we control for a variety of the characteristics of the lendings. Raising larger amount of loans may indicate the borrowers' higher debt capacity as well as the lenders' willingness to lend (Turnbull, 1979). Borrowers with greater debt capacity may get less restrictive loan terms. Therefore, we control for the ratio of the loan amount to the borrowing firms' total assets at last fiscal year end. Longer maturity of the loans exposes the lenders to more risks. Bradley and Roberts (2015) argues that the covenants are to reduce the effective maturity of the loans. Thus, we control for the impact of the loan maturity in the regression by adding the nat-

ural logarithm of the maturities in months. Performance pricing terms in the loan agreements are used to mitigate the adverse selection and moral hazards problem by attaching the loan price to borrowing firms' future performance (Asquith, Beatty and Weber, 2005). Arguably, performance pricing terms work as substitutes of financial covenants. Then, we control for such subsitute effects by adding a dummy variable that equals 1 if the loan contract includes performance pricing terms, 0 otherwise. Since considerable lendings are offered by syndications of the lenders, then the risks of the lendings are shared by multiple lenders (Dennis and Mullineaux, 2000). The lower risks taken by each lender may reduce the demand for tighter financial covenants. However, the leader lenders have incentive to shirk the responsibility of mornitoring in both ex ante and ex post stages (Sufi, 2007). Then, the participant lenders may ask leader lenders for contracting tighter financial covenants, which can force the leader lenders to monitor. Therefore, we control for such a syndication effects, using the natural logarithm of the number of lenders within a loan contract. Relationship lending is common and impacts the loan terms, which has been documented by a body of prior studies. The information asymmetry problems are alleviated in the repetitive borrowing between the same borrowers and lenders, thus, the borrowers get more favorable loan terms from relationship lendings (e.g., Bharath, Dahiya, Saunders and Srinivasan, 2011, among others). To control for the effects of relationship lending on the tightness of financial covenants, we add the natural logarithm of 1 plus the number of previous borrowings between the same borrowers and lenders prior to the loan inception dates in Dealscan database. Market-wide financial conditions may also affect the provision of credit, therefore, following previous banking literature, we add net percentage of domestic banks tightening standards for commercial and industrial loans to large and middle-market firms in the regressions. Moreover, we control for state, year, and industry (at 2-digit SIC

level) fixed effects in all regressions to exclude time invariant effects.

3.2.3 Summary statistics

Table 3.1 presents the time series variation in terms of the number of the loan packages and the number of unique borrowing firms. As is evident, both variables fluctuate with the boom and the recession of the U.S. economy. For instance, the number of the loan packages and the number of the borrowing firms peak in 1997 first time and in 2004 second time, while both witness a material drop during the financial crisis over 2007 to 2009. Meanwhile, we notice a material increase from 1995 to 1997. This might be attributed to the enforcement of IBBEA for interstate banking deregulation in 1995 and interstate branching deregulation in 1997.

Table 3.2 presents the frequencies of different types of the financial covenants in our final sample. At least one-fifth of the loan contracts include capital covenants. The most popular capital covenants are "Max. Capex"[1] (22.32%), "Net Worth" (20.23%), and "Tangible Net Worth" (18.64%). On the other hand, more than half of the loan packages contain performance covenants. Particularly, 56% of loan contracts have "Max. Debt to EBITDA"[2]. "Min. Fixed Charge Coverage"[3] and "Min. Interest Coverage"[4] are also used frequently, with the percentage of both reaching 37.88% and 37.25%.

Table 3.3 reports the summary statistics of variables used in subsequent analysis, including the proxies of the bank competition, the probability of financial covenant violation, the characteristics of the borrowing firms and the loan contracts, and the market-wide control variable. On average, a loan

[1] "Max. Capex" means the maximum of capital expenditure.
[2] "Max. Debt to EBITDA" means the maximum of the ratio of debt to earnings before interest, tax, depreciation and amortization (EBITDA)
[3] "Min. Fixed Charge Coverage" means the minimum of the fixed charge coverage ratio
[4] "Min. Interest Coverage" means the minimum of interest coverage ratio

package contains 2.6 financial covenants, and the probability of violating the financial covenants in current fiscal quarter is 0.38. Specifically, the average probability of violating performance covenants is 0.31, which is much higher than the average probability of violating capital covenants (0.11). This might be due to the fact that the performance covenants are more frequently used than the capital covenants in the loan contracts. The mean of yearly number of the bank branches in a state is 2647.83, and the standard deviation is 1389.26. The mean total assets of the borrowing firms is 2698.44 million dollars, and the minimum and maximum of total assets are 9.97 and 42109 million dollars, respectively, showing that our sample covers a large variation regarding firm size. The mean of financial leverage is 0.28, and the EBITDA is 14% of firm's sales. The mean of current ratio and market-to-book ratio are 1.94 and 2.78, respectively. The mean of firm age is 20 years, and 44% of borrowers get S&P long-term credit ratings. These characteristics of the firms are comparable to other studies. In terms of the characteristics of the loan contract, the mean of the ratio of loan amount to the borrower's total assets is 0.34. 8.16 lenders grant a loan to a borrowing firm. On average, the borrowing firm borrowed one time previously from the leader lender of the current loan. 70% of loan packages include performance pricing terms.

3.3 Empirical Analysis Results

3.3.1 Baseline results

Table 3.4 presents the baseline regression results of the financial covenant tightness on the bank competition. In all regression models, we control for the characteristics of the borrowing firms, the characteristics of the loan contracts and the market-wide factors. Furthermore, we capture time-invariant effects

within each state, year or industry by adding fixed effects. Column (1) shows the OLS estimate, where the dependent variable is the probability of financial covenant violation. The coefficient of *Residual: Ln(NO. of branches in a state)* is 0.158 and statistically significant at 1% level. It means that higher bank competition within a state is positively associated with the tightness of financial covenants in the loan agreements. This is consistent with our prediction. Moreover, the economic impact of bank competition on covenant tightness is also considerable. For example, one standard deviation increase (0.38) of bank competition proxy is associated with approximate 14.6% increase of the probability of financial covenant violation relative to the sample mean[5].

Column (2) and (3) report the OLS estimates for the regressions of the probability of violation on performance covenants and capital covenants on the bank competition, respectively. The coefficients of the bank competition proxy are also significant at conventional levels (above 10%), suggesting that the bank competition is associated with the tightness of different types of financial covenants positively. Although the OLS estimates present a positive and significant relationship between the bank competition and the financial covenant tightness, the probability ranges from 0 to 1, which cannot satisfy the general assumption of OLS in terms of the normally distributed dependent variable. Therefore, we use fraction probit model to estimate the regressions, and the results are presented in column (4) to column (6). The coefficients of the bank competition proxy are all statistically significant at 1% level.

Our findings contradict some of the evidence regarding the impact of bank competition on covenant contracting. Bushman et al. (2016) construct a proxy of bank competition that is confronted by each bank, using the text-searching techniques by identifying the disclosed competition information in 10-Qs and 10-Ks filings. Using the text-based competition proxy, they document a nega-

[5]Calculation of economic significance: $0.158 \times 0.35/0.38 \times 100\% \approx 14.6\%$

tive association between the number of covenants included in a loan package. However, their sample just covers public listed banks in the U.S., which are relatively larger lenders with arguably more clients with better credit. Hollander and Verriest (2016) regress covenant intensity on the number of institutions headquartered within a state or a city and document a negative coefficient, using a syndicated loan sample between 2005 to 2008. As we discussed above, with the deregulation of interstate banking and branching restriction, out-of-state banks can join in the competition with the in-state banks from the middle of 1990s. Thus, using the number of the institutions headquartered within a geographic area is likely to underestimate the intensity of local bank competition, which might bias the estimates. Our loan sample is relatively bigger than theirs, as we include loans starting between 1995 and 2013, and the lenders can be both public or private banks. Moreover, the number of main offices and branches within a state might be accurate to proxy the local bank competition, as it captures the competition from out-of-state banks, accompanying the impact of IBBEA enforcement on credit market competition at state level.

3.3.2 Bank competition and the borrower's quality

If more intensified bank competition in the local market drives the lenders seeking more clients with higher risks, banks have incentive to restrict the borrowing firm by using tighter financial covenants. Therefore, a negative relationship between the bank competition and the borrower's quality in expected. Then, we investigate the association between the state level bank competition and the quality of the borrowing firms. We use Ohlson score (O-score) and credit rating index to measure the quality of the borrowing firms. O-score measures the bankruptcy likelihood of the borrowing firms. The higher the O-score, the higher the likelihood of being bankrupt. Therefore, we expect a

positive association between the bank competition proxy and O-score. Credit rating index is a score that ranges from 1 to 7, where AAA rating of S&P long-term credit ratings is encoded as 1, AA class ratings as 2, A class ratings as 3, BBB class ratings as 4, BB class as 5, B class and ratings below as 6, and no ratings as 7 (Qian and Strahan, 2007). The higher index indicates worse credit of the borrowing firm. Therefore, we expect the bank competition proxy to be positively related to the credit rating index. Accounting for the time needed to initiate a loan application, negotiation and processing, we take the average value of the credit ratings index 12-month preceding the loan inception date to capture the overall credit rating in the loan contracting. The summary statistics of O-score and credit rating index are reported in table 3.3. The mean of O-score is -0.88, and the average credit rating index is 5.94.

Table 3.5 shows the results of the regressions of the quality of the borrowers on the bank competition. The coefficients of the bank competition proxy are both significantly positive, which is consistent with our predictions. Specifically, in column (1) the coefficient is -0.114 and significant at 1%, indicating that higher competition among banks in a state is associated with borrowers with higher bankruptcy likelihood. In column (2), the coefficient of bank competition proxy is 0.032 and significant at 5%, indicating that higher bank competition is associated with borrowers with worse credit ratings. Therefore, the reason of contracting tighter financial covenants under higher competition is that the banks intend to control for the risks of the loan portfolio when they take more risks under the intensified competition environment.

3.3.3 Additional analysis

A. State-year level analysis

Firstly, we show the analysis at state-year level. One of the assumptions of our hypothesis is that the intensified competition among banks decreases the loan rate, thus potentially decreasing the banks' revenue. To keep the profitability, the bank is more likely to seek riskier borrowers. To identify whether the loan interest income is affected by the bank competition, we construct a state-year level data using all loan packages with available information in All-In-Drawn Spread (AIDS) and the borrowers' state. Specifically, we count the number of loan packages and sum the total amount of loan packages within a state yearly. Then, we calculate the total interest of loans within a state in a year by summing the product of AIDS and loan amount. The summary statistics of the state-year level variables are reported in Panel A of Table 3.6. The average total number of loan packages is 64.37, and the mean of total loan amount within a state is 25294.93 million. We take the natural logarithm to normalize the variables in the regressions. The mean of total interest within a state in a year is 445.91 million dollars, but it varies too much where the maximum is 7513.18 million and minimum is 0.25 million. Thus, we also use their natural logarithm in the regressions.

Panel B of Table 3.6 presents the results of the regressions using the state-year level variables. After controlling for year and state fixed effects, the bank competition proxy is positively and significantly associated with the total number of loan packages within a state, but insignificant associated with total interest and total amount of loans. These results indicate that banks grant more loan packages to the borrowers in the state, but the total amount of loans has insignificant increase with the increase of bank competition, which implies that banks offer more smaller amount loans. In terms of bank compe-

tition and total interest, on one hand, the greater competition among banks reduces the interest rate, given the quality of the borrowers. On the other hand, greater competition drives the banks to seek riskier borrowers (recall the results in Table 3.5), which may increase the interest rate for those lendings. So, the insignificance of the coefficient of bank competion proxy indicates the competing effects of two forces in impacting the total interest.

B. Non-recession versus recession period

Christensen and Nikolaev (2012) document different patterns regarding the trend of covenant contracting for performance covenants and capital covenants after the 2008 financial crisis. Specifically, they find unconspicuous trend of the usage of performance covenants but an obvious steep increase in the usage of capital covenants. Therefore, the covenant contracting and covenant tightness might be different between recession period and non-recession period. We estimate the baseline regressions again, using partitioned samples for recession and non-recession period. In our sample period, April 2001 to November 2001 and January 2008 to June 2009 are defined as recession periods according to the NBER U.S. recession indicators.

Table 3.7 reports the recession versus non-recession period estimate of regression of covenant tightness on state bank competition. For the non-recession period, the bank competition is significantly and positively associated with the covenant tightness. The positive association also applies to the tightness of both performance and capital covenants. However, none of them is significant in recession period. The interpretation might be that, during non-recession period, banks are more likely to offer loans to riskier clients to get more market shares, in the mean time, use more restrictive covenants to lower the risks of repayment of the loans. But during recession periods, banks are confronted with more defaults and bankrupt borrowers in their loan portfolios, thus the

banks become more prudent and give up seeking more risky borrowing firms.

The univariate analysis shows that the borrowers in recession periods are relatively larger, more stable, older and more rated. The loan packages in recession periods are smaller, shorter and provided by fewer lenders and more relationship lendings [6]. We also estimate the regressions of borrower's quality on bank competition. The results are reported in Table 3.8. All coefficients of bank competition proxy are significant at 5% or above, indicating that higher bank competition is associated with the borrowers with higher risks during non-recession periods. However, we do not get significant coefficients for bank competition in recession period, which means the bank competition does not drive banks to offer credit to more risky clients during recession periods.

C. Small borrowers versus large borrowers

One might argue against the validity of our branch number-based bank competition proxy, since the loan officers in the bank branches may not get involved the decisions on the agreement of large bilateral loans or syndicated loans, which consists of the majority of Dealscan loan sample. It might be true that the borrowers of the large amount loans communicate and negotiate with the head management of the lenders directly, but it is arguable that the branches of the lenders in a specific local area may undertake some tasks such as monitoring or collecting information. Empirically, Hollander and Verriest (2016) document the statistically significant impact of the existence of the bank branches within 50 miles of the borrowing firm on lowering the covenant intensity. Moreover, if the branches really get involved into the contracting of large amount loans, it is likely that the branches influence the contracts with the smaller borrowers more than larger borrowers. Intuitively, larger borrowers are more likely to do the business with the head departments of the

[6]The univariate analysis results are reported in Table 3.17.

banks, whereas smaller borrowers are more likely to be affected by the local branches. For example, Canales and Nanda (2012) shows the branch managers can influence the credit supply to small business materially

Another theoretical motivation to investigate the heterogeneity in the size of the borrowers is that Christensen and Nikolaev (2012) suggest two different mechanisms of how the covenants work in the incomplete loan contract. They categorise financial covenants into two groups, performance covenants and capital covenants. Performance covenants use the information from income statement, while capital covenants only use balance sheet information. They affect the borrowing firms through different ways. Performance covenants allow the lenders to take contingent control right of the borrowers, depending on the firms' future performance. Capital covenants bind the interest of the shareholders of the borrowing firms with the loan contract, which encourages the shareholders monitoring managerial behaviours to avoid asset substitution, debt overhang or claim dilution.

It might be easier for a lender to take control right of smaller firms, and the lender usually has larger bargaining power than the small firms do in the re-negotiations if the covenants are violated. Thus, we expect that bank competition has greater impact on the tightness of performance covenants for smaller borrowing firms. As opposed to performance covenants, intervening in the large borrowing firms is difficult and costly for the lenders. Alternatively, to influence the management in the large borrowing firms, the lenders can use tighter capital covenants to encourage the shareholder in larger borrowing firms monitoring the managers. Therefore, the larger impact of bank competition on the tightness of capital covenants is expected for larger borrowing firms.

