TENG WANG

Essays in Banking and Corporate Finance

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Studies over bankieren en ondernemingsfinanciering

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To My Family

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Chapter 1
Introduction

In the seminal work by Modigliani and Miller (1958), authors propose a theory arguing the irrelevance of corporate financing decision in a frictionless financial market. Paradoxically, this paper has led to extensive theoretical and empirical analysis that reveals the importance of corporate financing decision in a dynamic economic environment. In reality, firms are not only facing bankruptcy costs, but also subject to information asymmetry and agency costs. Those market frictions have significant impact on firms' financing decision, and consequently influence firms' performance. In an imperfect financial market with frictions, the existence of banks as delegated monitor and financial intermediary helps to mitigate the information asymmetry between borrowing firms and lenders on the market, matches credit supply with credit demand, and generate extra liquidity to the market (Diamond 1984, Diamond and Rajan 2001). Bank credit remains as an important source for corporate financing – by the end of 2014, the amount of commercial and industrial loan provided by all commercial banks has reached a historical level of 1.8 trillion U.S. dollars which is equivalent to 11% of the U.S. GDP. It is therefore important to understand the interaction between banks and corporate borrowers and how changes in the banking industry affect firms' financing decision and performance.

This dissertation studies three research questions in the area of corporate finance and banking. The first chapter investigates the impact of government interventions in banks on corporate borrowers. Based on detailed information on the firms' borrowing history, we identify credit relationships with banks as channels that transmit government capital injection program as positive shocks in the banking industry and investigate the impact on corporate borrowers. To identify the impact, we define a firm-specific time-varying Intervention Score that is based on the firms' pre-crisis structure of bank relationships and their banks' participation in government

capital support programs. Using short-term event study methodology and panel data analysis, we investigate whether and how corporate borrowers' stock returns during the financial crisis of 2007-2009 relate to the variation in their intervention scores, controlling for the general stock market performance. While related studies document the negative spillover effects from the banking to the corporate sector in the first stage of the financial crisis, we show that bank-firm relationships serve as a transmission channel for positive spillover effects on the corporate sector in situations when shocks to banks are mitigated through government interventions. Our principal results indicate that firms significantly benefit from the government capital support in their banks. Firms display positive abnormal stock returns around intervention events in their banks and also higher average daily stock returns the higher their intervention scores. Moreover, the impact of government intervention varies with pre-crisis firm and bank characteristics. We further find some indication that financial constraints of firms have been reduced during the year after their banks received capital infusions, which is consistent with our main results based on firms' stock price performance. Our evidence is consistent with the broader view that bank-firm relationships serve as an important transmission channel for positive shocks to banks.

Chapter 3 looks into firm's debt maturity management activity and the impact on firms' funding liquidity. Funding liquidity risk is an important type of risk faced by firms in a financial market with friction. When a firm faces severe funding liquidity risk, it may be forced to search for expensive alternative financing sources, undertake a costly debt restructuring process, or even liquidate its assets, possibly at fire-sale prices (e.g., Brunnermeier and Yogo, 2009). It arises when a firm cannot meet its financing needs – either being unable to rollover its debt at maturity or being unable to finance new investment opportunities (e.g., Diamond, 1991). Survey evidence suggests that, when deciding on debt issues, one of the primary concerns for CFOs is to avoid the clustering of debt maturity dates (e.g., Graham and Harvey, 2001; Servaes and Tufano, 2006). Many recent studies show that firms having a large proportion of debt maturing during the crisis had severe funding liquidity problem, suffered from credit downgrading, and were forced to reduce investment (Almeida et al. 2012, Gopalan et al. 2012). This chapter looks into firms' debt maturity diversification practice and investigates first, what types of firms that maintain dispersed maturity overtime. And second, whether spreading out debt maturity could mitigate firms' funding liquidity problem. We find that larger, more leveraged, less profitable, growth-oriented, and non-bank dependent firms exhibit the largest maturity dispersion of outstanding

bonds. Such dispersion is maintained by frequently issuing sets of bonds with different maturities. We further find that more bond maturity dispersion results in higher funding availability and lower funding costs. The effects are stronger for firms that face more funding liquidity risk. The evidence suggests that spreading out bond maturities is an effective corporate policy to manage funding liquidity risk.

Chapter 4 investigates the role of labor market in the process of bank expansion in the United States. In the field of financial economics, one of the most fundamental questions is why we need the financial industry. Schumpeter in 1912 argued that the existence of financial institutions fosters real economic growth as it channels capital to its most efficient use. Many empirical papers shows that the significant development in the U.S. banking industry over the past three decades featured by interstate banking deregulation has led to more bank competition, better service level in the banking industry, improved credit availability for businesses and contribute to economic development (Jayaratne and Strahan 1996; Huang 2008). In this study, I argue that the mobility of incumbent bank employees is the key channel through which out-of-state banks can get access to local information, and the labor market friction in the target market influences the process of bank expansion and consequently the local lending market. I focus on the changes in jurisdictional enforcement of the non-compete covenants and exploit the heterogeneity in the non-compete enforcement as exogenous variations in labor market flexibility and test its impact on the mode how banks enter new markets. My findings highlight the importance of local information accessibility for banks expanding into new markets. Banks choose different modes to acquire local information in response to the flexibility of the local labor market. The difference in entry modes has different implications for local economic activity. Bank entries via new branches - but not via acquisition of incumbent banks' branches - significantly increase bank competition, improve the availability of credit to small businesses, and facilitate economic growth. This study has important policy implications. The findings show that policymakers should pay attention to the local labor legislation in order to unleash the full benefit of financial development on real growth.

Chapter 2
The Impact of Government Intervention in Banks on Corporate Borrowers' Stock Returns*

2.1 Introduction

Financial and banking crises have a significantly negative impact on the corporate sector, resulting in a lower stock market valuation of borrowing firms and a subsequent decrease in aggregate economic activity. However, little is known empirically about the existence and nature of spillover effects that might arise from a removal or mitigation of shocks to the financial and banking system to the corporate sector. Do stock prices of corporate borrowers react to rescue measures for banks? If yes, what are the direction, magnitude and speed of the reaction? Which firms exhibit the strongest stock price reaction? To shed light on these questions, we investigate whether and how government interventions in the U.S. banking sector influence the stock returns of corporate borrowers during the global financial crisis of 2007-2009.