Table 3.9 presents the estimated results of partitioned subsamples in terms of the borrowing firm size. We indicate a borrowing firm as a small (large) borrower if the total assets of the firm is below (above) the quartile of total

assets in each year. The coefficients of bank competition proxy in column (1) are positively significant at 5% level, but insignificant in column (4), which means smaller borrowing firms get tighter financial covenants with the increase of bank competition but larger borrowing firms are not affected. Furthermore, the column (2) and (3) shows, for smaller borrowers, the bank competition has statistically significant positive association (at 5% level) with the performance covenant tightness, but insignificant association with capital covenant tightness. Meanwhile, in large borrower sample, we get a statistically significant positive association between bank competition and capital covenant tightness at 1% level, but ingsignificant association between bank competition and performance covenant tightness. These results are consistent with our previous explanation that banks rely more on the performance covenants to restrict small borrowers, but more on the capital covenants for large borrowers.

Table 3.10 reports the results of regressions of the measures of the borrowers' quality on the bank competition. The results provide limited evidence regarding the risk-taking of the banks under the greater bank competition, given the size of the borrowers. Specifically, the coefficients of bank competition are both significant at 10% level in column (1) and (3). It means that, within both smaller and larger borrower groups, the higher bank competition is associated with borrowers with higher bankruptcy risks. However, the coefficients of bank competition in column (2) and (4) are insignificant, which might because the lack of sufficient variations in the credit rating index within each group. In the unreported summary statistics, more than half of the smaller borrowers are encoded as 7 (non-rated firms), and more than half of the larger borrowers are encoded as 4 (BBB rating).

D. Large lenders versus small lenders

Since Bushman et al. (2016) document a positive association between covenant intensity and bank competition using public listed banks sample, and some other studies also point out that the syndicated loan market in the U.S. is dominated by several large banks (e.g., Hollander and Verriest (2016), Ross (2010) etc.). So, we have a theoretical motivation to investigate whether large banks take actions differently from the small or middle size banks in terms of financial covenant contracting. Compared with the smaller banks, the larger banks are more likely to provide large amount of credit, to have more bargaining power against the borrowers, or to have better access to the clients with better credits. Therefore, large banks are expected to lend money to the firms with less risks, which may decrease the financial covenant tightness. Moreover, because of the large number of clients of the large bank, monitoring all borrowers' performance during the loan life is highly costly. Large banks are also less likely to take the full control right of the borrowing firms even the financial covenant thresholds are breached. Therefore, large banks might use tighter capital covenants to reduce agency cost of debts rather than using performance covenants to get contingent control rights in future. As opposed to the large banks, small banks are more likely to provide smaller amount loans, or lend to smaller riskier borrowers. Therefore, the financial covenants in smaller lenders' loan contract is expected to be more restrictive.

Following Hollander and Verriest (2016), we conduct the analysis by comparing the Big 3 against Non-Big 3 lenders in the U.S. syndicated loan market. The Big 3 lenders are JP Morgan, Citi and Bank of America, which almost take the half of the market (Hollander and Verriest, 2016), while other lenders are indicated as Non-Big 3 lenders. We identify the Big 3 lenders by manually

checking the lender's names recorded by Dealscan.[7]

Table 3.11 reports the results of factional probit regressions of financial covenant tightness on bank competition, using Big 3 and Non-Big 3 lenders separately. For Non-Big 3 lenders in column (1) to (3), the coefficients of bank competition proxy are positively associated with the probability of financial covenant violation at 1% level, in spite of the types of financial covenants. However, for Big 3 lenders, the higher competition is associated with tighter capital covenants positively and significantly but with financial covenant and performance financial covenant tightness insignificantly. These results are consistent with our previous hypothesis that the large lender provide loans to better clients, thus it has less motivation to include tighter financial covenants in the loan contract to restrict the borrowers. But the small bank lends money to smaller clients that might be riskier, so they use tighter covenants in the contract to protect the loan.

The univariate analysis shows that the borrowing firms of the loans led by Big 3 lenders are relatively larger, less leveraged, more profitable, higher valued by the market and more rated [8]. Table 3.12 reports the regressions of borrower's quality on bank competition, using Big 3 and Non-Big 3 lenders subsamples separately. We find a positively significant coefficient of bank competition proxy in credit rating index regression for non-Big 3 lenders sample, but insignificant coefficient in O-score regression. For big-3 lenders, we get positive and significant coefficient of the bank competition proxy in O-score regression but insignificant coefficient in credit rating index regression. Although some coefficients of the bank competition proxy are not significant, the results still, to some extent, show that the bank take more risks under intensi-

[7]The reason of manually checking lender's name is that the names recorded by Dealscan are not identical. For example, JP Morgan could appear in the form of "JPMorgan" or "JP Morgan NA" etc. Hence, we identify by observing the lender's name and make the judgments.

[8]The univariate analysis results are reported in Table 3.18.

fied competition, in spite of the size of the lenders. The insignificance of some coefficients probably because the borrowers with high bankruptcy likelihood are clustered in the clients of non-big 3 lenders, while the borrowers with better credit ratings are clustered in the clients of big 3 lenders. The insufficient variations drive the insignificance in the regressions.

E. Bank lenders versus non-bank lenders

Lim et al. (2014) has documented that non-bank lenders participate in the loan syndication and get higher loan rates by providing credit to financially constraint borrowing firms. Although the financial covenants are determined by the negotiation between the leader lenders (usually banks) and the borrowing firms, it still likely that the positive association between financial covenant tightness and bank competition is driven by loans led by non-bank lenders. To address this concern, we manually identify the bank or non-bank leader lenders, following the rule in Lim et al. (2014). Specifically, the commercial banks or the investment banks are identified as the bank lenders, otherwise non-bank lenders.[9] Among 9210 loan contracts in our sample, the property of leader lenders of 8914 loans can be clearly identified, where 7977 loans are led by bank lenders and 937 led by non-bank lenders. Basically, the borrowers of non-bank lender loans are smaller, with higher leverage, with lower profitability, and younger than those of bank lender loans, which might be more restricted to bank credit [10].

Table 3.13 reports the fractional probit model estimates of financial covnenant tightness on the bank competition, using partitioned sample by the bank and non-bank lenders. The coefficients in column (1) to (3) are all positively significant at 5% or above, which means the higher bank competition

[9]The makority of company profiles are mannually searched in Bloomberg, and the minority is from Wiki or the lenders' websites.

[10]The univariate analysis results are reported in Table 3.19.

is associated with tighter financial covenants for the bank lenders. However, none of the coefficients of bank competition proxy in column (4) to (6) is significant, indicating the financial covenant tightness in the loan contract led by the non-bank institute is not affected by the bank competition. These results indicate that the bank competition influence the bank lenders' decision on financial covenant contracting, but the non-bank lenders are unaffected.

Moreover, in Table 3.14, the coefficients of bank competition proxy in column (1) and (2) are significantly positive at conventional level (10% or above), showing that higher bank competition is associated with worse quality of the borrowers in the bank lenders. Meanwhile, the higher bank competition is also positively associated with the O-score of the borrowing firm of the loan led by non-bank lenders. Therefore, it indicates that bank lenders take more risks when the bank competition is higher. Non-bank lenders also provide loans to riskier borrowers when bank competition is higher without restricting the borrower by tighter financial covenants.

3.4 Causal Relationship Identification: IBBEA

Although we control for industry, year and state fixed effects in previous regressions of financial covenant tightness on the bank competition proxy, the number of main offices and branches within a state in a year is still might be endogenous to financial covenant tightness, where the bank competition might be correlated with other unobservable factors omitted in the regression models. For example, the higher competition among banks within a state might be related to a poorer investor-protection environment in a state. If the equity investors are not protected sufficiently, the companies are less likely to finance the projects by issuing equity. Alternatively, they may transfer to the creditors to finance. The high demand of debts attracts more banks enter the market

and supply the loans, but the banks may require tighter loan contract terms to protect themselves due to the poor investor-protection. If so, the positive association between the number of bank branches and financial covenant tightness reflects the effect of local investor protection. Therefore, we need an exogenous variation in bank competition at state level. IBBEA provides a useful setting to do a Difference-in-Difference test to identify the causal relationship between financial covenant tightness and the bank competition.

In the past, banks have been restricted from running business across state boundaries in the U.S., and interstate branching was specifically forbidden. In the late 1970s, Maine state started to relax the restrictions of out-of-state banks establishing branches, condition on Maine's in-state banks getting the permission reciprocally from other states. In 1994, Interstate Banking and Branching Efficiency Act, which became effective on January 1, 1995 for interstate banking and 1997 for interstate branching, removes the geographic restrictions on bank expansion. However, the act also allows state governments to set barriers for the entry of out-of-state banks individually, which creates an exogenous variations for bank competition within a state. Specifically, a state government can set barriers to restrict the entry of out-of-state banks in terms of four aspects: (1) the minimum age of the target institution, (2) de novo interstate branching, (3) the acquisition of individual branches, and (4) a statewide deposit cap (Rice and Strahan, 2010). The effective date of removing interstate branching is not identical among states. For example, the earliest date of enforcing the deregulation is on June 1, 1995 in Utah, and the latest date is on May 9, 2005 in Washington. Therefore, we use loan packages in our sample whose inception dates are between January 1, 1995 and December 31, 2005, which covers the period of branching deregulation.

To capture the incremental effects of branching deregulation on the financial covenant tightness, we use four dummy variables. Each dummy variable

indicates the status of each state the borrowing firm headquartered in removes at least 1, 2, 3 or 4 restrictions, respectively, on the loan inception date. Coefficients of these dummy variables in an OLS regression represents the average change of financial covenant tightness due to the removal of one more barriers on branching.

Table 3.15 reports the OLS estimates of the financial covenant tightness on the deregulation dummy indicators. In column (1) and (2), the coefficients of *Dummy: At least remove 1 restriction* are positively significant at conventional level (10% or above). However, the effect of deregulation is insignificant on the tightness of capital covenants. Specifically, the removal of one restriction from the regulated status increases the probability of financial covenant violation and probability of performance covenant violation by 13% (0.05/0.38 = 0.13) and 19% (0.058/0.31 = 0.19) at the sample mean, respectively. Other dummy variables of deregulation get insignificant coefficients. The results show that once the deregulation starts, the out-state banks enter the local loan market and the loan market reach a new equilibrium in the demand and supply of the loans, in spite of more barriers of bank branching are removed.

3.5 Robustness Tests

The first robustness test we conduct is to use more relaxed definition of the number of main office and branches. In our analysis above, we proxy bank competition using the number of full service brick and mortar offices and branches in FDIC branch data. This type of branches takes approximate 77% of the whole FDIC branches in our sample period. FDIC also records other types of branches, such as full service retail office, full service cyber office, full service mobile office etc. According to the definitions of the different types of the branches, full service brick and mortar office is the branch that is most

likely to get involved in loan contracting, however, other types of branches are also possible to undertake loan contracting tasks, such as full service retail office. Therefore, we redefine the number of branches by adding full service retail office, or by adding all other types of full service branches and run all analysis again. However, all results are qualitatively similar.

We conduct another robustness test by using a shorter sample of loans starting between 1995 and 2005. Since the latest deregulation of interstate branching occurs in 2005, it is likely that the number of branches within a state might be endogenous after 2005. To avoid the endogenous regressor, we do all analysis using the loans beginning during the IBBEA deregulation period, and again, all results are qualitatively same.

3.6 Conclusion

In this study, we analyze how bank competition influences the tightness of financial covenants. We add new evidence to the debate in previous literature on the relationship between the bank competition and bank risks. Specifically, we find a robust positive association between the statewide bank competition and the tightness of financial covenants in the loan contract, using a recently developed financial covenant tightness proxy. Our results show that the banks provide loans with more restrictive financial covenants when they are confronted with higher competition in the local market. We find that this positive relationship is caused by the banks seeking more riskier clients to keep the profits under higher competition, and the evidence supports our prediction that higher bank competition is associated with the borrowers with higher bankruptcy risks or worse credit ratings.

Additional analysis helps us to understand the relationship between the bank competition and financial covenant tightness in greater detail. Specifi-

cally, we find the positive relationship is mainly driven by non-recession period. The size of the borrower matters for how the lender uses tighter covenants. Smaller borrowers are restricted more by performance covenants, but larger borrowers receive tighter capital covenants. The size of the bank also matters. The big-3 lenders offer tighter capital covenants, while non-big 3 lenders use tighter financial covenants in both types. The IBBEA enforcement identifies the causal positive relationship between the bank competition and financial covenant tightness.

This study reveals that the banks take prudent actions when they take more risks under intensified competition in the loan market. This might be helpful to the supervisory departments to appraise the impact of deregulation in the U.S. banking industry. However, whether tighter financial covenants are really effective in mitigating the risks of the banks' loan portfolios is not addressed in this paper. We expect future research to shed some light on this issue.

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Table 3.1: Sample distribution by years

Loan Inception Year	No. of Packages	No. of Borrowers
1995	258	243
1996	610	556
1997	715	655
1998	600	537
1999	561	511
2000	525	486
2001	598	556
2002	641	607
2003	625	587
2004	685	638
2005	633	580
2006	502	452
2007	473	427
2008	334	306
2009	242	228
2010	292	287
2011	402	379
2012	255	241
2013	259	245

Table 3.2: Types of financial covenants

Type of Financial Covenants	Item	No. of Covenants	No. of Packages	Percentage
Capital covenants	Max. Capex	2056	9210	22.32%
	Net Worth	1863	9210	20.23%
	Tangible Net Worth	1717	9210	18.64%
	Max. Leverage ratio	1448	9210	15.72%
	Min. Current Ratio	1067	9210	11.59%
	Max. Debt to Tangible Net Worth	906	9210	9.84%
	Max. Senior Debt to EBITDA	847	9210	9.20%
	Min. Quick Ratio	262	9210	2.84%
	Max. Debt to Equity	77	9210	0.84%
	Max. Senior Leverage	12	9210	0.13%
	Max. Loan to Value	9	9210	0.10%
	Min. Equity to Asset Ratio	1	9210	0.01%
	Min. Net Worth to Total Asset	1	9210	0.01%
Performance covenants	Max. Debt to EBITDA	5200	9210	56.46%
	Min. Fixed Charge Coverage	3489	9210	37.88%
	Min. Interest Coverage	3431	9210	37.25%
	Min. EBITDA	803	9210	8.72%
	Min. Debt Service Coverage	676	9210	7.34%
	Min. Cash Interest Coverage	90	9210	0.98%

Table 3.3: Summary statistics

	Obs.	Mean	Std. Dev.	Min	Max
Prob. of covenant violation	9210	0.38	0.41	0.00	1.00
Prob. of violation of performance covenants	9210	0.31	0.40	0.00	1.00
Prob. of violation of capital covenants	9210	0.11	0.26	0.00	1.00
NO. of financial covenants of a package	9210	2.60	1.15	1.00	7.00
NO. of branches in a state	9210	2647.83	1389.26	130.00	6323.00
Ln(NO. of branches in a state)	9210	7.69	0.69	4.87	8.75
Residual: Ln(No. of branches in a state)	9210	−0.02	0.35	−1.46	0.78
Total assets (million USD)	9210	2698.44	6210.97	9.97	42109.00
Ln(Total assets)	9210	6.41	1.80	2.30	10.65
Leverage	9210	0.28	0.17	0.00	0.74
EBITDA/Sales	9210	0.14	0.16	−0.49	0.68
Current ratio	9210	1.94	1.11	0.34	6.65
Market-to-book ratio	9210	2.78	3.17	0.06	22.52
Firm age (in years)	9210	20.06	15.50	2.00	60.00
Ln(Firm age)	9210	2.76	0.78	1.10	4.11
Dummy: S&P rated	9210	0.44	0.50	0.00	1.00
Loan amount/Total assets	9210	0.34	0.32	0.02	1.85
Maturity of the package	9210	47.87	21.63	6.00	111.00
Ln(Maturity)	9210	3.72	0.60	1.79	4.71
NO. of lenders	9210	8.16	8.23	1.00	42.00
Ln(NO. of lenders)	9210	1.56	1.11	0.00	3.74
NO. of past loans with leader lender	9210	1.03	1.54	0.00	7.00
Ln(1 + NO. of past loans with leader lender)	9210	0.49	0.61	0.00	2.08
Dummy: Performance pricing	9210	0.70	0.46	0.00	1.00
Net % of banks tightening standards	9210	0.06	0.23	−0.24	0.84
O-score	9210	−0.88	1.45	−3.85	3.36
Credit rating index	9210	5.94	1.36	1.00	7.00

Table 3.4: Bank competition (residual) and financial covenant tightness

	OLS			Fractional Probit Model		
	(1) PViol	(2) P-Cov PViol	(3) C-Cov PViol	(4) PViol	(5) P-Cov PViol	(6) C-Cov PViol
Residual: Ln(No. of branches in a state)	0.158***	0.134***	0.059*	0.522***	0.435**	0.737***
	(2.90)	(2.62)	(1.74)	(3.07)	(2.50)	(3.52)
Ln(Total assets)	−0.046***	−0.035***	−0.019***	−0.144***	−0.124***	−0.104***
	(−8.37)	(−6.37)	(−4.88)	(−8.31)	(−6.52)	(−4.86)
Leverage	0.794***	0.777***	0.176***	2.399***	2.512***	1.026***
	(28.67)	(26.82)	(8.82)	(26.13)	(24.79)	(10.28)
EBITDA/Sales	−0.550***	−0.637***	−0.067*	−1.746***	−2.167***	−0.266*
	(−15.40)	(−17.16)	(−1.71)	(−13.80)	(−14.89)	(−1.69)
Current ratio	−0.024***	−0.017***	−0.013***	−0.073***	−0.059***	−0.055***
	(−5.30)	(−3.98)	(−3.65)	(−5.07)	(−3.94)	(−2.86)
Market-to-book ratio	−0.011***	−0.011***	0.000	−0.034***	−0.039***	0.001
	(−7.26)	(−7.57)	(0.42)	(−7.01)	(−7.30)	(0.25)
Ln(Firm age)	−0.000	0.003	−0.002	0.001	0.017	−0.027
	(−0.06)	(0.54)	(−0.49)	(0.05)	(0.84)	(−1.09)
Dummy: S&P rated	−0.028**	−0.029**	−0.008	−0.091***	−0.102***	−0.069
	(−2.53)	(−2.58)	(−1.06)	(−2.68)	(−2.74)	(−1.44)
Loan amount/Total assets	−0.023	−0.031**	0.015	−0.075	−0.115**	0.036
	(−1.47)	(−2.10)	(1.20)	(−1.51)	(−2.23)	(0.59)
Ln(Maturity)	0.021***	0.046***	−0.029***	0.071***	0.168***	−0.141***
	(2.94)	(6.24)	(−5.90)	(3.21)	(6.60)	(−5.72)
Dummy: Performance pricing	0.011	0.031***	−0.021***	0.038	0.110***	−0.113***
	(1.06)	(3.00)	(−3.36)	(1.24)	(3.29)	(−3.11)
Ln(NO. of lenders)	−0.012*	−0.008	−0.008*	−0.030	−0.014	−0.044*
	(−1.82)	(−1.27)	(−1.89)	(−1.46)	(−0.65)	(−1.75)
Ln(1 + NO. of past loans with leader lender)	−0.010	−0.011*	−0.004	−0.029	−0.033	−0.022
	(−1.46)	(−1.65)	(−0.96)	(−1.37)	(−1.44)	(−0.86)
Net % of banks tightening standards	0.011	0.011	−0.030	0.017	0.039	−0.124
	(0.21)	(0.23)	(−1.00)	(0.11)	(0.26)	(−0.70)
Constant	0.753***	0.471***	0.434***	0.753***	−0.105	0.311
	(11.44)	(6.90)	(9.64)	(3.83)	(−0.49)	(1.36)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes
N	9210	9210	9210	9210	9210	9210
Adj. R^2	0.24	0.23	0.14			
Pseudo R^2				0.15	0.16	0.15

This table reports the results of the regressions of the financial covenant tightness on the bank competition, where the bank competition proxy is the residual from the regression of the natural logarithm of the number of branches in a state on the natural logarithm of state GDP in last year. PViol, P-Cov PViol and C-Cov PViol indicate the probability of financial covenant violation, the probability of performance covenant violation and the probability of capital covenant violation, respectively. Column (1)–(3) report the OLS estimates, and column (4)–(6) report fractional probit regression estimates. Year, 2-digit SIC industry, and state fixed effects are controlled. T-stats in OLS estimates and Z-stats in fractional probit model are reported in the parentheses. Standard errors are corrected by clustering at state-year level. ***, ** and * denote statistical significance at 1%, 5% and 10% level, respectively. Detailed definitions of the variables are described in Table 3.16.

Table 3.5: Bank competition and the borrower's quality

	(1) O-Score	(2) Credit rating index
Residual: Ln(No. of branches in a state)	0.058**	0.067**
	(2.25)	(2.18)
Ln(Total assets)	−0.313***	−0.502***
	(−32.11)	(−39.97)
Leverage	5.107***	−0.202***
	(86.99)	(−3.34)
EBITDA/Sales	−2.498***	0.086
	(−20.70)	(1.21)
Current ratio	−0.506***	0.035***
	(−48.47)	(3.57)
Market-to-book ratio	0.040***	−0.027***
	(11.61)	(−6.62)
Ln(Firm age)	0.069***	−0.196***
	(5.14)	(−12.23)
Loan amount/Total assets	−0.128***	0.054
	(−3.49)	(1.53)
Ln(Maturity)	−0.052***	0.179***
	(−3.15)	(9.21)
Ln(NO. of lenders)	−0.061***	−0.078***
	(−4.87)	(−4.91)
Ln(1 + NO. of past loans with leader lender)	0.015	−0.054***
	(1.09)	(−3.00)
Net % of banks tightening standards	0.021	0.045
	(0.23)	(0.38)
Constant	1.023***	8.950***
	(8.92)	(63.16)
Year	Yes	Yes
Industry	Yes	Yes
N	9210	9210
Adj. R^2	0.75	0.58

This table reports the results of the regressions of the quality of the borrowers on the bank competition, where bank competition proxy is the residual from the regression of the natural logarithm of the number of main offices and branches in a state on the natural logarithm of state GDP in last year. O-Score and credit rating index proxy the quality of the borrowers as the dependent variables. Column (1) and (2) report OLS estimates. T-stats are reported in the parentheses. Year and 2-digt SIC industry are controlled. Standard errors are corrected by clustering at state-year level. ***, **, and * denote statistical significance at 1%, 5% and 10% level, respectively. Detailed definitions of the variables are described in Table 3.16.

Table 3.6: State-year level analysis

Panel A: Summary statistics

	Obs.	Mean	Median	Std. Dev.	Min	Max
No. of packages within a state	864	64.37	36.00	81.88	1.00	469.00
Total loan amount in a state (million USD)	864	25294.93	11101.64	38113.95	9.75	290077.05
Ln(Total loan amount in a state)	864	9.07	9.31	1.76	2.28	12.58
Total interest within a state (million USD)	864	445.91	187.45	733.31	0.25	7513.18
Ln(Total interest within a state)	864	5.00	5.23	1.74	−1.39	8.92

Panel B: Regression analysis

	(1) Number	(2) Amount	(3) Interest	(4) Number	(5) Amount	(6) Interest
Ln(NO. of branches in a state)	0.150***	0.048	0.262			
	(2.77)	(0.21)	(1.13)			
Residual: Ln(NO. of branches in a state)				0.174***	−0.330	−0.040
				(2.91)	(−1.41)	(−0.17)
Constant	1.800***	7.466***	1.512	2.752***	8.013***	3.396***
	(4.63)	(4.52)	(0.92)	(42.04)	(38.17)	(16.15)
Year	Yes	Yes	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes
N	864	864	864	864	864	864
Adj. R^2		0.90	0.90		0.90	0.90
Pesudo R^2	0.92			0.92		

This table reports the results of state-year level analysis. Panel A reports the summary statistics of state-year level variables. Panel B reports the state-year level regression analysis results. The dependent variables in column (1) and (4) are the number of packages within a state. The number of packages within a state is the number of loan packages granted to the borrowers headquartered in a state in a year. The dependent variables in column (2) and (5) are the natural logarithm of total loan amount in a state. Total loan amount in a state is the sum of the amount of loans granted to the borrowers headquartered in a state in a year. The dependent variables in column (3) and (6) are the natural logarithm of total interest within a state. Total interest within a state is the natural logarithm of total interest within a state in a year. We compute the interest as the sum of loan facility level All-In-Drawn spread (AIDS) times the loan amount. Column (1) and (4) present the poisson regression estimates, and other columns present the OLS estimates. Year and state fixed effects are controlled. Standard errors are corrected by clustering at state level. ***, **, and * denotes statistical significance at 1%, 5% and 10% level, respectively. Detailed definitions of the variables are described in Table 3.16.

Table 3.7: Non-recession v.s. Recession: Bank competition and financial covenant tightness

	Non-recession			Recession		
	(1) PViol	(2) P-Cov PViol	(3) C-Cov PViol	(4) PViol	(5) P-Cov PViol	(6) C-Cov PViol
Residual: Ln(No. of branches in a state)	0.525***	0.466***	0.710***	1.036	0.491	0.478
	(3.02)	(2.59)	(3.27)	(1.48)	(0.82)	(0.47)
Ln(Total assets)	−0.140***	−0.125***	−0.091***	−0.180**	−0.111*	−0.211***
	(−7.77)	(−6.20)	(−4.20)	(−2.53)	(−1.83)	(−3.31)
Leverage	2.479***	2.605***	1.030***	1.671***	1.722***	0.997**
	(26.35)	(24.94)	(9.87)	(5.19)	(5.46)	(2.36)
EBITDA/Sales	−1.801***	−2.122***	−0.416***	−1.255***	−2.542***	1.157**
	(−14.00)	(−13.62)	(−2.59)	(−2.73)	(−7.02)	(2.35)
Current ratio	−0.066***	−0.053***	−0.054***	−0.213***	−0.170***	−0.147**
	(−4.52)	(−3.47)	(−2.74)	(−3.40)	(−2.96)	(−2.14)
Market-to-book ratio	−0.032***	−0.037***	0.001	−0.052***	−0.061***	−0.005
	(−6.29)	(−6.64)	(0.21)	(−2.84)	(−2.75)	(−0.21)
Ln(Firm age)	0.003	0.022	−0.035	−0.049	−0.055	0.001
	(0.16)	(1.03)	(−1.33)	(−0.80)	(−0.90)	(0.01)
Dummy: S&P rated	−0.094***	−0.099**	−0.071	−0.089	−0.158	−0.013
	(−2.69)	(−2.54)	(−1.50)	(−0.62)	(−1.26)	(−0.06)
Loan amount/Total assets	−0.059	−0.099*	0.050	−0.281	−0.369	−0.063
	(−1.16)	(−1.87)	(0.81)	(−1.40)	(−1.50)	(−0.35)
Ln(Maturity)	0.071***	0.166***	−0.126***	0.044	0.169**	−0.330***
	(2.98)	(6.04)	(−4.76)	(0.62)	(2.33)	(−3.71)
Dummy: Performance pricing	0.034	0.116***	−0.130***	0.062	0.047	0.067
	(1.07)	(3.37)	(−3.44)	(0.55)	(0.40)	(0.55)
Ln(NO. of lenders)	−0.027	−0.007	−0.054**	−0.101	−0.102	−0.059
	(−1.23)	(−0.29)	(−2.09)	(−1.45)	(−1.47)	(−0.70)
Ln(1 + NO. of past loans with leader lender)	−0.026	−0.035	−0.004	−0.062	−0.028	−0.129*
	(−1.15)	(−1.45)	(−0.15)	(−0.90)	(−0.43)	(−1.77)
Net % of banks tightening standards	0.140	0.147	−0.119	−0.668*	−0.849**	0.094
	(0.70)	(0.79)	(−0.53)	(−1.95)	(−2.30)	(0.27)
Constant	0.642***	−0.167	0.126	3.252***	2.028**	2.233***
	(3.25)	(−0.76)	(0.53)	(4.06)	(2.55)	(2.89)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes
N	8343	8343	8343	867	867	867
Pseudo R^2	0.16	0.16	0.15	0.17	0.20	0.27

This table reports fractional probit regression estimates using partitioned subsamples by recession and non-recession period. A loan package starts during 2001m4 to 2001m11 and 2008m1 to 2009m6 is denoted as a package in recession period, otherwise denoted as non-recession period package. The recession periods are identified by NBER United States Reccession Indicators. PViol denotes the probability of covenant violation at the inception dates of the loan packages. P-Cov PViol and C-Cov PViol denote the probability of violation of performance covenants and capital covenants, respectively, at the inception dates of the loan packages. Year, 2-digit SIC industry, and state fixed effects are controlled. Standard errors are clustered at state-year level. ***, **, and * denote significance at 1%, 5%, and 10% level, respectively. Detailed definitions of the variables are described in Table 3.16.

Table 3.8: Non-recession v.s. Recession: Bank competition and the borrower's quality

	Non-recession		Recession	
	(1) O-score	(2) Credit rating index	(3) O-score	(4) Credit rating index
Residual: Ln(No. of branches in a state)	0.073***	0.073**	−0.129	−0.007
	(2.72)	(2.26)	(−1.47)	(−0.06)
Ln(Total assets)	−0.309***	−0.501***	−0.338***	−0.510***
	(−31.33)	(−37.53)	(−8.76)	(−16.18)
Leverage	5.114***	−0.232***	4.996***	0.116
	(83.02)	(−3.65)	(27.25)	(0.62)
EBITDA/Sales	−2.525***	0.070	−2.191***	0.207
	(−20.40)	(0.94)	(−5.65)	(0.76)
Current ratio	−0.500***	0.034***	−0.590***	0.044
	(−46.25)	(3.36)	(−17.86)	(1.29)
Market-to-book ratio	0.041***	−0.026***	0.025**	−0.035***
	(11.17)	(−6.06)	(2.52)	(−3.40)
Ln(Firm age)	0.068***	−0.186***	0.075*	−0.303***
	(4.76)	(−10.91)	(1.66)	(−6.43)
Loan amount/Total assets	−0.132***	0.063*	−0.040	−0.092
	(−3.53)	(1.74)	(−0.24)	(−0.75)
Ln(Maturity)	−0.054***	0.184***	−0.049	0.165***
	(−3.10)	(8.83)	(−0.95)	(3.42)
Ln(NO. of lenders)	−0.063***	−0.078***	−0.067	−0.095*
	(−4.83)	(−4.73)	(−1.62)	(−1.93)
Ln(1 + NO. of past loans with leader lender)	0.012	−0.056***	0.063	−0.018
	(0.83)	(−2.98)	(1.57)	(−0.28)
Net % of banks tightening standards	0.067	0.295**	0.414**	−0.254
	(0.62)	(2.15)	(2.01)	(−0.89)
Constant	0.979***	8.913***	1.357***	9.586***
	(8.08)	(59.47)	(3.75)	(21.85)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
N	8343	8343	867	867
Adj. R^2	0.75	0.58	0.74	0.61

This table reports OLS estimates of borrower's quality and bank competition, using partitioned subsamples by recession and non-recession period. A loan package starts during 2001m4 to 2001m11 and 2008m1 to 2009m6 is denoted as a package in recession period, otherwise it is denoted as non-recession period package. The recession period is identified from NBER United States Reccession Indicators. The dependent variables in column (1) and (3) are Ohlson-score. The dependent variable in column (2) and (4) are credit rating index. T-stats are reported in the parentheses. Year and 2-digt SIC industry are controlled. Standard errors are clustered at state-year level. ***, ** , and * denote significance at 1%, 5%, and 10% level. Detailed definitions of the variables are described in Table 3.16.