Financial crises, such as the Japanese, the Russian, the Asian, and the recent global one, have not only adversely affected the financial system but also the real economy in many countries through a tightening of bank lending (e.g., Chava and Purnanandam (2011), Campello et al. (2010), Carvalho et al. (2011), Giannetti and Simonov (2013), Ivashina and Scharfstein (2010),

*This Chapter is based on Norden, Roosenboom and Wang (2013). We are especially grateful for the helpful comments and suggestions from an anonymous referee and Hendrik Bessembinder (the editor). This paper also benefits tremendously from very helpful discussions with, among many others, Shantanu Banerjee, Dion Bongaerts, Olivier De Jonghe, Werner Neus, Steven Ongena, David Robinson, Jörg Rocholl, Mathijs van Dijk, and participants at the European Finance Association 2011 Meetings in Stockholm, the Banking Workshop 2011 in Münster, the Corporate Finance 2011 in Lille, the IFABS 2011 Conference in Rome, the Belgian Financial Research Forum 2012 in Antwerp, and the ERIM PhD seminar at Erasmus University. I gratefully acknowledge financial support from the National Science Foundation of the Netherlands (NWO) under Mosaic grant number 017.007.128 and the Vereniging Trustfonds Erasmus University Rotterdam.

and Lemmon and Roberts (2010)). Related studies document a sharp drop in bank credit supply to the corporate sector during the peak of the financial crisis. To "restore liquidity and stability to the financial system" (U.S. Congress (2008), p. 2), the Federal Reserve System cut the target interest rate from 5.25% to close to zero from September 2007 to December 2008. When this monetary intervention proved ineffective, the U.S. government was forced to step in and use tax payers' money to bail out the troubled banking industry. Under the Emergency Economic Stabilization Act, the U.S. government provided certain banks with additional equity to stabilize the financial industry via the Capital Purchase Program (CPP), a prominent part of the Troubled Asset Relief Program (TARP). The stated aim of the CPP was to "strengthen the capital base of the financially sound banks" by providing them with extra liquidity and equity so that banks could "increase their capability of lending to U.S. consumers and businesses to support the U.S. economy" (U.S. Department of Treasury, October 14, 2008). However, evidence is mixed on whether banks have actually used this government support to keep on lending (e.g., Li (2013)) or to repair their own balance sheets (e.g., SIGTARP (2010), Taliaferro (2009)). Thus, the question whether such intervention in banks has implications for corporate borrowers remains largely unanswered.

In this paper, we depart from the existing literature by investigating the impact of U.S. banks' participation in the CPP on borrowing firms' stock price performance. To identify the impact, we focus on the bank lending channel and define a firm-specific time-varying intervention score that is based on the firms' pre-crisis structure of bank relationships and their banks' participation in government capital support programs. We focus on the corporate borrowers' stock price performance to capture the effect of government intervention on the bank lending channel. Using short-term event study methodology and panel data analysis, we investigate whether and how corporate borrowers' stock returns during the financial crisis of 2007-2009 relate to the variation in their intervention scores, controlling for the general stock market performance. We also test whether pre-crisis firm, bank, and bank-firm relationship characteristics influence this link.

While related studies document the negative spillover effects from the banking to the corporate sector in the first stage of the financial crisis, we show that bank-firm relationships serve as a transmission channel for positive spillover effects on the corporate sector in situations when shocks to banks are mitigated through government interventions. Our principal results indicate that firms significantly benefit from the CPP infusions in their banks. Firms display

positive abnormal stock returns around intervention events in their banks and also higher average daily stock returns the higher their intervention scores. We further show that the positive effect on borrowing firms' stock returns is not merely significant for the forced CPP interventions but also when banks voluntarily participated in the CPP. Moreover, the impact of government intervention varies with pre-crisis firm and bank characteristics. Firms that are riskier (i.e., more levered, less profitable, more financially distressed), bank-dependent and more strongly hit by the financial crisis benefit more from government capital infusions in their banks during the crisis. Firms also benefit more from government intervention when they borrow from banks that are less capitalized and smaller. Various empirical checks confirm these findings and their robustness. We further find some indication that financial constraints of firms have been reduced during the year after their banks received capital infusions, which is consistent with our main results based on firms' stock price performance.

Our paper relates to three strands of the banking and finance literature. The first strand examines the impact of financial and banking crises. Several studies show that such crises are associated with reductions in the aggregate output level (e.g., Dell'Ariccia et al. (2008), Reinhart and Rogoff (2009)). Other studies examine the impact of the financial crises on banks and show that there are significant negative effects on banks' capital that reduce the supply of loans to the corporate sector (e.g., Panetta et al. (2010), Santos (2011)). For instance, Shin et al. (2008) document that banks, especially the under-capitalized ones, were forced to swiftly repair their capital structure by reducing loan provisions during the Korean crisis to avoid bankruptcy. Further evidence suggests that adverse consequences from increased losses in the banking sector spill over to the corporate sector and negatively affect borrowing firms' performance (Chava and Purnanandam (2011), Lemmon and Roberts (2010)). Moreover, Campello et al. (2010) provide survey evidence that the recent financial crisis more adversely affected financially constrained firms, which were forced to cut heavily in their spending in R&D, marketing, and employment, and forego profitable investment opportunities. We extend this research by showing that corporate borrowers' stock returns positively respond to government capital infusions in their banks.

Second, our work relates to the increasing literature on government interventions in the banking sector. Previous studies have focused on the characteristics of banks that were subject to intervention and the changes in their performance. For example, banks that received capital

infusions under TARP are larger, and have lower capital ratios, lower market-to-book ratios, and better asset quality than non-TARP recipient banks (Bayazitova and Shivdasani (2012)). The finding on asset quality suggests that the U.S. government has predominantly supported those banks that were sufficiently healthy to recover from the crisis. Furthermore, evidence suggests that earlier rounds of TARP capital infusions resulted in wealth gains for the banks' shareholders (Bayazitova and Shivdasani (2012), Veronesi and Zingales (2010)). There is mixed evidence on the question whether TARP capital infusions effectively stimulated bank lending during the crisis. Li (2013) suggests that the TARP program has indeed encouraged bank lending. However, other studies argue that due to severe capital losses of banks during crisis, most banks use the TARP funds to repair their balance sheets rather than lending to businesses (e.g., SIGTARP (2010), Taliaferro (2009)). In addition, government intervention was accompanied by stricter supervisory and governance rules that might have further tightened banks' lending (e.g., Adams (2012), Kim (2010), Fahlenbrach and Stulz (2011)). Unlike studies that investigate characteristics of TARP capital recipient banks and their performance, we analyze the impact on TARP banks' borrowers to identify spillover effects associated with the capital infusion program on the corporate sector.

The third strand of literature investigates the importance of bank-firm relationships. Given that the vast majority of corporate borrowers rely on multiple bank relationships, the effectiveness of the bank lending channel essentially depends on the structure of firms' bank relationships and the banks' ability and willingness to provide credit. Previous studies suggest that firms benefit from establishing and maintaining a close relationship with banks (James (1987), Petersen and Rajan (1994), Berger and Udell (1995), Boot (2000), Norden and Weber (2010), Bharath et al. (2011)). Closer banking ties increase firms' access to credit and facilitate loan renegotiation (e.g., Petersen and Rajan (1994), Cole (1998), Shin et al. (2008), Gopalan et al. (2011)). Strong bank relationships are particularly valuable when borrowers face temporary liquidity problems or face adverse economic situations (e.g., Bolton and Scharfstein (1996), Elsas and Krahnen (1998), Detragiache et al. (2000)). However, theory argues that the information monopoly arising from close bank relationships can create a "hold up problem" for the borrowers to obtain alternative funds from other banks (e.g., Rajan (1992), Gopalan et al. (2011)). This reasoning implies that a close bank relationship exposes the firm to a higher sensitivity to potential shocks to the bank. Empirical evidence confirms that banks that

experience large exogenous shocks tighten their lending and banks' financial insolvency negatively impacts their borrowers' stock returns (Slovin et al. (1993), Kang and Stulz (2000), Bae et al. (2002), Ongena et al. (2003)). Lemmon and Roberts (2010) highlight the important role of bank credit supply by showing that even large firms with access to the public credit market are vulnerable to shocks in bank credit supply. Chava and Purnanandam (2011) investigate the impact of the Russian crisis on U.S. banks and find that adverse shocks to bank capital mostly affect bank-dependent borrowers. Carvalho et al. (2011) confirm this result for the recent financial crisis by showing how negative shocks to banks spill over to the corporate sector. They find that sharp decreases in banks' market capitalization are associated with equity valuation losses of firms that have credit relationships with these banks. The effect is strongest for firms with close credit relationships, higher informational asymmetry, and a higher need to roll over their debt. Gokcen (2010) looks at whether the first TARP intervention positively impacted corporate borrowers. He reports a positive short-term impact on firm's stock returns if the firm's top lead bank is one of the nine banks that were forced to participate in TARP. In this paper, we use complementary empirical methods that make it possible for us to take into account the specific nature of the CPP. In addition to short-term event study methodology, which captures jump effects in stock prices due to the expected impact of the intervention, we apply a novel measurement approach, the intervention score, in panel data regressions to investigate the impact of intervention events over a longer time horizon. The intervention score reflects the impact of intervention-induced expected and actual changes in bank lending on corporate borrowers' stock returns, considering the number of banks that obtain capital infusions, the bank-specific magnitude of the capital infusions, and the bank-specific duration of the capital infusion.

The rest of the paper is organized as follows. Section II describes the institutional background of the Capital Purchase Program (CPP). Section III presents our main hypotheses. Section IV describes the data. Section V reports the main findings. Section VI summarizes the results from further empirical checks. Section VII concludes.

2.2 Institutional Background of the Capital Purchase Program (CPP)

Under the Emergency Economic Stabilization Act (EESA) of 2008, TARP was initiated by the U.S. Treasury Department to purchase up to $700 billion troubled assets from financial institutions and other companies. Secretary Paulson revised the TARP implementation plan on October 14, 2008 and decided to directly infuse $250 billion to the financial system through the Capital Purchase Program (CPP). The CPP allows qualifying financial institutions to sell preferred stocks and warrants to the U.S. Treasury Department. The first nine banks were forced to participate in the CPP whereas all the later recipient banks participated in the CPP voluntarily. Until the end of 2009, more than 600 financial institutions have received capital support that in total amounts to roughly $202 billion. Table 2.1 provides an overview of the CPP.

TABLE 2.1 The Capital Purchase Program

This table provides information on banks that participated in the Capital Purchase Program (CPP). Panel A contains information on banks that received CPP funds and banks that paid back CPP funds later. Panel B provides statistics on the distribution of the CPP infusions. The sample period starts from 28 October 2008 and ends at 31 December 2009. Amounts of the CPP are calculated as cumulative numbers in billions of dollars.

Panel A. Top 10 banks in terms of total amount of CPP received and redeemed

CPP capital infusion		CPP redemption	
Bank name	Amount (in billion $)	Bank name	Amount (in billion $)
Wells Fargo	25	Bank of America	25
JPMorgan Chase	25	JPMorgan Chase	25
Citigroup	25	Wells Fargo	25
Bank of America	25	Morgan Stanley	10
The Goldman Sachs	10	The Goldman Sachs	10
Morgan Stanley	10	U.S. Bancorp	6.60
PNC	7.58	American Express	3.39
U.S. Bancorp	6.60	BB&T	3.13
SunTrust Banks	4.85	Bank of New York Mellon	3
Capital One	3.56	State Street	2
Total amount	142.58	Total amount	113.12
As a percentage of total CPP infusion	70.33%	As a percentage of total CPP repayment	95.04%

Panel B. The distribution of CPP infusions (Banks are ranked in terms of total amount of CPP received)

	Amount (in billion $)	As a percentage of total CPP infusion
First quartile of CPP recipient banks (top 25% capital recipients)	197.95	97.64%
Second quartile of CPP recipient banks (25% -50% capital recipients)	3.10	1.53%
Third quartile of CPP recipient banks (50%- 75% capital recipients)	1.23	0.61%
Fourth quartile of CPP recipient banks (75%-100% capital recipients)	0.46	0.22%

Panel A lists the top 10 banks in terms of the amount of CPP capital received and repaid. Note that the list of top CPP recipient banks does not fully coincide with the list of the first nine banks that were forced to participate. There are also a number of large voluntary capital infusions that happened at a later stage; for example, US Bancorp was not forced to participate in the initial CPP infusion but voluntarily opted for CPP funding and obtained $6.6 billion in total. Panel B shows that the distribution of CPP infusions is highly concentrated. We rank all CPP recipient banks in terms of the amount of capital received, and the result shows that the top 25% of CPP recipient banks in terms of the amount received have taken almost all (97.6%) of the total CPP funds.