Table 3.9: Small borrowers v.s. Large borrowers: Bank competition and financial covenant tightness

	Small borrowers			Large borrowers		
	(1) PViol	(2) P-Cov PViol	(3) C-Cov PViol	(4) PViol	(5) P-Cov PViol	(6) C-Cov PViol
Residual: Ln(No. of branches in a state)	0.666**	0.823**	0.269	0.236	−0.384	1.116**
	(2.35)	(2.55)	(0.86)	(0.70)	(−1.07)	(2.03)
Ln(Total assets)	−0.051	−0.002	−0.095**	−0.195***	−0.233***	0.012
	(−1.27)	(−0.04)	(−2.54)	(−3.80)	(−4.57)	(0.15)
Leverage	1.945***	2.182***	0.671***	3.334***	3.735***	1.288***
	(12.12)	(13.40)	(3.86)	(12.24)	(13.75)	(4.12)
EBITDA/Sales	−1.286***	−1.456***	−0.361**	−2.755***	−3.790***	−0.902*
	(−7.64)	(−7.03)	(−2.05)	(−6.40)	(−8.77)	(−1.91)
Current ratio	−0.140***	−0.125***	−0.092***	−0.023	−0.038	0.025
	(−6.27)	(−5.26)	(−3.64)	(−0.56)	(−0.87)	(0.46)
Market-to-book ratio	−0.015**	−0.026***	0.017**	−0.042***	−0.044***	−0.007
	(−2.00)	(−3.30)	(2.15)	(−3.81)	(−3.47)	(−0.50)
Ln(Firm age)	−0.014	0.003	−0.022	−0.019	0.008	−0.108*
	(−0.36)	(0.07)	(−0.52)	(−0.41)	(0.15)	(−1.91)
Dummy: S&P rated	−0.225*	−0.264*	−0.413	−0.154*	−0.068	−0.287***
	(−1.67)	(−1.85)	(−1.50)	(−1.65)	(−0.61)	(−2.72)
Loan amount/Total assets	0.095	0.123	0.018	−0.316**	−0.368**	−0.025
	(1.11)	(1.34)	(0.20)	(−2.19)	(−2.19)	(−0.11)
Ln(Maturity)	0.089**	0.216***	−0.142***	0.145***	0.160***	0.065
	(2.00)	(4.20)	(−3.04)	(3.33)	(3.40)	(1.01)
Dummy: Performance pricing	0.138***	0.212***	−0.130**	−0.172**	−0.162*	−0.024
	(2.68)	(3.78)	(−2.21)	(−2.18)	(−1.89)	(−0.22)
Ln(NO. of lenders)	−0.147***	−0.179***	0.024	0.032	0.051	−0.041
	(−3.24)	(−3.45)	(0.41)	(0.68)	(1.14)	(−0.62)
Ln(1 + NO. of past loans with leader lender)	−0.187***	−0.176***	−0.133**	−0.001	−0.003	−0.027
	(−3.93)	(−3.49)	(−2.43)	(−0.02)	(−0.07)	(−0.42)
Net % of banks tightening standards	−0.398	−0.451	−0.191	0.181	0.285	0.174
	(−1.45)	(−1.45)	(−0.73)	(0.52)	(0.83)	(0.35)
Constant	−0.131	−1.579***	0.422	1.209***	1.136**	−0.871
	(−0.31)	(−3.50)	(1.00)	(2.65)	(2.17)	(−1.37)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes
N	2294	2294	2294	2314	2314	2314
Pseudo R^2	0.14	0.16	0.16	0.24	0.30	0.20

This table reports fractional probit regression estimates using partitioned subsamples by small and large borrowers. We categorise the small (large) borrowers by indicating if the total assets of the borrower is lower (higher) than the bottom (top) quartile by each year. PViol denotes the probability of covenant violation at the inception dates of the loan packages. P-Cov PViol and C-Cov PViol denote the probability of violation of performance covenants and capital covenants, respectively, at the inception dates of the loan packages. Year, 2-digit SIC industry, and state fixed effects are controlled. Standard errors are corrected by clustering at state-year level. ***, **, and * denote significance at 1%, 5%, and 10% level, respectively. Detailed definitions of the variables are described in Table 3.16.

Table 3.10: Small borrowers v.s. large borrowers: bank competition and the borrowers' quality

	Small borrowers		Large borrowers	
	(1) O-score	(2) Credit rating index	(3) O-score	(4) Credit rating index
Residual: Ln(NO. of branches in a state)	0.100*	−0.006	0.100*	0.052
	(1.79)	(−0.43)	(1.91)	(0.72)
Ln(Total assets)	−0.332***	−0.026***	−0.362***	−0.376***
	(−10.54)	(−4.25)	(−14.23)	(−9.47)
Leverage	5.150***	−0.186***	4.694***	1.311***
	(43.68)	(−4.70)	(34.09)	(7.15)
EBITDA/Sales	−2.633***	0.005	−2.196***	−1.002***
	(−15.36)	(0.20)	(−10.18)	(−4.72)
Current ratio	−0.502***	−0.002	−0.566***	−0.006
	(−28.98)	(−0.56)	(−17.73)	(−0.18)
Market-to-book ratio	0.040***	−0.002*	0.053***	−0.024**
	(5.99)	(−1.70)	(9.84)	(−2.50)
Ln(Firm age)	0.073**	0.019**	0.048**	−0.248***
	(2.50)	(2.40)	(2.05)	(−6.69)
Loan amount/Total assets	−0.173**	0.043**	−0.167**	0.125
	(−2.33)	(2.43)	(−2.05)	(1.03)
Ln(Maturity)	−0.093***	−0.007	0.021	0.250***
	(−2.61)	(−1.37)	(0.78)	(6.83)
Ln(NO. of lenders)	−0.093**	−0.031***	−0.057**	−0.155***
	(−2.42)	(−2.72)	(−2.25)	(−4.61)
Ln(1 + NO. of past loans with leader lender)	−0.023	0.013	0.028	−0.040
	(−0.58)	(1.22)	(1.25)	(−1.21)
Net % of banks tightening standards	−0.012	0.029	−0.157	0.375
	(−0.06)	(0.62)	(−0.92)	(1.51)
Constant	1.366***	7.062***	1.208***	7.497***
	(5.61)	(100.96)	(4.73)	(20.04)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
N	2294	2294	2314	2314
Adj. R^2	0.76	0.20	0.70	0.37

This table reports OLS estimates of regressions of borrower's quality on bank competition, using partitioned subsamples by small or large borrowers. Small(Large) borrowers are identified as to the total assets ranked in the bottome(top) quartile in each year. The dependent variable in column (1) and (3) is Ohlson-score. The dependent variable in column (2) and (4) is credit rating index. T-stats are reported in the parentheses. Year and 2-digt SIC industry are controlled. Standard errors are corrected by clustering at state-year level. ***, **, and * denote statistical significance at 1%, 5% and 10% level, respectively. Detailed definitions of the variables are described in Table 3.16.

Table 3.11: Big 3 lenders v.s. Non-big 3 lenders: Bank competition and financial covenant tightness

	Non-big 3 Lenders			Big 3 Lenders		
	(1) PViol	(2) P-Cov PViol	(3) C-Cov PViol	(4) PViol	(5) P-Cov PViol	(6) C-Cov PViol
Residual: Ln(No. of branches in a state)	0.618***	0.552***	0.696***	0.417	0.298	1.072***
	(3.09)	(2.68)	(2.90)	(1.32)	(0.87)	(2.76)
Ln(Total assets)	−0.125***	−0.115***	−0.072***	−0.209***	−0.171***	−0.212***
	(−6.35)	(−5.52)	(−2.98)	(−6.17)	(−4.42)	(−5.12)
Leverage	2.432***	2.535***	1.079***	2.433***	2.551***	1.046***
	(24.33)	(23.85)	(9.27)	(12.78)	(12.38)	(5.18)
EBITDA/Sales	−1.709***	−2.069***	−0.242	−1.836***	−2.588***	−0.267
	(−12.31)	(−12.52)	(−1.53)	(−6.93)	(−8.95)	(−1.03)
Current ratio	−0.077***	−0.067***	−0.047**	−0.048*	−0.008	−0.080*
	(−5.03)	(−4.15)	(−2.29)	(−1.69)	(−0.25)	(−1.92)
Market-to-book ratio	−0.027***	−0.034***	0.007	−0.056***	−0.060***	−0.026*
	(−4.83)	(−5.50)	(1.22)	(−4.75)	(−5.19)	(−1.81)
Ln(Firm age)	−0.003	0.012	−0.048*	0.025	0.040	0.054
	(−0.15)	(0.50)	(−1.82)	(0.62)	(1.01)	(0.99)
Dummy: S&P rated	−0.099**	−0.098**	−0.128**	−0.070	−0.077	0.001
	(−2.57)	(−2.28)	(−2.50)	(−0.99)	(−1.00)	(0.01)
Loan amount/Total assets	−0.007	−0.080	0.092	−0.401***	−0.381***	−0.137
	(−0.13)	(−1.46)	(1.41)	(−3.05)	(−2.78)	(−0.97)
Ln(Maturity)	0.072***	0.184***	−0.151***	0.055	0.119***	−0.147**
	(2.66)	(5.79)	(−5.07)	(1.24)	(2.65)	(−2.56)
Dummy: Performance pricing	0.019	0.090**	−0.105**	0.090	0.161**	−0.107
	(0.57)	(2.38)	(−2.54)	(1.33)	(2.17)	(−1.24)
Ln(NO. of lenders)	−0.040*	−0.011	−0.070**	−0.006	−0.027	0.052
	(−1.75)	(−0.46)	(−2.43)	(−0.14)	(−0.60)	(1.01)
Ln(1 + NO. of past loans with leader lender)	−0.009	−0.014	−0.019	−0.047	−0.063	0.003
	(−0.34)	(−0.52)	(−0.60)	(−1.11)	(−1.39)	(0.06)
Net % of banks tightening standards	−0.155	−0.159	−0.223	0.452	0.545*	0.007
	(−0.94)	(−0.98)	(−1.23)	(1.59)	(1.94)	(0.02)
Constant	0.593***	−0.310	0.409	1.383***	0.635*	−0.007
	(2.70)	(−1.26)	(1.64)	(3.89)	(1.72)	(−0.01)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes
N	6610	6610	6610	2600	2600	2600
Pseudo R^2	0.15	0.15	0.15	0.19	0.21	0.20

This table reports fractional probit regression estimates using partitioned subsamples by the loans are granted by Big 3 or Non-Big 3 lenders. Big 3 lenders are Bank of America, JP Morgan and Citi. PViol denotes the probability of covenant violation at the inception date of the loan package. P-Cov PViol and C-Cov PViol denote the probability of violation of performance covenants and capital covenants, respectively, at the inception date of the loan package. Year, 2-digit SIC industry, and state fixed effects are controlled. Standard errors are corrected by clustering at state-year level. ***, **, and * denote significance at 1%, 5%, and 10% level, respectively. Detailed definitions of the variables are described in Table 3.16.

Table 3.12: Big 3 Lenders v.s. Non-Big 3 Lenders: Bank competition and the borrower's quality

	Non-Big 3 Lenders		Big 3 Lenders	
	(1) O-Score	(2) Credit rating index	(3) O-Score	(4) Credit rating index
Residual: Ln(No. of branches in a state)	0.039	0.108***	0.111**	−0.041
	(1.30)	(3.02)	(2.58)	(−0.59)
Ln(Total assets)	−0.338***	−0.468***	−0.256***	−0.576***
	(−28.56)	(−33.17)	(−13.96)	(−22.55)
Leverage	5.129***	−0.230***	5.091***	−0.250**
	(72.83)	(−3.42)	(50.28)	(−2.17)
EBITDA/Sales	−2.491***	0.115	−2.476***	−0.037
	(−19.73)	(1.59)	(−12.22)	(−0.20)
Current ratio	−0.499***	0.029***	−0.521***	0.042*
	(−43.22)	(2.93)	(−22.97)	(1.75)
Market-to-book ratio	0.034***	−0.022***	0.053***	−0.030***
	(8.35)	(−5.53)	(8.78)	(−3.36)
Ln(Firm age)	0.084***	−0.195***	0.014	−0.199***
	(5.70)	(−11.10)	(0.57)	(−6.35)
Loan amount/Total assets	−0.132***	0.073*	−0.169**	−0.050
	(−3.19)	(1.96)	(−2.25)	(−0.51)
Ln(Maturity)	−0.042**	0.134***	−0.058**	0.223***
	(−2.17)	(6.33)	(−2.23)	(5.95)
Ln(NO. of lenders)	−0.048***	−0.081***	−0.077***	−0.061*
	(−3.27)	(−4.58)	(−3.09)	(−1.87)
Ln(1 + NO. of past loans with leader lender)	0.011	−0.047**	0.026	−0.072**
	(0.69)	(−2.08)	(1.12)	(−2.37)
Net % of banks tightening standards	−0.024	−0.078	0.218	0.214
	(−0.22)	(−0.62)	(1.27)	(0.92)
Constant	1.224***	8.814***	0.565***	9.704***
	(8.89)	(59.45)	(2.72)	(29.95)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
N	6610	6610	2600	2600
Adj. R^2	0.75	0.56	0.74	0.61

This table reports estimates using partitioned subsamples by a loan is granted by Big 3 or Non-Big 3 lenders. Big 3 lenders are Bank of America, JP Morgan and Citi. The dependent variables in column (1) and (3) are Ohlson-score. The dependent variables in column (2) and (4) are credit rating index. T-stats are reported in the parentheses. Year and 2-digt SIC industry are controlled. Standard errors are corrected by clustering at state-year level. ***, **, and * denote statistical significance at 1%, 5% and 10% level, respectively. Detailed definitions of the variables are described in Table 3.16.

Table 3.13: Bank Lenders v.s. Non-Bank Lenders: Bank competition and financial covenant tightness

	Bank Lenders			Non-Bank Lenders		
	(1) PViol	(2) P-Cov PViol	(3) C-Cov PViol	(4) PViol	(5) P-Cov PViol	(6) C-Cov PViol
Residual: Ln(No. of branches in a state)	0.587***	0.394**	0.916***	0.349	0.638	−0.190
	(3.19)	(2.03)	(3.93)	(0.66)	(1.21)	(−0.25)
Ln(Total assets)	−0.155***	−0.146***	−0.098***	−0.064	−0.031	0.012
	(−8.15)	(−7.20)	(−4.00)	(−1.22)	(−0.56)	(0.18)
Leverage	2.429***	2.569***	1.006***	2.418***	2.259***	1.175***
	(25.06)	(24.23)	(8.96)	(8.86)	(8.15)	(3.53)
EBITDA/Sales	−1.795***	−2.339***	−0.186	−1.423***	−1.432***	−0.668*
	(−12.96)	(−14.48)	(−1.09)	(−3.87)	(−4.25)	(−1.72)
Current ratio	−0.069***	−0.055***	−0.054***	−0.118***	−0.114**	−0.081
	(−4.51)	(−3.35)	(−2.68)	(−2.71)	(−2.48)	(−1.27)
Market-to-book ratio	−0.038***	−0.042***	−0.004	−0.021	−0.033**	0.023
	(−7.32)	(−7.01)	(−0.58)	(−1.54)	(−2.28)	(1.45)
Ln(Firm age)	0.004	0.031	−0.023	−0.006	−0.055	−0.142*
	(0.21)	(1.46)	(−0.92)	(−0.12)	(−0.93)	(−1.80)
Dummy: S&P rated	−0.077**	−0.092**	−0.042	−0.404***	−0.326***	−0.569***
	(−2.01)	(−2.19)	(−0.81)	(−3.41)	(−2.62)	(−3.27)
Loan amount/Total assets	−0.086	−0.145***	0.066	−0.108	−0.135	0.187
	(−1.59)	(−2.62)	(0.92)	(−0.70)	(−0.82)	(0.93)
Ln(Maturity)	0.074***	0.161***	−0.134***	0.120	0.276***	−0.125
	(3.00)	(5.65)	(−4.38)	(1.46)	(3.12)	(−1.22)
Dummy: Performance pricing	0.032	0.121***	−0.123***	0.065	0.065	−0.077
	(0.94)	(3.24)	(−3.09)	(0.65)	(0.61)	(−0.68)
Ln(NO. of lenders)	−0.017	0.008	−0.056**	−0.127*	−0.120*	−0.087
	(−0.78)	(0.33)	(−2.00)	(−1.83)	(−1.76)	(−1.08)
Ln(1 + NO. of past loans with leader lender)	−0.028	−0.034	−0.015	−0.023	−0.033	0.012
	(−1.26)	(−1.41)	(−0.55)	(−0.26)	(−0.37)	(0.09)
Net % of banks tightening standards	0.110	0.177	−0.183	−1.015**	−1.398***	0.336
	(0.62)	(1.00)	(−0.97)	(−2.25)	(−3.10)	(0.58)
Constant	0.803***	0.076	0.183	−0.288	−1.554**	0.106
	(3.68)	(0.32)	(0.75)	(−0.45)	(−2.23)	(0.15)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes
N	7977	7977	7977	937	937	937
Pseudo R^2	0.15	0.17	0.15	0.21	0.20	0.29

This table reports fractional probit regression estimates using partitioned subsamples by bank leader lenders and non-bank leader lenders. The bank leader lender is identified as the commercial bank or investment bank which take the leader role in a loan package in Dealscan, otherwise, the leader lender is identified as the non-bank lender. PViol denotes the probability of covenant violation at the inception date of the loan package. P-Cov PViol and C-Cov PViol denotes the probability of violation of performance covenants and capital covenants, respectively, at the inception date of the loan package. Industry effects are controlled at 2-digit SIC level. Standard errors are clustered at state-year level. ***, **, and * denotes significance at 1%, 5%, and 10% level, respectively.

Table 3.14: Bank Lenders v.s. Non-Bank Lenders: Bank competition and the borrower's quality

	Bank Lenders		Non-Bank Lenders	
	(1) O-score	(2) Credit rating index	(3) O-score	(4) Credit rating index
Residual: Ln(No. of branches in a state)	0.053**	0.061*	0.193**	0.074
	(2.05)	(1.74)	(2.06)	(1.03)
Ln(Total assets)	−0.314***	−0.525***	−0.331***	−0.428***
	(−30.61)	(−38.82)	(−10.28)	(−16.60)
Leverage	5.116***	−0.251***	4.685***	0.064
	(82.51)	(−3.70)	(25.22)	(0.43)
EBITDA/Sales	−2.461***	0.009	−2.418***	−0.004
	(−19.70)	(0.12)	(−7.31)	(−0.02)
Current ratio	−0.504***	0.038***	−0.476***	0.005
	(−43.66)	(3.58)	(−13.99)	(0.21)
Market-to-book ratio	0.043***	−0.029***	0.026*	−0.007
	(12.30)	(−6.23)	(1.94)	(−0.79)
Ln(Firm age)	0.076***	−0.198***	0.064	−0.166***
	(5.73)	(−11.27)	(1.23)	(−4.22)
Loan amount/Total assets	−0.136***	0.073*	−0.245**	−0.136*
	(−3.72)	(1.79)	(−2.01)	(−1.76)
Ln(Maturity)	−0.065***	0.160***	−0.015	0.276***
	(−3.89)	(7.45)	(−0.20)	(4.72)
Ln(NO. of lenders)	−0.049***	−0.066***	−0.071	−0.050
	(−3.61)	(−3.76)	(−1.62)	(−1.37)
Ln(1 + NO. of past loans with leader lender)	0.020	−0.052***	0.082	−0.041
	(1.44)	(−2.79)	(1.42)	(−0.67)
Net % of banks tightening standards	−0.014	0.009	0.167	0.172
	(−0.14)	(0.07)	(0.49)	(0.68)
Constant	0.870***	9.083***	2.038***	8.411***
	(7.69)	(59.13)	(4.69)	(28.09)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
N	7977	7977	937	937
Adj. R^2	0.75	0.58	0.68	0.62

This table reports estimates using partitioned subsamples by a loan agreement is leaded by bank lenders or non-bank lenders. The dependent variables in column (1) and (3) are Ohlson-score. The dependent variables in column (2) and (4) are credit rating index. T-stats are reported in the parentheses. Year and 2-digit SIC industry are controlled. Standard errors are corrected by clustering at state-year level. ***, **, and * denote statistical significance at 1%, 5% and 10% level, respectively. Detailed definitions of the variables are described in Table 3.16.

Table 3.15: IBBEA: Bank competition and financial covenant tightness

	(1) PViol	(2) P-Cov PViol	(3) C-Cov PViol
Dummy: At least remove 1 restriction	0.050*	0.058**	0.010
	(1.92)	(2.17)	(0.54)
Dummy: At least remove 2 restrictions	−0.014	−0.036	0.006
	(−0.47)	(−1.12)	(0.29)
Dummy: At least remove 3 restrictions	0.003	−0.017	0.006
	(0.08)	(−0.45)	(0.21)
Dummy: At least remove 4 restrictions	−0.033	−0.043	−0.012
	(−0.72)	(−0.96)	(−0.37)
Ln(Total assets)	−0.042***	−0.032***	−0.020***
	(−6.62)	(−4.93)	(−4.03)
Leverage	0.800***	0.771***	0.223***
	(24.36)	(21.95)	(8.90)
EBITDA/Sales	−0.546***	−0.565***	−0.136***
	(−13.32)	(−12.09)	(−3.41)
Current ratio	−0.020***	−0.014***	−0.012***
	(−3.84)	(−2.91)	(−2.65)
Market-to-book ratio	−0.010***	−0.011***	0.001
	(−6.20)	(−6.68)	(0.63)
Ln(Firm age)	−0.001	0.005	−0.003
	(−0.16)	(0.66)	(−0.48)
Dummy: S&P rated	−0.020	−0.013	−0.010
	(−1.43)	(−0.88)	(−1.07)
Loan amount/Total assets	0.001	−0.016	0.028*
	(0.04)	(−0.91)	(1.71)
Ln(Maturity)	0.021**	0.049***	−0.029***
	(2.54)	(5.82)	(−4.96)
Dummy: Performance pricing	0.020	0.042***	−0.024***
	(1.60)	(3.20)	(−2.87)
Ln(NO. of lenders)	−0.010	−0.004	−0.012**
	(−1.32)	(−0.58)	(−2.21)
Ln(1 + NO. of past loans with leader lender)	−0.008	−0.005	−0.008
	(−1.04)	(−0.67)	(−1.54)
Net % of banks tightening standards	−0.004	−0.025	−0.046
	(−0.05)	(−0.41)	(−1.03)
Constant	0.703***	0.405***	0.446***
	(9.57)	(4.98)	(8.57)
Industry	Yes	Yes	Yes
Year	Yes	Yes	Yes
State	Yes	Yes	Yes
N	6451	6451	6451
Adj. R^2	0.21	0.20	0.12

This table resports the OLS estimate results using IBBEA over 1995 – 2005. The number of removed restrictions on bank branching is from Rice and Strahan (2010). We use four dummy variables to indicate the incremental effects of removing a restrion. P-Cov, PViol, and C-Cov PViol denote the probability of violation of performance covenants and capital covenants, respectively, at the inception date of the loan package. Year, 2-digit SIC industry, and state fixed effects are controlled. Standard errors are corrected by clustering at state-year level. ***, **, and * denote significance at 1%, 5%, and 10% level, respectively. Detailed definitions of the variables are described in Table 3.16.

Appendix

Table 3.16: Variable definitions

Variable	Data Source	Description
Tightness of financial covenants		
Prob. of covenant violation (Pviol)	Peter Demerjian's personal website	Estimated probability of violating financial covenants within the subsequent first fiscal quater of the loan beginning date.
Prob. of violation of capital covenants (C-Cov Pviol)	Peter Demerjian's personal website	Estimated probability of violating capital financial covenants within the subsequent first fiscal quater of the loan beginning date.
Prob. of violation of performance covenants (P-Cov Pviol)	Peter Demerjian's personal website	Estimated probability of violating performance financial covenants within the subsequent first fiscal quater of the loan beginning date.
Bank competition		
NO. of bank branches in a state	FDIC	The number of brick and mortar main offices and branches of full service commercial bank.
Ln(NO. of bank branches in a state)		Natural logarithm of *NO. of bank branches in a state*.
Residual: Ln(No. of branches in a state)		The residual of the regression of Ln(NO. of bank branches in a state) on the natural logarithm of state-year GDP.
Characteristics of the borrowing firms		
Current ratio	Compustat	The ratio of current assets to total assets at the end of fiscal year preceding the loan beginning date.
Dummy: S&P rated	Compustat	A dummy variable that equals 1 to indicate the borrowing firm receiving S&P Domestic Long Term Issuer Credit Rating 3-month preceding the loan beginning date.
EBITDA/Sales	Compustat	The ratio of EBITDA to total sales at the end of fiscal year preceding the loan inception date.
Firm age	Compustat	The number of years from the first occurrence of the borrowing company in Compustat to the year of loan inception date.

Leverage	Compustat	The ratio of the sum of debt in current liabilities and long-term debt to total assets at the end of fiscal year preceding the loan inception date.
Ln(Firm age)	Compustat	Natural logarithm of *Firm age*.
Ln(Total assets)	Compustat	Natural logarithm of *Total assets*.
Market-to-book ratio	Compustat, CRSP	Market-to-book ratio of the borrowing firm at the end of fiscal year preceding the loan begnning date.
Total assets	Compustat	Total assets of the borrowing firm at the end of fiscal year preceding the loan inception date.
Characteristics of the loan contracts		
Dummy: Performance pricing	Dealscan	A dummy variable that equals 1 to indicate the loan contract including performance pricing grids, 0 otherwise.
Ln(1 + NO. of past loans with the lead lender)	Dealscan	Natural logarithm of 1 plus *NO. of past loans with the leader lender*.
Ln(Maturity)	Dealscan	Natural logarithm of *Maturity*.
Ln(NO. of lenders)	Dealscan	Natural logarithm of *NO. of lenders*.
Loan amount/Total assets	Compustat, Dealscan	The ratio of total amount of loans in a package to the total assets of the borrowing firm at the end of fiscal year preceding the loan beginning date.
Maturity	Dealscan	The number of months of the maximum maturiy of a loan facility in a package.
NO. of financial covenants	Dealscan	The number of financial covenants in a loan contract.
NO. of lenders	Dealscan	The number of lenders in a loan contract.
NO. of past loans with the leader lender	Dealscan	The number of loan contracts between the borrowing firm and the leader lender before the loan inception date in Dealscan.
Quality of the borrowing firms		
O-score	Compustat	Ohlson score at the end of fiscal year preceding the loan inception date.
Credit rating index	Compustat	An index ranging from 1 to 7, representing AAA (1), AA (2), A (3), BBB (4), BB (5), below BB (6) and no rating (7), respectively.
Other variables		
Industry	Compustat	2-digit SIC.
Net percentage of banks tightening standards	FRED	Net percentage of Domestic Banks Tightening Standards for Commercial and Industrial Loans to Large and Middle-Market Firms.
State	Compustat	State in which the borrowing firm headquartered.
Year	Dealscan	The year of loan contract begnning date.

Table 3.17: Non-recession v.s. Recession period: Mean and median equality tests

	Non-recession			Recession				
	Obs.	Mean	Median	Obs.	Mean	Median	T	χ^2
Prob. of covenant violation	8343	0.370	0.127	867	0.421	0.182	−3.328***	5.054
Prob. of violation of performance covenants	8343	0.305	0.053	867	0.360	0.081	−3.682***	9.721***
Prob. of violation of capital covenants	8343	0.109	0	867	0.108	0	0.184	6.701***
Ln(Total assets)	8343	6.386	6.413	867	6.686	6.680	−4.758***	16.258***
Leverage	8343	0.276	0.260	867	0.268	0.261	1.349	0.215
EBITDA/Sales	8343	0.142	0.120	867	0.147	0.119	−0.833	0.0620
Current ratio	8343	1.956	1.706	867	1.804	1.617	4.161***	4.432
Market-to-book ratio	8343	2.813	1.963	867	2.499	1.664	2.819***	18.642***
Ln(Firm age)	8343	2.750	2.708	867	2.864	2.833	−4.224***	9.653***
Dummy: S&P rated	8343	0.435	0	867	0.468	0	−1.857	3.488
Loan amount/Total assets	8343	0.350	0.255	867	0.280	0.196	6.903***	33.004***
Ln(Maturity)	8343	3.744	4.078	867	3.528	3.584	9.442***	122.596***
Dummy: Performance pricing	8343	0.697	1	867	0.706	1	−0.517	.
Ln(NO. of lenders)	8343	1.571	1.792	867	1.485	1.609	2.233	5.520
Ln(1 + NO. of past loans with leader lender)	8343	0.493	0	867	0.517	0	−1.100	0.212

This table presents the mean and median equality tests for a set of borrowing firm characteristics and loan contract characteristics as to recession or non-recession periods. The T statistics are to test the equality of mean, and the χ^2 statistics are to test the equality of median. ***, **, and * indicate the significance at the 1%, 5%, and 10% level, respectively.

Table 3.18: Big 3 v.s. Non-Big 3 lenders: Mean and median equality tests

	Big 3 lenders			Non-Big 3 lenders				
	Obs.	Mean	Median	Obs.	Mean	Median	T	χ^2
Prob. of covenant violation	2600	0.324	0.079	6610	0.395	0.156	−7.578***	62.681***
Prob. of violation of performance covenants	2600	0.271	0.031	6610	0.326	0.066	−6.066***	41.081***
Prob. of violation of capital covenants	2600	0.086	0	6610	0.119	0.002	−5.852***	77.698***
Ln(Total assets)	2600	6.996	7.020	6610	6.186	6.199	19.660***	277.811***
Leverage	2600	0.257	0.240	6610	0.283	0.271	−6.855***	50.838***
EBITDA/Sales	2600	0.149	0.129	6610	0.140	0.116	2.733***	31.905***
Current ratio	2600	1.871	1.669	6610	1.969	1.710	−4.054***	2.626
Market-to-book ratio	2600	2.939	2.078	6610	2.723	1.875	2.954***	26.889***
Ln(Firm age)	2600	2.893	2.890	6610	2.709	2.708	10.170***	52.909***
Dummy: S&P rated	2600	0.542	1	6610	0.398	0	12.575***	157.917***
Loan amount/Total assets	2600	0.277	0.201	6610	0.370	0.274	−13.917***	157.429***
Ln(Maturity)	2600	3.702	4.078	6610	3.732	3.951	−2.087	6.264
Dummy: Performance pricing	2600	0.785	1	6610	0.664	1	12.224***	.
Ln(NO. of lenders)	2600	1.836	2.079	6610	1.455	1.609	15.446***	182.254***
Ln(1 + NO. of past loans with leader lender)	2600	0.568	0.693	6610	0.466	0	7.085***	40.339***

This table presents the mean and median equality tests for a set of borrowing firm characteristics and loan contract characteristics as to Big-3 lenders or non-Big 3 leader lenders. The T statistics are to test the equality of mean, and the χ^2 statistics are to test the equality of median. ***, **, and * indicate the significance at the 1%, 5%, and 10% level, respectively.