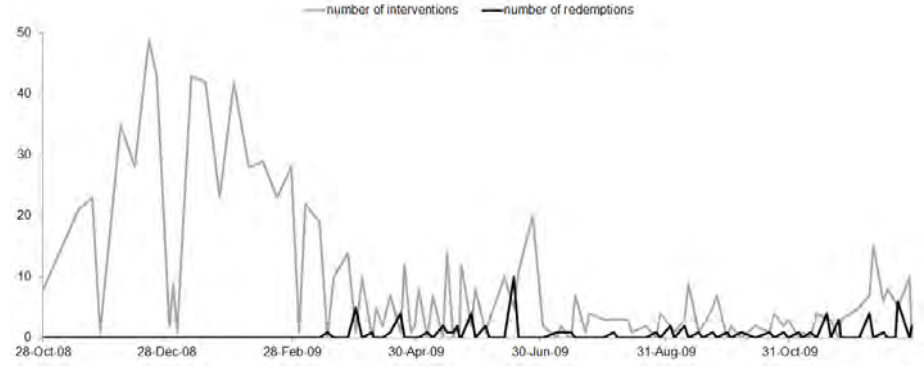
For the CPP redemption, 63 banks had paid back $118 billion by the end of December 2009. The initial CPP conditions made it impossible for banks to repurchase the stock completely at par within three years after receiving the CPP. In February 2009, the enactment of the American Recovery and Reinvestment Act (ARRA) introduced stricter rules on incentive-based executive compensation, but also made the early repayment of CPP funds possible.

Figure 2.1 illustrates the number of events and amounts associated with CPP infusions and redemptions. Most capital infusions happened during the fourth quarter of 2008 and the first quarter of 2009 and all CPP redemptions took place after February 2009. CPP redemptions peak on June 16 2009, when 64.74 billion dollars were redeemed by several large banks. Those banks include JP Morgan Chase, Morgan Stanley, and Goldman Sachs that were forced to participate in the CPP initially. They choose to pay back funds at the same time in order not to leak information on their relative financial soundness to the market. Several recent studies on the impact of TARP and CPP show that the government intervention was predominantly associated with increases in banks' stock prices and decreases in CDS spreads (e.g., Veronesi and Zingales (2010), Li (2013), Elyasiani et al. (2011), Bayazitova and Shivdasani (2012)). Li (2013) shows that banks used approximately one-third of the TARP capital to support new loans and the rest to strengthen their balance sheets. Figure 2.2 displays banks' quarterly loan growth from the FDIC Call Reports to document potential changes in credit supply around the government intervention events. Banks that obtain capital infusions indeed increased total lending in the quarter the intervention took place compared to the quarter before. Non-CPP banks did not. This observation suggests that CPP capital infusions have at least in part been used to restore business lending.

FIGURE 2.1 Number and Amount of CPP Capital Infusions and Redemptions over Time

Panel A. Number of CPP capital infusions and redemptions

This figure displays the distribution of the number of capital infusions and redemptions from October 2008 to December 2009. The data on banks' participation in the CPP come from the website of U.S. Treasury Department (http://www.financialstability.gov).



Panel B. Amount of CPP capital infusions and redemptions

This figure displays the distribution of capital infusions and redemptions (in billion $) from October 2008 to December 2009. The data on banks' participation in the CPP come from the website of U.S. Treasury Department (http://www.financialstability.gov).

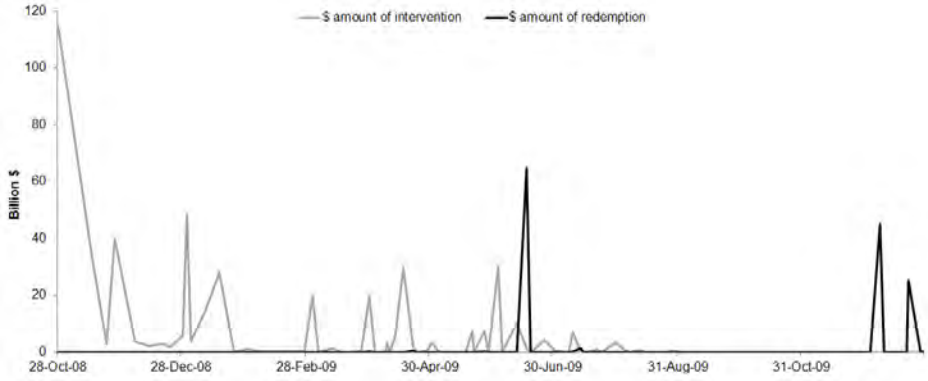
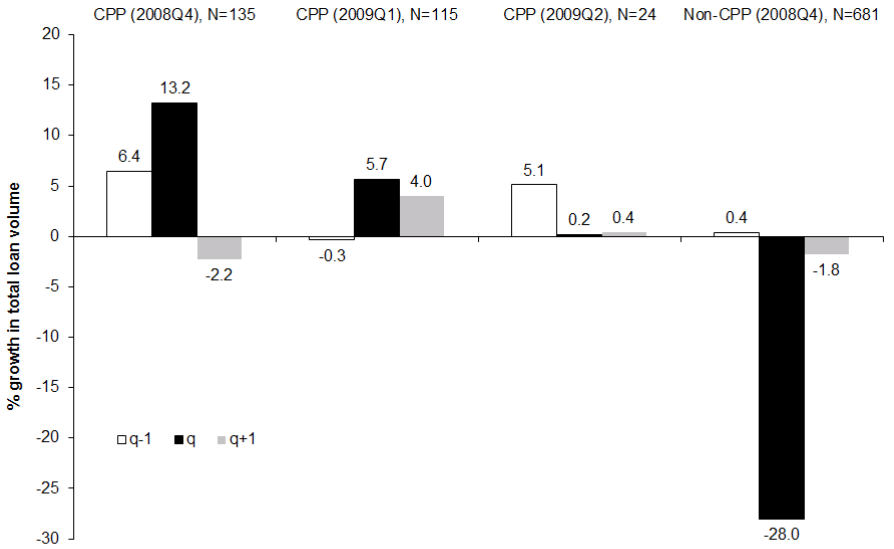


FIGURE 2.2 Growth in Total Loan Volume of CPP and Non-CPP Banks

This figure plots the growth rate in total loan volume for the group of banks that received CPP money in 2008Q4, 2009Q1 and 2009Q2, respectively. The figure shows the growth in total loan volume one quarter before (q-1), the quarter of (q) and one quarter after (q+1) the bank received a capital infusion. For comparison, we also include the growth in total loan volume of the group of non-CPP banks in 2008Q4. N indicates the number of banks used to compute the growth in total loan volume. We aggregate quarterly loan volume from FDIC Call Reports across individual banks to obtain total loan volume. We then compute the percentage growth rate in total loan volume from one quarter to the next.



2.3 Hypotheses

The declared purpose of the U.S. government's intervention via CPP was to stabilize banks with extra liquidity and make it possible for them to keep on lending or to increase lending to the corporate sector. If investors expect that government interventions in banks could help alleviating the negative credit shocks and improving the credit availability to firms through the bank lending channel, then a positive valuation impact on corporate borrowers' stock price performance would be observed. Therefore, we propose the following hypothesis:

Hypothesis H1: CPP interventions in banks have a significantly positive impact on corporate borrowers' stock price performance.

We next investigate whether borrowers' characteristics affect the stock price impact of CPP intervention. Given the fact that the recent financial crisis originated from the supply side

(Ciccarelli et al. (2010), Ivashina and Scharfstein (2010), Ongena et al. (2010)) the entire banking industry became cautious and reluctant to grant new loans. Other things equal, it was more difficult for smaller, bank-dependent, less profitable clients with a higher leverage ratio and bankruptcy risk to get sufficient credit or to switch to alternative financing sources due to the high risk level and information asymmetry between banks and those firms. Also, a lower level of cash holdings prior to the crisis makes firms more vulnerable to the credit supply shocks during the banking crisis. It is also more difficult for more bank-dependent firms, such as firms with low liquidity and firms that lack an investment-grade rating, to raise external finance. These firms are therefore more sensitive to shocks to banks and government intervention in the banking industry is expected to be especially helpful for those firms. We expect that the crisis stock price performance of these firms is more positively affected when the shocks to banks are mitigated by capital infusions in their banks. In addition, consistent with Chava and Purnanandam (2011), we expect firms that were most strongly affected during the financial crisis are also the ones that benefit most once the negative shocks are mitigated by the government interventions.

Hypothesis H2: CPP interventions in banks have a significantly stronger impact on stock returns of corporate borrowers who are smaller (H2a), more leveraged (H2b), less profitable (H2c), closer to financial distress (H2d), short on cash (H2e), less liquid (H2f), more strongly hit during the financial crisis (H2g) and more bank-dependent (H2h).

We also investigate whether bank characteristics influence the magnitude of the impact of government interventions on firm's stock price performance. Previous studies on the bank lending channel argue that large and well-capitalized banks are better able to buffer their lending activity against shocks affecting the availability of external finance (Kishan and Opiela (2000), Gambacorta and Mistrulli (2004)). Empirical evidence from the recent financial crisis shows that banks with higher capital ratios are less adversely hit by the crisis since they are better able to absorb potential losses (Bayazitova and Shivdasani (2012), Li (2013)). Without capital infusions in their banks, firms borrowing more from weaker and smaller banks would have experienced more funding difficulties (e.g., increase in loan spread paid) during the credit crunch (Santos, 2011). In line with this argument, we expect a stronger improvement in the stock price performance of firms that borrow from smaller and financially distressed banks once shocks on these banks are alleviated by CPP intervention.

Hypothesis H3: CPP interventions in banks have a significantly stronger impact on stock

returns of corporate borrowers that borrow from banks that are less profitable (H3a), less capitalized (H3b), and smaller (H3c).

2.4 Data

Our data comprise information on firm stock price performance, firm characteristics, bank-firm lending relationships, banks' characteristics and their participation in the Capital Purchasing Program. We consider firms that are included in the CRSP, Compustat and LPC Dealscan databases. We identify firm characteristics prior to the start of the crisis in the second quarter of 2007. Bank-firm relationships are measured prior to the government intervention in the banking sector We identify banks' participations in the CPP interventions and borrowing firms' stock price performance during the crisis period, which starts from August 9, 2007 (when the Fed first increased the level of temporary open market operations; see Cecchetti (2009)) to December 31, 2009. In total, our sample consists of 1,156 firms, of which 260 are included in the S&P 500 index. The total market value of firms in our sample accounts for more than half of the total market capitalization of the listed U.S. firms. Table 2.2 reports summary statistics for the main variables and the Appendix A2.1 shows variable definitions, data sources, and the period of measurement. We describe these variables in more detail in the remainder of this section.

TABLE 2.2 Summary Statistics

This table reports summary statistics for the main variables. Detailed variable descriptions are provided in the Appendix A2.1. Panel A reports summary statistics of firm characteristics and bank characteristics. The data for firm and bank characteristics come from the second quarter of 2007. Crisis performance is calculated as the buy-and-hold stock return from August 9, 2007 to September 30, 2008. Panel B reports summary statistics on firms' daily stock returns, the daily market returns based on the CRSP value-weighted market portfolio, and the two intervention scores (INT_SCO_DM, INT_SCO_AMT). The sample period starts on August 09, 2007 and ends on December 31, 2009. The pre-CPP period refers to the period from August 09, 2007 to October 27, 2008, and the post-CPP period refers to the period from October 28, 2008 to December 31, 2009.

Panel A. Firm characteristics and bank characteristics

Variable group	Variables	Mean	Median	St. Dev.	Units
Firm characteristics	Firm size	11,041	1,721	88,396	Million $
	Log(Firm size)	7.46	7.45	1.62	1
	Leverage	28.60	26.09	21.70	%
	ROA	1.31	1.17	2.61	%
	Altman's Z	1.33	1.24	1.35	1
	Bank-dependence	0.60	1.00	0.49	Dummy
	Cash holdings	14.00	4.61	24.61	%
	Bid-ask spread	0.21	0.12	0.39	%
	Crisis performance	-0.18	-0.19	0.52	1

Table 2.2 – continued from the previous page

Bank characteristics	Bank ROA	0.64	0.66	0.24	%
	Bank capital ratio	12.19	12.02	10.53	%
	Bank size	1,685,739	1,585,788	1,134,451	Million $
	Log(Bank size)	14.05	14.27	0.96	1
Number of firms	1,156				

Panel B. Firm stock price performance, general *stock market performance, and government intervention*

		Pre-CPP			Post-CPP			
Variable group	Variables	Mean	Median	St. Dev.	Mean	Median	St. Dev.	Units
Firm stock return	RETURN	-0.0017	-0.0012	0.0377	0.0027	0.0007	0.0553	1
Stock market return	R_{mt}	-0.0016	-0.0005	0.0188	0.0014	0.0026	0.0222	1
Government intervention	INT_SCO_DM	0	0	0	1.1042	1	0.6699	1
	INT_SCO_AMT	0	0	0	0.0284	0.02	0.0459	1
Number of firms	1,156				1,156			
Number of obs.	350,504				341,356			

2.4.1 Firm Characteristics and Stock Market Data

We collect data on firms' accounting variables and bank dependence (based on S&P credit ratings) from Compustat, and data on firms' stock market performance from CRSP. We merge the stock market performance data with firm accounting data using the CRSP identifier, "permno". We exclude the financial firms (SIC codes between 6000 and 6999). In order to avoid endogeneity problems in our analysis, we identify firms based on their pre-crisis accounting characteristics (2007Q2).