Table 3.19: Bank lenders v.s. Non-bank lenders: Mean and median equality tests

	Bank lenders			Non-bank lenders				
	Obs.	Mean	Median	Obs.	Mean	Median	T	χ^2
Prob. of covenant violation	7977	0.357	0.079	937	0.511	0.156	−10.231***	72.201***
Prob. of violation of performance covenants	7977	0.292	0.031	937	0.456	0.066	−10.779***	77.100***
Prob. of violation of capital covenants	7977	0.104	0	937	0.125	0.002	−2.146	47.112***
Ln(Total assets)	7977	6.520	7.020	937	6.060	6.199	7.322***	44.423***
Leverage	7977	0.270	0.240	937	0.327	0.271	−8.661***	48.182***
EBITDA/Sales	7977	0.150	0.129	937	0.096	0.116	9.922***	122.886***
Current ratio	7977	1.945	1.669	937	1.812	1.710	3.589***	16.325***
Market-to-book ratio	7977	2.799	2.078	937	2.613	1.875	1.548	49.044***
Ln(Firm age)	7977	2.797	2.890	937	2.574	2.708	8.592***	58.383***
Dummy: S&P rated	7977	0.452	1	937	0.414	0	2.243	4.951
Loan amount/Total assets	7977	0.339	0.201	937	0.395	0.274	−4.464***	16.325***
Ln(Maturity)	7977	3.720	4.078	937	3.789	3.951	−3.581***	1.506
Dummy: Performance pricing	7977	0.727	1	937	0.564	1	9.638***	.
Ln(NO. of lenders)	7977	1.642	2.079	937	1.214	1.609	11.082***	97.371***
Ln(1 + NO. of past loans with leader lender)	7977	0.523	0.693	937	0.340	0	9.922***	70.962***

This table presents the mean and median equality tests for a set of borrowing firm characteristics and loan contract characteristics as to the bank or non-bank leader lenders. The T statistics are to test the equality of mean, and the χ^2 statistics are to test the equality of median. ***, **, and * indicate the significance at the 1%, 5%, and 10% level, respectively.

Chapter 4

Bank Presence and Local Disaster Resilience

4.1 Introduction

Recent studies document increasingly devastating impacts of disasters on the local economy (e.g., Garmaise and Moskowitz, 2009; Strobl, 2011; Cavallo, Galiani, Noy and Pantano, 2013; Schüwer, Lambert and Noth, 2018, among others). Meanwhile, another body of literature suggests disasters generate positive shocks to the local demand for credit due to the need for reconstruction, and banks can take advantage of the business opportunity and offer credit in time to assist local economic recovery (e.g., Cortés and Strahan, 2017; Nguyen and Wilson, 2018; Schüwer et al., 2018). In the event of a federal-declared natural disaster, bank lending constitutes an essential part of financial assistance to the affected local economy.[1] Cortés and Strahan (2017) show that bank credit increases in disaster-affected areas and banks fund some of the increase by reducing credit in those unaffected but connected areas. However, extant literature does not shed much light on the physical presence of the banking industry and the business and economy in disaster-affected areas.

We focus on the physical presence of bank branches in the affected counties. Anecdotal evidence shows that the disasters may also destroy the brick and mortar bank branches, which may prevent the banking industry from reacting and assisting the affected areas. For instance, Hurricane Katrina, which struck the U.S. in 2005. According to the statistics from the Federal Deposit Insurance Corporate (FDIC), as of September 19, 2005, 5054 bank branches were affected, of which 4774 are still open, and 280 closed.[2] The disruption to bank branches may jeopardize their capability of supplying credit.

Previous literature shows that the physical presence of brick and mortar

[1] Other sources of finance include federal assistance from the United States Federal Emergency Management Agency (FEMA) and insurances (Cortés, 2014; Cortés and Strahan, 2017).

[2] FDIC: Hurricane Katrina - Information for Consumers and Bankers in the Affected Areas (https://www.fdic.gov/news/katrina/).

bank branches is associated with better access to credit in a local area. Agarwal and Hauswald (2010) find that borrowing firms are more likely to receive favorable loan terms from bank branches that are nearby. Nguyen (2019) finds that the closure of bank branches harms local lending to small businesses significantly. Several previous studies postulate that the physical presence of branches give banks superior access to information on borrower quality and enable banks to monitor more effectively (Berger, 2015; Degryse and Ongena, 2005; Loutskina and Strahan, 2011; Agarwal and Hauswald, 2010; Ergungor, 2010; Cortés, 2012). Cortés and Strahan (2017) posit that banks usually have branches in their core business areas to maintain their strong market presence and protect their rents. Physical presence also enables banks to capture the uprising credit demand, for example, facing the exogenous demand from oil and gas shale discoveries, banks with branches in the exposed areas can take advantage of the discoveries (Gilje, Loutskina and Strahan, 2016). They also find, in the aftermath of disasters, banks transfer capital to affected areas where they have substantial branch presence from non-core markets. Apart from businesses, Celerier and Matray (2018) further demonstrates that expansion of bank branches improves financial inclusion and facilitates wealth accumulation by households. These findings discussed above strongly suggest that business and households in the areas with a greater presence of bank branches have better access to bank credit, which assists the resilience of the disaster-affected area. We, therefore, hypothesize that physical presence of banking service enhances the resilience of local economy to disasters.

We perform our empirical analysis using the data on the federal-declared disasters from FEMA and the bank branches in the contiguous U.S. counties from FDIC (more details in the data section). We measure the physical presence of banking service using the number of brick and mortar bank branches in a county. In our baseline analysis, we examine to what extent

the number of branches alleviates the negative impact of disasters on the local business sector.[3] We find the occurrence of disaster lowers the employment, payroll, and number of establishments by 4.01%, 2.38%, and 0.96%, respectively, in the disaster year, when a county does not have any bank branch. However, the presence of five bank branches (the 25^{th} percentile) in a county reduces the marginal effect of the occurance of disasters to -1.788%, -0.767%, and -0.6602%, respectively, on the business-sector employment, the business-sector total payroll, and the number of business establishments. For a median country, such an increase in bank branches salvages 152 jobs, \$2.752 million of the payroll, and 1.996 business establishments from the damage of disasters. These results demonstrate the physical presence of bank branches significantly mitigates the devastation of disasters on local business sector.

In her study on post-disaster employment, Cortés (2014) shows that the level of employment is less subject to the influence of natural disasters in the counties with more deposits. The number of branches, therefore, can be merely a measure of the size of deposits in the local banking system. In an additional test, we control for the total amount of deposits in a county and find that the effect of bank branches persists. Cortés and Strahan (2017) find that banks transfer funds to disaster areas from unaffected and non-core markets. In line with their argument, our finding here suggests that the supply of credit through local branches in response to disasters is not only from local deposits. The information advantage and monitoring power associated with physical bank branches allow banks to supply credit from both local and external funds.

The economic and social fabric of a local area can be trained to become more resilient to disasters, which may render a county less reliant on banking services to resist disasters. If a geographic area suffers from disasters more

[3]We focus on the business sector because it constitutes the main component of a local economy.

frequently, the economic agents are more likely to have taken the disasters into account in their business activities. When a disaster strikes, the local economic would be more ready to cope, even without the presence of banking services. Consequently, we expect that the positive effect of bank branches to be stronger in areas less affected by disasters. We separate the counties into those frequently- and those infrequently-affected. We find, indeed, the mitigating effect of bank branches comes from those counties infrequently affected.

Our sample period is from 1994 to 2016, which covers two special events, the Atlantic hurricane season in year 2005 when Katrina occured and the financial crisis during 2007 – 2009. Substantial government financial aids and extreme banking prudence during these periods may sideline the relevance of the effects of physical banking presence. Indeed, we find that bank branches' mitigating effect is absent during these two sub-sample periods. Our baseline results are prominent in the pre-Katrina period (i.e., 1994-2004) and the post-crisis period (i.e., 2010-2016).

Not all disasters in our sample are due to natural causes. Among the 2120 disasters, 4 cases are due to human causes. There are also 771 "fires" whose cause may be either natural or human (the data is insufficient for us to distinguish between them however). In a robustness check, we drop all cases of "fires" and those 4 cases with human causes. We find qualitatively the same results.

Overall, our results above demonstrate that the presence of bank branches significantly mitigates the negative impact of disasters on the local business sector. In our further analysis, we examine how the presence of bank branches mitigates the impact of disasters on overall local employment (including both the business and the public sector) and personal wealth. We measure personal wealth by personal income per capita and the employment by the unemployment ratio. We find disasters significantly reduce personal wealth in the same

year, but the presence of bank branches significantly mitigates such a negative impact. This finding is in line with the view of Celerier and Matray (2018) that the physical presence of banking service enhances financial inclusion and household wealth. Surprisingly, we find unemployment rate decreases significantly in the disaster year. This finding might be because activities in the non-business sectors are more vibrant during recovery. We find the negative impact on employment is weaker when the physical presence of banking service is stronger, which indicates the activities in the non-business sectors are less vibrant when banks can do more in the course of recovery. This result suggests a substitution effect between the banking service and the work by the non-business sector.

We contribute to the literature in several ways. First, previous literature has emphasized the importance of banks' physical presence in providing credit (Agarwal and Hauswald, 2010; Berger, 2015; Celerier and Matray, 2018; Degryse and Ongena, 2005; Gilje, 2019; Loutskina and Strahan, 2011; Ergungor, 2010; Nguyen, 2019; Cortés and Strahan, 2017). Cortés and Strahan (2017) further demonstrate that banks reallocate capital to disaster-affected areas to facilitate recovery. However, the literature is silent regarding to what extent the physical presence of banking service facilitates the recovery of local economy from the devastation of disasters. We fill this gap in the literature. In her unpublished manuscript, Cortés (2014) emphasizes the importance of local deposits in sustaining employment in the aftermath of disasters. We explore the line of research further by studying a more comprehensive set of local economic indicators. Importantly, unlike Cortés (2014), we highlight the importance of the physical presence of banking services instead of the existence of local deposits. Second, the boom of internet and online banking service instigates the skepticism towards the necessity of brick and mortar bank branches. A strand of recent literature demonstrates that the physical presence is still necessary

because it offers banks the informational advantage about borrower quality and the monitoring power (Agarwal and Hauswald, 2010; Celerier and Matray, 2018; Gilje, 2019; Nguyen, 2019). In addition to those studies, we show that the physical presence of bank branches provides "insurance" against the adverse impact of disasters on local economy.

We proceed as follows. In Section 4.2, we describe the data and sample. In section 4.3, we present the results from our baseline analysis of the local business sectors. In Section 4.4, we report additional results on the business sectors. In Section 4.5, we report the results based on the overall local employment and personal wealth. In Section 4.6, we conclude.

4.2 Data

4.2.1 Data sources and sample construction

We collect the sample of disasters from *FEMA Disaster Declarations Summary*. This database, which records the federal-declared disasters since 1953, provides the types and the starting dates of the disasters. It also lists the affected counties by each disaster since 1964. Therefore, we can tell which disaster affects which county in a year. We use a dummy variable D to indicate whether a county is affected by federal-declared disasters in a year or not. If a county is affected by at least one disasters in a year, D equals 1 (0 otherwise).

We retrieve the information on bank branches from the FDIC *Summary of Deposits* data. This database provides the geographic information of the bank branches and the headquarters of the banks on an annual basis. Moreover, it contains the information on the types of bank branches, e.g., "brick and mortar branches", "consumer credit offices", "administrative offices", etc. Since we are interested in banks' physical presence in local areas, we sum the number

of brick and mortar bank branches and offices for each county in each year. The data began in 1994. To minimize the effects of skewness on our analysis, we take the natural logarithm of the total number of bank branches in our regression analyses.

To measure the impact of the federal-declared disasters on the local business sector in a county, we collect several variables. For the status of local business, the *County Business Pattern Data* by the U.S. Census Bureau provides the number of business establishments, the number of employees in the establishments, and the total annual payrolls for each county-year. Again, to address our concern of variable skewness, we take the natural logarithm of these three variables in our regression analyses. The current version of *County Business Pattern Data* overs the period from 1993 to 2016. Therefore, our sample stopped in 2016. Additionally, to measure county-level personal wealth, we use the data on *personal income per capita* from the Bureau of Economic Analysis (BEA) which begins in 2001 and continue till present. To measure the county-level overall employment, we use the data from *Local Area Unemployment Statistics* provided by the Bureau of Labor Statistics. This database provides annual unemployment rate, the size of labor force, the number of employed persons, and the number of unemployed persons in each county from 1990. We winsorize all continuous variables at 0.5% and 99.5% percentiles. We provide the detailed variable definitions in Table 4.1.

4.2.2 Summary statistics

Table 4.2 reports the frequencies of counties affected and unaffected by disasters in each year from 1994 to 2016. Out of the 75943 county-year observations, 30.8% are affected by disasters. In year 2005, disasters affected 93.2% of the counties, and Hurricane Katrina was one of the reasons.

Table 4.3 reports the distribution of disasters across different disaster types. The most common disasters are fire and severe storms. As we mentioned earlier, the cause of fires can be either natural or human. However, our results are not sensitive to the exclusion of human-caused disasters. Moreover, the higher frequency of a type of disaster does not necessarily mean greater damage, for example, hurricanes and earthquakes may have broad effect and cause huge losses.

Table 4.4 reports the summary statistics for the variables used in our regression analyses. There are 31% of the county-year observations affected by at least one disaster. The mean of the number of the bank branches (nbr) in a county in a year is about 25, and the standard deviation is 44.46, indicating some counties have a very large number of bank branches. In our regression analysis, we take the natural logarithm of nbr ($lnbr$) to make the measure of the branch presence more symmetric across county-years. The mean and median of $lnbr$ are 2.51 and 2.40, respectively. For the business sector in an average county, there are 31377.76 persons employed by 2060.36 local business establishments. The average annual total payroll for the business sector in a county is \$1,140,334.1. At the county level, the average personal income per capita in our sample is \$33,394.1. The average unemployment rate for a county is 6% in a year.[4] Again, we take the natural logarithm of these variables to mitigate the skewness bias in our regression analyses.

4.3 Baseline Results

In this section, we present the baseline results. We estimate the effects of disaster occurrence on the county-level business sector, and how the presence

[4]Specifically, the size of the labor force for an average county is 41806.42 in a year among which 39340.8 are employed and 2422.42 unemployed

of bank branches mitigates such effects. We employ a triple-difference model. To control for the unmeasured heterogeneity across counties and over time, we include county fixed effects and year fixed effects in all models. The disaster dummy, D, captures the diff-in-diff treatment effect of the disaster occurrence on the dependent variable. To examine to what extent bank branches mitigate the disasters' impact, we add the natural logarithm of the number of bank branches ($lnbr$) and its interaction with D. The dependent variables are the logarithm of the number of employees ($ln(emp)$), the logarithm of the total business-sector annual payroll ($ln(ap)$), and the logarithm of the county-level total number of establishments in a year ($ln(est)$), respectively. Column (1) to (3) in Table 4.5 report the results.

Column (1) reports the impact on the number of employees. The coefficient of D is -0.0401 and statistically significant at the 1% level, indicating that, in a county without any bank branch, an occurrence of disasters reduces the number of business-sector employee by 4.01% in the disaster year. For a median county, this result means a loss of 269 jobs. The coefficient of the interaction term $D \times lnbr$ is 0.0124 and statistically significant at the 1% level too, indicating a higher presence of physical bank branches significantly mitigates the negative impact of disasters on business-sector employment. Specifically, an increase in the number of bank branches from zero to five (the 25^{th} percentile) reduces the marginal effect of disasters on the number of business-sector employees to -1.788%. This change in the marginal effect corresponds to approximately 153 employees salvaged from disasters for a median county (with 6505 employees) in the disaster year. The results on the total payroll and the number of establishments have a similar pattern. Column (2) shows that disasters reduce the total annual business-sector payroll by 2.38% in the affected counties. But, a greater presence of bank branches mitigates such a negative effect significantly — an increase of the number of bank branches from zero to

five reduces the marginal effect of disasters to -0.767%, which corresponds to \$2.752 million salvaged from disasters for a median county (with a total annual payroll of \$170.689 million). Column (3) shows that the occurrence of disasters reduces the number of business establishments in a county by 0.96%, relative to a non-disaster county in a disaster year. The coefficient on the interaction term $D \times lnbr$ is 0.002 and significant at the 1% level. Therefore, an increase in the number of bank branches from zero to five reduces the disasters' marginal effect on the total number of business establishments to -0.602% (equivalent to 1.996 business establishments saved from the impact of disasters). Overall, the results above demonstrate that the physical presence of banking service mitigates the harm of disasters on local business to a large extent.