We include firms' total assets, cash holdings, and other variables that indicate the level of firms' financial distress; such as leverage ratio, ROA, Altman's Z-score, and the crisis stock price performance. We also consider variables that reflect the ease of firms' access to the external financial resources, such as the bid-ask spread and bank-dependence. In line with Kashyap et al. (1994) and Chava and Purnanandam (2011), we evaluate a firm's dependence on banks by examining their public debt rating status. We treat the non-rated and not investment-grade rated firms as bank-dependent firms and the investment-grade rated firms as not bank-dependent. In a credit crunch of such a scale, it is very difficult for the non-investment-grade firms to obtain alternative finance from either public debt market or commercial paper market. In our sample, roughly 60% of firms are categorized as bank-dependent borrowers according to their pre-crisis credit rating status.

2.4.2 Bank-Firm Lending Relationships

The strength of the bank-firm relationship is a key factor influencing the credit channel that transmits shocks from banks to their borrowers. Therefore, in order to examine the impact of government interventions on borrowing firms' performance we first measure the strength of each pair of bank-firm relationships. Having a stronger lending relationship with a bank allows borrowers to have better access to credit from this bank but also makes them more sensitive to the shocks to this bank at the same time.

To establish bank-firm relationships, we employ the LPC Dealscan database, which has been used in related studies (e.g., Dennis et al. (2000), Bharath et al. (2011)). This database contains detailed information on bank loans, mostly syndicated loans, granted to large companies. There are various ways of measuring the strength of a bank-firm relationship; some studies focus on the time dimension and measure the length of the lending relationship (e.g. Berger and Udell (1995)), while others employ the existence of repeated lending, concurrent underwriting, lines of credit, and checking accounts as proxies for a strong bank relationship (e.g., Schenone (2004), Drucker and Puri (2005), Bharath et al. (2007), Norden and Weber (2010), Bharath et al. (2011)). Since the LPC database starts in 1982, it would not be possible to observe the exact starting point of the lending relationship and thus difficult to calculate the length of any of such a lending relationship. Thus, instead of focusing on the "time dimension" of the banking relationship, we choose to focus on the "exclusivity dimension" of bank relationships, which takes into account the number of bank lending relationships and the concentration of bank debt.

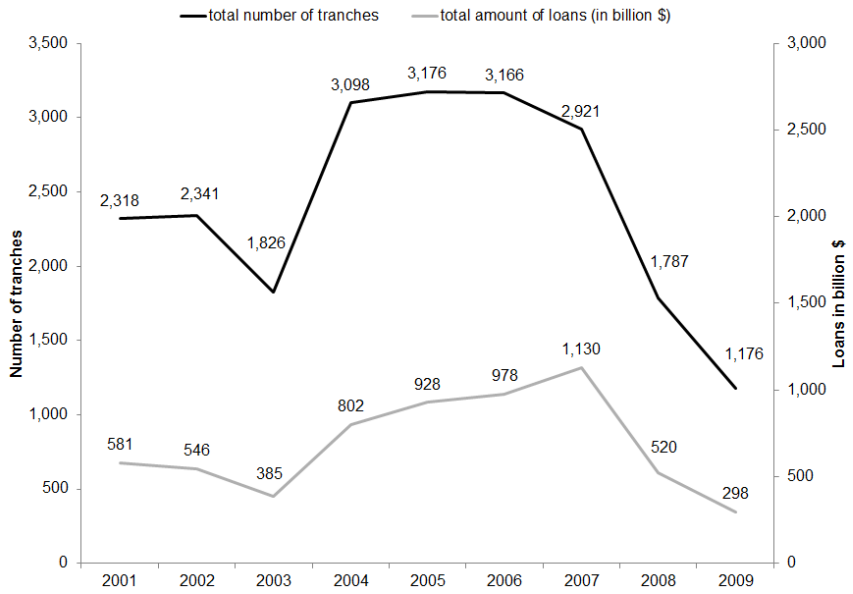
In line with the related studies that suggest that repeated contracting between firms and banks correlates with a strong bank-borrower relationship, we take the repeated lending of banks to firms in the past as an indication for a strong bank-firm relationship. Similar to the method used by Bharath et al. (2007), we construct a firm-specific and time varying bank-firm lending relationship variable $LR_{ij,t}$ that quantifies the relative importance of the relationship with bank j among all lending relationships of firm i at time t. We construct this lending relationship measure by analyzing the loan portfolio of firm i at time t. To do so, we review the history of new business loans extended to firm i by bank j prior to time t over a four-year window period from 2004 to 2007. We use such window length because the median maturity of the loans in the LPC Dealscan database is 4.8 years. Given that our analysis period is from August 2007 to December 2009, a loan granted during 2004-2007 should still be counted as part of firm's total loan portfolio in our analysis period and thus would provide information about the strength of bank-

firm relationship.

The reason why we only review the loan history until 2007 and then freeze the relationship during the government intervention period is that tracking relationships through the crisis could create an endogeneity problem since certain firms might have started new relationships with banks that participated in the CPP because they expected that these banks are more willing or better able to provide credit. However, this does not seem to have happened on a large scale since significantly less new lending relationships have been formed after the beginning of the crisis in 2008 and 2009 (see Figure 2.3).

FIGURE 2.3 Loan Origination from 2001 to 2009

This figure reports the total number and total volume (in billion $) of new bank loans to U.S. firms originated from January 01, 2001 to December 31, 2009. The data come from the LPC Dealscan database.



We construct the banking relationship $LR_{ij,t}$ by looking at firm i's top lead arrangers (banks) for each of firm i's historical loan in the LPC database. Suppose that firm i obtained n loans during the past four years prior to time t, the lending relationship between firm i and one lending bank j at time t is calculated as:

$$LR_{ij,t} = \frac{\sum_{x=1}^{n} Lead_{ij,x}}{\sum_{x=1}^{n} numL_{i,x}} \quad (1)$$

where $Lead_{ij,x}$ is a dummy variable that equals one if bank j (among the others) acts as a lead arranger in loan x to firm i, and zero otherwise. $numL_{i,x}$ is the number of lead arrangers involved in loan x to firm i.

The calculation of LR_{ij} is best illustrated by an example. LPC Dealscan reports that Accenture has entered two new loan contracts over the four-year period from 2004 to 2007; the first loan contract was granted in June 2004 with Bank of America and JP Morgan as lead arrangers. The second loan was granted in June 2006 with Bank of America and Citigroup as lead arrangers. In this case, the strength of relationship between Accenture and Bank of America is calculated as: $LR_{Accenture,\ BankofAmerica}=2/(2+1+1)=0.5$; similarly, $LR_{Accenture,\ JPM}=1/(2+1+1)=0.25$ and $LR_{Accenture,\ Citi}=1/(2+1+1)=0.25$. This method does not only identify the most important banks (lead arrangers) for each firm, but also differentiate the relative importance among lead arrangers over the past years. Note that for many cases in the LPC database, information on the actual shares of the individual banks in each syndicated loan are missing or not reliable, i.e., we cannot calculate the relative importance of each lead arranger based on loan volumes. Therefore, we use an indicator variable-based measurement approach, which is the closest we can get to accurately reflect the strength of a bank-firm relationship.