4.4 Additional Tests

4.4.1 Local deposits

The number of brick and mortar bank branches in a county is often positively related to the size of the local economy. The number of bank branches, therefore, might capture unmeasured factors related to the size of the economy apart from the physical presence of banking service. As a robustness test, we further control for the total amount of deposits for each county in a year. The amount of total deposits reflects the size of a county's economy in a year and the economy's reliance on the banking system. Since we control for the county fixed effects and year fixed effects in our models, the annual total deposits capture the time-variant factors linked to the size of the local economy and the funds available in the local banking system.

We report the results in Table 4.6. The coefficient of the annual county total deposits (*lndep*) is positive and statistically significant in all regressions, sug-

gesting the funds available in the local banking system is positively associated with greater employment, higher total amount of payroll, and more establishments in a county. Importantly, the coefficients on the disaster dummy D, the logarithm of the number of bank branches $lnbr$, and their interaction term are qualitatively same as those reported in the baseline results (Table 4.5). Therefore, the effect of bank branches does not simply reflect a size effect in the local economy. Rather, as is postulated by Gilje et al. (2016); Cortés and Strahan (2017), the physical presence of bank branches in an area indicates where the core markets of banking business are. Banks have informational advantage and monitoring power in their core market through their physical presence. When disasters strike, banks also sustain their competitiveness in their core markets by transferring funds from non-core markets to meet the unexpected increase in credit demand (Gilje et al., 2016; Cortés and Strahan, 2017). Our results here are also consistent with the view that the physical presence of bank branches constitutes an important part of the infrastructure for capital movement. As is suggested by Cortés and Strahan (2017), it is not only the deposits available in the local banking system but also the capital transfer via the bank-branch networks across counties that are important in supplying credits when needed in response to a disaster.

4.4.2 Infrequently affected counties

In this section, we perform an additional test to examine whether the counties infrequently affected by disasters see their resilience to disaster enhanced more dramatically by a higher number of bank branches than those frequently affected do. Arguably, the resilience of local economic and social framework to disasters improves with experiences. In locations where disasters hit more frequently, business and households should are likely to be better prepared for

further disasters. The marginal contribution of banks' physical presence, therefore, should be lower in the infrequently-affected counties. In contrast, in the less frequently affected counties, households and firms don't normally factor in the likelihood of disasters in their routine activities. A disaster, therefore, should delt a greater shock to the demand for credit in the counties where disasters occur less frequently, and the physical presence of bank branches should impact a county's economic resilience to disasters more positively

To classify the counties, we sum all the declared disasters by county for the whole sample period. Then, we define a county as infrequently (frequently) affected by disasters if the sum is in the bottom (top) tercile. We estimate our baseline regressions based on the sample from infrequently- and frequently-affected counties separately and report the results in Table 4.7. The dependent variables in sections (1) to (3) are the natural logarithm of the number of employees in the local business establishments, the natural logarithm of total annual payrolls in the business sector of the county, and the natural logarithm of the number of business establishments in the county, respectively. The coefficients on D and $D \times lnbr$ in all the columns for the infrequently affected counties are negative and statistically significant at the 5% level or above. In contrast, none of the coefficients on D or $D \times lnbr$ for the frequently-affected counties are statistically significant. Together, these results are in line with the view that the marginal contribution to recovery of the bank branches is lower in frequently-affect counties because the social and economic systems in these areas are better prepared to absorb the impact from disasters.

4.4.3 Human-caused disasters and natural disasters

Table 4.3 shows that, the FEMA disaster data set contains some disasters caused by human, e.g., "terrorist" (two cases), "chemical" (one case), "Hu-

man Cause" (one case). Further, the category "Fire" may contain fires due to both natural or human causes.[5] Those (possibly) human-caused disasters may not be exogenous to local economy or business, thus may introduce bias to our regression estimates. For robustness, we exclude those county-year observations with possible human-caused disasters and repeat our baseline analysis. Specifically, we exclude the county-years that are affected only by possibly human-caused disasters, namely "Other", "Terrorist", "Chemical", "Toxic Substances", "Human Cause", and "Fire". Correspondingly, we form a new disaster dummy variable ND which replaces D in our regressions. The results are reported in Table 4.8. The coefficients of the variables in all columns are almost same as what we report in the baseline table (see Table 4.5). Therefore, human-caused disasters do not annihilate our baseline results.

4.4.4 The bank-branch effect in sub sample periods

Our sample period contains two special sub-periods. In year 2005, Hurricane Katrina struck a large area of the U.S., causing huge damages to the affected areas. Thirteen states declared the state of emergency. The hurricane also, to a large extent, damaged the local networks of bank branches. During this period, the federal and local governments provided financial aids in large amounts to aid local recovery. Arguably, bank credit became less important relative to government aids during the Katrina period. We, therefore, expect the mitigating effect of bank branches to be weaker in year 2005 – 2006.

During 2007 – 2009, the global financial crisis caused tremendous damages to the local economies. The banking system was dysfunctional for a prolonged period of time while banks exercised extreme prudent to safeguard their funds under management. We, therefore, expect the banks' role in facilitating re-

[5]The data is insufficient for us to distinguish between fires due to human causes and those due to natural reasons, however.

silience from disasters to be weak too in the financial crisis period.

We test the above predictions in our sub sample periods. In particular, we divide our sample period into the pre-Katrina period (1994 – 2004), the Katrina period (2005 – 2006), the financial-crisis period (2007 – 2009), and the post-crisis period (2010 – 2016). We repeat our baseline models in each sub sample period and report the results Table 4.9. Panel A shows the sub-period results on the number of local establishments. The coefficients on D and $D \times lnbr$ are significantly (at the 1% level) negative, and positive respectively during 2010 – 2016, but are statistically insignificant in other periods. Panel B reports the sub-period results on the total annual business payroll. The coefficients on D and $D \times lnbr$ are significantly (at the 1% level) negative and positive respectively during 1994 – 2004 and 2010 – 2016. In contrast, none of these two coefficients are statistically significant during the Katrina period or the financial crisis period. Panel C presents the sub-period results on the number of local business establishments. Again, the coefficients on D and $D \times lnbr$ are significantly (at the 5% level or above) negative and positive, respectively during 1994 – 2004 and 2010 – 2016. But these two coefficients are statistically insignificant during the crisis period of 2007 – 2009. Surprisingly, the coefficient on D ($D \times lnbr$) is positive at 0.0117 (negative at -0.0035) during the Katrina period and statistically significant at the 1% level. It could be that the unprecedented large amount of government aid boosted small business in the local areas where the physical presence of banking service is minimal.

4.5 Extended Analysis: County-Level Per Capital Income and Unemployment Rate

Our analyses above focus on the local business sector. In this section, we extend our analysis to cover the per capita income and unemployment rate at the county level.[6] Different from the business-sector employment, the county-level employment includes those of both the business and non-business sectors.

4.5.1 Per capita income

We estimate how disasters and the presence of bank branches affect the natural logarithm of personal income per capita. We retrieve the data on personal income per capita from the U.S. Bureau of Economic Analysis, starting from 2001. Therefore, the sample period is 2001 – 2016 for this extended analysis. We report the results in column (1) of Table 4.10. The coefficient of D is -0.0115 and statistically significant at the 1% level, indicating that the personal income per capita decreases by 1.15% during the disaster period. Relative to the 25th percentile personal income per capita ($26,234), the disasters cause a loss of approximately $301.7 to each person. Importantly, the coefficient on the interaction term $D \times lnnbr$ is 0.0059 and statistically significant at the 1% level, which means that the physical presence of bank branches mitigates the negative impact of disasters on personal income. An increase in the number of county-level bank branches from zero to five (i.e., the 25^{th} percentile) weakens the disaster's marginal effect to 0.0929%, equivalent to an increase in the personal income per capita of $329 during the disaster.

[6] Ideally, we should also study the county-level GDP. However, BEA discloses county-year level GDP only since 2012.

4.5.2 County-level unemployment rate

We also estimate how disasters and the presence of bank branches affect the local unemployment rate. We collect the data on county-level employment from the Bureau of Labor Statistics. The results are reported in column (2) of Table 4.10. The coefficient on D is -0.0012 and statistically significant at the 1% level. Meanwhile, the coefficient on $D \times lnbr$ is 0.0002 and significant at the 5% level. In column (3), we further show that disasters do not affect the size of labor force in a county significantly (the coefficient on D is only 0.0001 and statistically insignificant with $t = 0.05$). At first sight, it is surprising that disasters reduce the unemployment rate, and a high bank-branch presence mitigates such an effect. Considering disasters reduce the employment in the local business sector (column (1) of Table 4.5) and do not change the size of overall labor force, the reduced unemployment is likely due to the hiring from government or other non-business sectors in their effort to salvage the local economy from the damage of disasters.

4.6 Conclusion

In this study, we analyze the role of the physical presence of bank branches in facilitating the recovery of the local economy from disaster damages. Recent studies find disasters have increasingly devastating impacts on the local economy (e.g., Garmaise and Moskowitz, 2009; Strobl, 2011; Cavallo et al., 2013; Schüwer et al., 2018, among others). A strand of literature postulates that banks transfer funds internally from non-core markets to meet the uprising credit demand in the disaster-affected areas (Gilje et al., 2016; Cortés and Strahan, 2017). Nevertheless, the literature is silent about whether the physical presence of banking service indeed enhances the resilience to disasters of

a local economy. We fill this gap by showing that disasters have much weaker impacts on the local economy when the physical presence of banking service is stronger.

Our results also demonstrate that a greater physical presence of bank branches is not just a reflection of the size of local economy or the amount of deposit in the local banking system. Previous studies show that the physical presence of bank branches are essential for local credit supply (Agarwal and Hauswald, 2010; Nguyen, 2019). Banks maintain brick and mortar branches in the locations where their core markets are (Cortés and Strahan, 2017) because the physical presence in a market improves banks information advantage over borrower quality and enhances banks' monitoring power (Berger, 2015; Degryse and Ongena, 2005; Loutskina and Strahan, 2011; Agarwal and Hauswald, 2010; Ergungor, 2010; Cortés, 2012). Our findings are in line with these previous studies.

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Table 4.1: Variable Definitions

Variable name	Variable label	Definition	Source
ap	Total payroll	The total business-sector payroll in thousand dollars at the county-year level.	CBP
D	Disaster affected dummy	A dummy variable indicating a county-year observation where the county is affected by any disasters. It equals one if the county is affected by one or more disasters in a year and zero otherwise.	FEMA
depsumcnty	Total county deposits	The sum of deposits in the bank branches in a county in a year.	FDIC
emp	No. of employees	The number of employees employed by the business establishments of a county in a year.	CBP
est	No. of establishments	The number of business establishments of a county in a year.	CBP
lnbr	ln(No. of branches)	The natural logarithm of $(nbr + 1)$.	FDIC
lndep	ln(Total county deposits)	The natural logarithm of *depsumcnty*.	FDIC
ln(pincpc)	ln(personal income per capita)	The natural logrithm of $(pincpc + 1)$.	BEA
ln(emp)	ln(No. of employees)	The natural logarithm of $(emp + 1)$.	CBP
ln(ap)	ln(Total payroll)	The natural logarithm of $(ap + 1)$.	CBP
ln(est)	ln(No. of establishments)	The natural logarithm of $(est + 1)$.	CBP
nbr	No. of branches	The number of brick and mortar bank branches in a county in a year.	FDIC
ND	Natural disasters affected dummy	A dummy variable indicating a county-year observation where the county is affected by one or more disasters (human-caused disasters excluded). It equals one if the county is affected by disasters in a year and zero otherwise.	FEMA
pincpc	Personal income per capita	Personal income per capita in dollars measured at the county-year level.	BEA
unemployr	Unemployment rate	The unemployment rate measured at the county-year level.	BLS

Abbreviations of data sources: U.S. Bureau of Economic Analysis (BEA); Bureau of Labor Statistics (BLS). County Business Patterns, U.S. Census Bureau (CBP). Federal Deposit Insurance Corporation (FDIC).

Table 4.2: The distribution of disaster-affected and unaffected counties over time

	Affected			Unaffected		
	N	Percent(%) [Whole sample]	Percent(%) [yearly]	N	Percent(%) [Whole sample]	Percent(%) [yearly]
1994	610	0.84	19.28	2,554	3.51	80.72
1995	479	0.66	15.14	2,685	3.69	84.86
1996	1,031	1.42	32.56	2,135	2.93	67.44
1997	682	0.94	21.53	2,485	3.41	78.47
1998	1,072	1.47	33.88	2,092	2.87	66.12
1999	969	1.33	30.62	2,196	3.02	69.38
2000	850	1.17	26.86	2,314	3.18	73.14
2001	909	1.25	28.72	2,256	3.10	71.28
2002	824	1.13	26.03	2,342	3.22	73.97
2003	1,112	1.53	35.12	2,054	2.82	64.88
2004	1,257	1.73	39.69	1,910	2.62	60.31
2005	2,945	4.05	93.02	221	0.30	6.98
2006	783	1.08	24.74	2,382	3.27	75.26
2007	977	1.34	30.86	2,189	3.01	69.14
2008	1,389	1.91	43.86	1,778	2.44	56.14
2009	840	1.15	26.53	2,326	3.20	73.47
2010	1,008	1.38	31.84	2,158	2.96	68.16
2011	1,494	2.05	47.20	1,671	2.30	52.80
2012	686	0.94	21.68	2,478	3.40	78.32
2013	586	0.81	18.52	2,578	3.54	81.48
2014	529	0.73	16.74	2,631	3.61	83.26
2015	704	0.97	22.27	2,457	3.38	77.73
2016	804	1.10	25.47	2,353	3.23	74.53
Total	22,540	30.98		50,245	69.01	

This table reports the number and percentages of the disaster-affected and unaffected counties in each year.

Table 4.3: The types of disasters and affected counties

Disaster Type	N of declared disasters	The number of counties affected by a disaster within each type			
		Mean	Median	p25	p75
Fire	771	3	1	1	1
Severe Storm(s)	751	18	10	5	23
Hurricane	193	36	21	10	51
Flood	156	18	13	5	26
Snow	111	19	13	7	23
Severe Ice Storm	52	35	26	9	46
Tornado	32	13	7	2	19
Other	13	19	5	2	21
Coastal Storm	10	34	34	11	53
Earthquake	9	6	3	2	6
Freezing	5	19	11	10	16
Mud/Landslide	4	1	1	1	1
Tsunami	3	3	3	3	3
Fishing Losses	3	6	6	4	8
Terrorist	2	3	3	1	4
Chemical	1	9	9	9	9
Dam/Levee Break	1	1	1	1	1
Toxic Substances	1	1	1	1	1
Human Cause	1	1	1	1	1
Volcano	1	1	1	1	1

This table tabulates the number of federal-declared disasters for each disaster type, and the statistics of the number of countie(s) affected by a disaster for each type. The sample period is 1994 – 2016. *p25* and *p75* denote the 25^{th} and the 75^{th} percentile, respectively.