For both borrowing firms and lead banks, we aggregate data to the parent-bank level. We use the parent bank in our analysis because the CPP is only conducted at the parent-firm level. We also exclude finance companies as lenders from our analysis because these institutions are not eligible to receive CPP capital infusions.

The large number of mergers and acquisitions in the U.S. banking industry during our sample period makes it challenging to track the dynamics of bank-firm relationships. We use the Thomson One Banker and Zephyr database to document bank mergers and acquisitions events from 2004-2009 and construct dynamic relationships between banks and firms. Similar to other studies we assume that in most of the cases, the post-merger/post-acquisition bank inherited the loans of the pre-merger/pre-acquisition banks under normal economic situations. When bank A is acquired by bank B at time t_1, all clients of bank A are automatically counted as clients of bank B

after time t_1, and $LR_{iB,t}$ for firm i is recalculated by taking into account the prior relationship with bank A.

Based on the information extracted from 2,449 loan contracts from January 2004 till December 2007, we are able to construct 127,748 pairs of bank-firm relationships $LR_{ij,t}$ at the beginning of 2005 and this number is then reduced to 112,512 pairs at the end of 2009 due to mergers and acquisitions in the banking sector. We use the borrower parent ticker from LPC Dealscan to match to the ticker of Compustat. Using the link of Michael R. Roberts (http://finance.wharton.upenn.edu/~mrrobert/) we also match the company names from LPC Dealscan to the "gvkey" from Compustat (see Chava and Roberts (2008) for more details on this link). This produces a similar match given that all firms in our sample are publicly listed and have a borrower parent ticker available in LPC Dealscan.

2.4.3 CPP Capital Infusions and Redemptions

The data on banks' participation in TARP's capital infusion program CPP come from the website (http://www.treasury.gov/initiatives/financial-stability) of the U.S. Treasury Department. It includes information on capital infusions and capital redemptions. We employ an innovative measurement to assess the intensity of the positive spill-over effects stemming from intervention by defining a firm-specific and time-varying CPP intervention score which takes a firm's bank relationships and the banks' participation in the CPP program into account. We create two intervention variables for each firm to capture the presence (INT_SCO_DM) and magnitude (INT_SCO_AMT) of CPP interventions. For INT_SCO_DM, we first create a time-varying intervention variable $Intervention\_DM_{j,t}$ for each firm's bank j. $Intervention\_DM_{j,t}$ increases its value by one when a capital infusion took place and decrease value by one if there is capital redemption. Second, we transform the bank-level variable $Intervention\_DM_{j,t}$ into a firm-level intervention score, $INT\_SCO\_DM_{i,t}$, for each firm i by considering the lending relationships with its m banks. The daily firm-level intervention score is calculated as shown in equation (2).

$$(2) \qquad INT\_SCO\_DM_{i,t} = \sum_{j=1}^{m} LR_{ij,t} \times Intervention\_DM_{j,t}$$

Following similar procedure, we create a second firm-level intervention measure by considering firm i's lending relationships with m banks and the amount of CPP capital that is injected into each of the m lending banks. First, for each bank, we create a time-varying

intervention variable Intervention_AMT$_{j,t}$, which increases (decreases) its value by the CPP dollar amount injected to (redeemed by) bank j scaled by the total asset value of bank j prior to the start of the crisis (2007Q2).

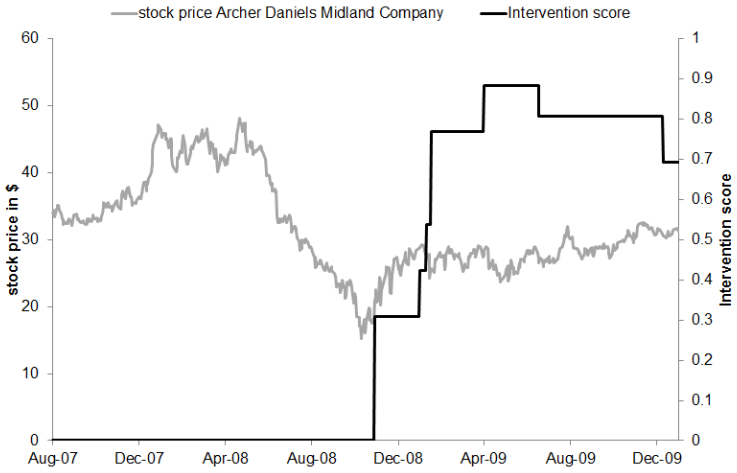
$$(3) \qquad Intervention\_AMT_{j,t} = \frac{amount\ injected\ to\ bank\ j}{pre-crisis\ total\ assets\ of\ bank\ j}$$

We then transform the bank-level variable Intervention_AMT$_{j,t}$ into a daily firm-level intervention score, INT_SCO_AMT$_{i,t}$ by considering the lending relationships with its m banks, as shown in equation (4):

$$(4) \qquad INT\_SCO\_AMT_{i,t} = \sum_{j=1}^{m} LR_{ij,t} \times Intervention\_AMT_{j,t}$$

Since the impact of the CPP intervention on firms' stock market performance is the main focus of our analysis, we use an example from our dataset to illustrate the first intervention score INT_SCO_DM$_{i,t}$ and firms' stock price performance in Figure 2.4.

FIGURE 2.4 The Co-Movement of the Intervention Score and Firm Stock Price
This figure shows the co-movement of stock price and the intervention score (INT_SCO_DM) of Archer Daniels Midland Company from August 09, 2007 until December 31, 2009.



The company Archer Daniels Midland Company (NYSE: ADM, agriculture and food industry) started three loan contracts from 2004 till 2007, which involved a total of 26 lead arrangers (16 unique banks). As displayed in Figure 2.4, INT_SCO_DM$_{i,t}$ (measured on the left

axis) first increased during the initial CPP infusion since three banks (acted as lead arrangers eight times) received CPP funds. As more banks obtained CPP funds later on, the intervention score $INT\_SCO\_DM_{i,t}$ increased further. After the enactment of the American Recovery and Reinvestment Act (ARRA) on February of 2009, some banks started to pay back the CPP money, and thus we see a decrease in INT_SCO_DM.