Table 4.4: Summary statistics

	N	Mean	Std. Dev.	p25	Median	p75
Disaster affected county dummy [D]	72,785	0.31	0.46	0.00	0.00	1.00
No. of bank branches [nbr]	72,785	24.97	50.11	5.00	10.00	21.00
lnbr	72,785	2.51	1.08	1.79	2.40	3.09
Business-sector variables						
No. of business-sector employees [emp]	70,981	32,550.68	88,096.82	2,233.00	6,505.00	19,502.00
ln(emp)	70,981	8.84	1.79	7.71	8.78	9.88
Total business-sector payroll ($1000) [ap]	70,981	1,211,747.96	3,896,445.61	53,713.00	170,689.00	566,513.00
ln(ap)	70981	12.14	1.87	10.89	12.05	13.25
No. of business establishments [est]	70,981	2,133.48	5,208.96	237.00	557.00	1,464.00
ln(est)	70,981	6.47	1.43	5.47	6.32	7.29
County-level variables						
Personal income per capita [pincpc]	48,578	32,944.59	9,720.63	26,234.00	31,132.00	37,547.00
ln(pincpc)	48,578	10.36	0.27	10.17	10.35	10.53
Unemployment rate [unemployr]	72,751	0.06	0.03	0.04	0.06	0.08
Size of labor force (in persons) [labf]	72,751	43,414.84	103,421.31	5,258.00	11,855.00	30,759.00
ln(labf)	72,751	9.53	1.41	8.57	9.38	10.33
Total deposits ($1000) [depsumcnty]	72,785	1,541,940.42	5,241,029.77	135,690.00	313,271.00	776,636.00

This table lists the summary statistics of the variables in the analysis. The abbreviations of the variable are in brackets in the first column. *p25* and *p75* denote the 25^{th} and 75^{th} percentile, respectively.

Table 4.5: Baseline results

	(1) ln(emp)	(2) ln(ap)	(3) ln(est)
D	-0.0401^{***}	-0.0238^{***}	-0.0096^{***}
	(-2.81)	(-3.55)	(-4.65)
lnbr	0.3384^{***}	0.3409^{***}	0.2858^{***}
	(11.04)	(14.83)	(21.08)
D × lnbr	0.0124^{***}	0.0090^{***}	0.0020^{***}
	(2.96)	(4.64)	(3.14)
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Sample Period	1994-2016	1994-2016	1994-2016
N	70,981	70,981	70,981
$Adj.R^2$	0.9449	0.9806	0.9966

This table reports the OLS results estimated on the county-year panel data. The dependent variables are the natural logarithm of the number of business-sector employees (*ln(emp)*), the natural logarithm of the total business-sector payroll (*ln(ap)*), and the natural logarithm of the number of business establishments (*ln(est)*), respectively. *D* is the disaster affected county dummy. *lnbr* is the natural logrithm of the number of bank branches. Standard errors are corrected by clustering at the county level. ***, **, and * indicate significance at the 0.01, 0.05, and 0.1, respectively.

Table 4.6: Additional tests: control for total local deposits

	(1) ln(emp)	(2) ln(ap)	(3) ln(est)
D	-0.0349^{**}	-0.0179^{***}	-0.0061^{***}
	(-2.46)	(-2.72)	(-3.13)
lnbr	0.1613^{***}	0.1376^{***}	0.1652^{***}
	(4.81)	(5.55)	(13.89)
D × lnbr	0.0110^{***}	0.0074^{***}	0.0010^{*}
	(2.63)	(3.86)	(1.66)
lndep	0.2986^{***}	0.3428^{***}	0.2033^{***}
	(10.93)	(13.74)	(18.59)
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Sample Period	1994-2016	1994-2016	1994-2016
N	70981	70981	70981
$Adj.R^2$	0.9456	0.9814	0.9970

This table reports the OLS results estimated on the county-year panel data. The dependent variables are the natural logarithm of the number of business-sector employees (*ln(emp)*), the natural logarithm of the total business-sector payroll (*ln(ap)*), and the natural logarithm of the number of business establishments (*ln(est)*), respectively. *D* is the disaster affected county dummy. *lnbr* is the natural logrithm of the number of bank branches. *lndep* is the natural logrithm of total bank deposits of a county. Standard errors are corrected by clustering at county level. ***, **, and * indicate significance at 0.01, 0.05, and 0.1, respectively.

Table 4.7: Additional test: Infrequently and frequently affected counties

	(1) ln(emp)		(2) ln(ap)		(3) ln(est)	
	Infreq.	Freq.	Infreq.	Freq.	Infreq.	Freq.
D	-0.0868^{**}	0.0009	-0.0499^{***}	-0.0077	-0.0137^{***}	-0.0011
	(-2.24)	(0.06)	(-3.25)	(-0.75)	(-3.20)	(-0.32)
lnbr	0.3206^{***}	0.3045^{***}	0.3273^{***}	0.3014^{***}	0.2550^{***}	0.2877^{***}
	(4.76)	(6.46)	(7.54)	(7.80)	(11.41)	(11.98)
D × lnbr	0.0258^{**}	0.0013	0.0191^{***}	0.0040	0.0042^{***}	-0.0006
	(2.09)	(0.30)	(3.90)	(1.49)	(2.78)	(-0.72)
County FE	Yes		Yes		Yes	
Year FE	Yes		Yes		Yes	
Sample Period	1994-2016		1994-2016		1994-2016	
N	24204	20105	24204	20105	24204	20105
$Adj.R^2$	0.9250	0.9623	0.9770	0.9850	0.9958	0.9975

This table reports the OLS results estimated on the county-year panel data. The dependent variables are the natural logarithm of the number of business-sector employees (*ln(emp)*), the natural logarithm of the total business-sector payroll (*ln(ap)*), and the natural logarithm of the number of business establishments (*ln(est)*), respectively. *D* is the disaster affected county dummy. *lnbr* is the natural logrithm of the number of bank branches. A Infrequently (frequently) affected county has the total number of disasters in the sample period in the bottom(top) tertile. Standard errors are corrected by clustering at county level. ***, **, and * indicate significance at 0.01, 0.05, and 0.1, respectively.

Table 4.8: Additional test: Natural disasters

	(1) ln(emp)	(2) ln(ap)	(3) ln(est)
ND	-0.0328^{**}	-0.0177^{**}	-0.0086^{***}
	(-2.27)	(-2.55)	(-4.09)
lnbr	0.3393^{***}	0.3414^{***}	0.2860^{***}
	(10.94)	(14.77)	(21.08)
ND × lnbr	0.0104^{**}	0.0072^{***}	0.0018^{***}
	(2.48)	(3.64)	(2.85)
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Sample Period	1994-2016	1994-2016	1994-2016
N	69434	69434	69434
$Adj.R^2$	0.9448	0.9805	0.9965

This table reports the OLS results estimated on the county-year panel data. The dependent variables are the natural logarithm of the number of business-sector employees (*ln(emp)*), the natural logarithm of the total business-sector payroll (*ln(ap)*), and the natural logarithm of the number of business establishments (*ln(est)*), respectively. *ND* is a dummy variable, indicating the disasters excluding fires and human-caused disasters. What remains are natural disaster, including Severe Storm(s), Flood, Hurricane, Snow, Severe Ice Storm, Tornado, Drought, Coastal Storm, Freezing, Earthquake, Volcano, Mud/Landslide, Tsunami, Dam/Levee Break, and Typhoon. Standard errors are corrected by clustering at the county level. ***, ** and * indicate significance at the 0.01, 0.05 and 0.1, respectively.

Table 4.9: Additional test: the bank branch effects in sub sample period

Panel A

	(1) ln(emp) [1994-2004]	(2) ln(emp) [2005-2006]	(3) ln(emp) [2007-2009]	(4) ln(emp) [2010-2016]
D	−0.0100	0.0354	−0.0819	−0.0791***
	(−0.79)	(0.80)	(−1.46)	(−2.74)
lnbr	0.1850***	−0.0002	−0.0340	0.1477*
	(3.81)	(−0.00)	(−0.26)	(1.67)
D × lnbr	0.0035	−0.0124	0.0269	0.0261***
	(0.89)	(−0.96)	(1.65)	(2.99)
N	33940	6174	9265	21595
Adj.R^2	0.9688	0.9717	0.9544	0.9500

Panel B

	(1) ln(ap) [1994-2004]	(2) ln(ap) [2005-2006]	(3) ln(ap) [2007-2009]	(4) ln(ap) [2010-2016]
D	−0.0196***	0.0240	−0.0174	−0.0383***
	(−2.96)	(1.09)	(−0.93)	(−2.58)
lnbr	0.2041***	0.0368	0.0050	0.0894*
	(7.45)	(0.43)	(0.07)	(1.73)
D × lnbr	0.0058***	−0.0036	0.0062	0.0125***
	(2.75)	(−0.56)	(1.20)	(2.87)
N	33940	6174	9265	21595
Adj.R^2	0.9897	0.9931	0.9902	0.9847

Panel C

	(1) ln(est) [1994-2004]	(2) ln(est) [2005-2006]	(3) ln(est) [2007-2009]	(4) ln(est) [2010-2016]
D	−0.0062***	0.0117***	−0.0033	−0.0064***
	(−2.83)	(4.31)	(−1.46)	(−2.79)
lnbr	0.1558***	0.0946***	0.0155	0.0438***
	(13.28)	(6.71)	(1.47)	(5.48)
D × lnbr	0.0018**	−0.0035***	0.0001	0.0022***
	(2.50)	(−4.74)	(0.13)	(2.87)
N	33940	6174	9265	21595
Adj.R^2	0.9981	0.9997	0.9997	0.9993

This table reports the OLS results estimated on the county-year panel data for the sub sample periods. The dependent variable is the natural logarithm of the number of business-sector employees (*ln(emp)*), the natural logarithm of the total business-sector payroll (*ln(ap)*), and the natural logarithm of the number of business establishments (*ln(est)*) for Panel A, B, and C, respectively. *D* is the disaster affected county dummy. *lnbr* is the natural logarithm of the number of bank branches. County fixed effects and year fixed effects are included in all models. ***, **, and * indicate significance at the 0.01, 0.05, and 0.1, respectively.

Table 4.10: Extended test: Disasters, bank branches and local wealth and unemployment

	(1) ln(pincpc)	(2) unemployr	(3) ln(labf)
D	-0.0115^{***}	-0.0012^{***}	0.0001
	(-4.53)	(-4.14)	(0.05)
lnbr	0.0171^{**}	0.0011	0.2264^{***}
	(1.96)	(1.15)	(20.27)
D × lnbr	0.0059^{***}	0.0002^{**}	-0.0009
	(7.35)	(2.20)	(-1.32)
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Sample Period	2001-2016	1994-2016	1994-2016
N	48577	72751	72751
$Adj.R^2$	0.9307	0.8226	0.9964

This table reports the OLS results estimated on the county-year panel data. The dependent variables in columns (1), (2), and (3) are the natural logarithm of personal income per capita, the unemployment rate of a county, and the natural logarithm of the size of labor force (in persons), respectively. D is the disaster affected county dummy. *lnbr* is the natural logrithm of the number of bank branches. Standard errors are corrected by clustering at the county level. ***, **, and * indicate significance at the 0.01, 0.05, and 0.1, respectively.

Chapter 5

Conclusive Remarks and Suggestions for Future Research

This thesis consists of three empirical essays on the interface of loan contract, banking, corporate finance, and local economy.

In the first essay, we examine the determinants of loan price in mergers and acquisitions. We manually search SEC 8-K filings to identify the loan-funded M&A transactions and link them to loan facilities in Dealscan. Our unique data set includes 512 loan-funded M&As announced during 1994 to 2017 in the U.S. Using this unique data, we find that the size of the target firm relative to the acquiring firm is positively and significantly associated with the All-in-Drawn spread (AIDS). This result is in line with the view that deal size summarizes the complexity of the transaction, information asymmetries related to the transaction, and great cost to achieve synergies (Alexandridis, Fuller, Terhaar and Travlos, 2013; Hansen, 1987; Faccio and Masulis, 2005; Datta, 1991), which increases the perceived risks of the lenders. Furthermore, our analysis shows that the loan price is negatively and significantly associated with the post-acquisition stock return and operation performance. It is consistent with the view that loan price is a sufficient indicator of the acquiring firm's future post-transaction performance. It is in line with the view of the previous literature that the lenders have the advantage in collecting borrower's information and contract the uncertain states of the borrower by charging higher loan price (e.g., Diamond, 1984; Strahan, 1999; Bharadwaj and Shivdasani, 2003; Schlingemann, 2004).

The first essay contributes to the M&A research by providing new evidence on the financing cost of the M&A of private debt financing. Previous studies examine what determines the loan finance and how loan finance relates to merger performance. We add to this literature by showing that the characteristics of M&As affect the loan financing cost. Moreover, we contribute to the loan pricing literature by showing that the characteristics of major investment project (M&A) can influence loan price. In addition, our analysis on the

relationship between the loan price and post-acquisition firm performance is consistent with the view that lenders successfully incorporate post-transaction performance in loan pricing (Strahan, 1999).

In the second essay, we use a measure developed in recent literature to analysis how bank competition affects the tightness of financial covenants. We find that the financial covenant tightness increases with the level of bank competition significantly. Related, we find that greater bank competition leads to lower borrower quality. Overall, our findings show that competition forces banks to take more risks by offering credit to lower quality borrowing firms, and banks use tighter financial covenants to safeguard their loans. Moreover, we find the results are more pronounced during the non-recession periods, for smaller borrowing firms, for non-Big 3 lenders, and for bank lenders. Using the deregulation of IBBEA 1994, we further establish the causal link between financial covenant tightness and the bank competition.

Previous studies demonstrate how bank competition affects the price term and collateral in the loan contract. We investigate the impact of the bank competition on the financial covenants. Our findings are in line with the view that financial covenants enable the lenders to take creditor control rights to mitigate the risks of the loans when the borrowers are riskier (Aghion and Bolton, 1992; Dichev and Skinner, 2002; Chava and Roberts, 2008; Nini, Smith and Sufi, 2009; Roberts and Sufi, 2009; Nini, Smith and Sufi, 2012). Meanwhile, this essay adds to the studies on the relation between bank risks and bank competition. Our findings are consistent with the view that the banks take more risks when the competition is intensified (e.g., Keeley, 1990; Hellmann, Murdock and Stiglitz, 2000; Repullo, 2004, etc.) . We extend the literature by showing that the banks are also prudent and use tighter financial covenants to safeguard their loans.

The third essay examines whether the physical presence of the banking

system mitigates the negative impact of disasters on local business and economy. We show that disasters reduce the number of business-sector employees, total business-sector payroll, and the number of business establishments in the affected counties, but the physical presence of bank branches ameliorate such impacts significantly. Our evidence highlight the importance of the physical presence of banking serving in enhancing the local resilience to disasters, which is in line with the view in Cortés and Strahan (2017) and Schüwer, Lambert and Noth (2018). Further, we find that such effects are more pronounced in the counties that are less frequently affected by the disasters, and the effects do not evaporate along with time. We also find the stronger physical presence of the banking industry mitigates the impact of the disasters on employment in the affected counties.

This essay contributes to the literature on the role of bank branches. Despite the trend of digital and online banking, previous literature continue to demonstrate the importance of the physical bank branches in supplying credit (Agarwal and Hauswald, 2010; Celerier and Matray, 2018; Gilje, 2019; Nguyen, 2019). We find evidence consistent with the view that physical bank branches have positive externality to the local business during and after disasters. Cortés and Strahan (2017) and Schüwer et al. (2018) find the banks offer credit immediately after the disasters taking place through the internal capital market, where the disasters lead to the exogenous increase in the demand on credit. Our findings demonstrate local business and economy perform better in the presence of greater banking presence. Our results suggest that the physical network of bank branches constitutes an essential part of the financial infrastructure safeguarding the local economy from the devastation of disasters.

Overall, the first essay suggests that the lenders can take the information advantage and price the risks related to the borrowers' investment projects in the loan contract. The second essay suggests the competition in the banking

industry makes the banks prudent whenextending credit to riskier borrowers, using tighter financial covenants in the loan contracts. The third essay suggests the necessity of bank branches, as the physical presence of the banking industry has positive externality to the society under the negative shocks on the local economy.

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