2.5 Empirical Results

2.5.1 The Short-Run Impact of CPP Intervention on Firm's Stock Returns

In our first set of tests, we examine the short-run impact of CPP intervention events on firms' stock performance. We calculate the 5-day cumulative abnormal returns (CARs) for the time interval [-2, +2] around days on which corporate borrowers' banks experience CPP capital infusions. We calculate firms' abnormal returns using the market-adjusted model by subtracting the return of the CRSP value-weighted stock market returns (including dividends distributions) as the market portfolio, comprising all NYSE/AMEX/Nasdaq listed firms. We also use the market model to calculate abnormal returns based on a pre-crisis estimation window of 255 days ending August 9, 2007 or a pre-intervention estimation window of 255 days ending October 1, 2008.

We test the short-term stock price reaction for firms surrounding the first up to the sixth intervention event in one or more of their banks. We also distinguish between forced events (when the government forced nine banks to accept a capital infusion on October 28, 2008) and voluntary events (when banks applied for a capital infusion at a later date on a voluntary basis).

Table 2.3 shows the short-term event study results. Consistent with our Hypothesis H1, firms display a significantly positive stock price reaction around intervention events in their banks. On average, using the market-adjusted model in Panel A of Table 2.3 we find that the mean (median) cumulative abnormal return (CAR) equals 1.41% (0.84%) during the 5-day event window. The first event and forced event show the largest stock price reaction. Note that the 1,109 first intervention events include the 1,026 forced events. This shows that most firms in our sample borrow from at least one of the nine banks that were forced by the U.S. government to participate in CPP. However, it is important to note that later intervention events and voluntary events also trigger a significantly positive stock price reaction.

The results remain robust when we calculate abnormal returns using the market model using

a pre-intervention estimation period (255 days; up to October 1, 2008; Panel B of Table 2.3) or using a pre-crisis estimation period (255 days; up to August 9, 2007; Panel C of Table 2.3). We also used the Fama French 3-factor model in unreported tests using the pre-crisis and the pre-intervention estimation period. The mean (median) CAR equals 1.2% (0.63%) for the pre-intervention estimation period and 1.12% (0.39%) for the pre-crisis estimation period. All CARs are significantly different from zero at the one percent level of significance.

TABLE 2.3 Short-Term Impact of Government Interventions in Banks on Corporate Borrowers' Stock Returns

This table shows the event study results of government intervention in banks on corporate borrowers' stock returns. We report the mean and median 5-day cumulative abnormal returns (CARs) during an event window of [-2, +2] surrounding government intervention in one or more of the firm's banks (in percent). We distinguish between the first up to the sixth intervention event, the forced intervention event on October 28, 2008, subsequent voluntary intervention events, and all intervention events together. Panel A shows CARs using the market-adjusted model, Panel B shows CARs using the market model with a pre-intervention estimation window of 255 trading days (ending on October 1, 2008) and Panel C shows CARs using the market model with a pre-crisis estimation window of 255 trading days (ending on August 9, 2007). We use the CRSP value-weighted stock market returns (including dividends distributions) as the market portfolio, comprising all NYSE/AMEX/NASDAQ listed firms.*, ** and *** indicate significance 10%, 5% and 1% level.

Panel A. CARs during event window [-2, +2] using the market-adjusted model

Intervention event	Mean	*t*-stat	*p*-value	sig.	Median	% positive	*p*-value Wilcoxon sign test	*p*-value Wilcoxon rank sum test	Number of observations
1	3.29	4.423	0.000	***	2.07	58.7	0.000	0.000	1,109
2	0.97	1.881	0.030	**	0.69	52.9	0.084	0.077	907
3	1.01	2.134	0.016	**	0.44	52.5	0.157	0.153	840
4	-0.63	-1.623	0.109		0.04	50.4	0.870	0.268	603
5	1.55	2.621	0.000	***	1.24	58.6	0.000	0.000	406
6	1.68	2.086	0.019	**	1.05	58.7	0.095	0.055	104
Forced	3.45	6.626	0.000	***	1.75	56.9	0.000	0.000	1,026
Voluntary	0.71	3.245	0.000	***	0.29	51.3	0.139	0.110	2,943
All events	1.41	4.362	0.000	***	0.84	54.7	0.000	0.000	3,969

Panel B. CARs during event window [-2, +2] using the market model (pre-intervention estimation period)

Intervention event	Mean	*t*-stat	*p*-value	sig.	Median	% positive	*p*-value Wilcoxon sign test	*p*-value Wilcoxon rank sum test	Number of observations
1	2.72	4.488	0.000	***	1.99	57.08	0.000	0.000	1,109
2	1.08	2.131	0.017	**	0.28	51.16	0.506	0.114	907
3	1.16	2.493	0.006	***	-0.10	48.93	0.557	0.255	840
4	-0.41	-0.843	0.200		-0.25	48.25	0.414	0.132	603
5	1.67	2.879	0.002	***	1.19	59.80	0.000	0.000	406
6	1.63	2.041	0.021	**	1.21	57.28	0.167	0.089	104
Forced	2.83	5.668	0.000	***	2.15	57.7	0.000	0.000	1,026
Voluntary	0.87	4.119	0.000	***	0.28	51.9	0.035	0.011	2,943
All events	1.42	4.484	0.000	***	0.57	57.08	0.000	0.000	3,969

Panel C. CARs during event window [-2, +2] using the market model (pre-crisis estimation period)

Intervention event	Mean	*t*-stat	*p*-value	sig.	Median	% positive	*p*-value Wilcoxon sign test	*p*-value Wilcoxon rank sum test	Number of observations
1	1.19	2.510	0.000	***	0.67	52.36	0.100	0.192	1,082
2	1.24	3.797	0.017	**	1.07	56.79	0.000	0.000	891
3	1.25	3.985	0.000	***	0.59	53.63	0.040	0.037	826
4	-0.20	-0.641	0.261		0.23	51.60	0.461	0.976	596
5	1.44	4.603	0.000	***	1.00	58.21	0.001	0.001	402
6	1.47	3.122	0.000	***	0.30	52.94	0.621	0.158	103
Forced	1.17	2.222	0.027	***	0.78	52.6	0.094	0.149	1,004
Voluntary	0.98	4.528	0.000	***	0.67	54.3	0.000	0.000	2,896
All events	1.11	5.533	0.000	***	0.75	54.51	0.001	0.000	3,900

2.5.2 The Longer-Run Impact of CPP Intervention on Firms' Stock Returns

In our second set of tests, we estimate panel data regressions to examine the longer-run impact of CPP interventions on firms' stock price performance. There are several reasons why panel data regressions are well-suited in our setting. First, we can take into account the specific nature of the CPP, especially its scale, scope and timing. Except in the first round of capital infusions which were forced, banks could apply for government capital infusions during a pre-defined time horizon. The series of bank-specific intervention events sometimes followed close to each other, did not happen simultaneously, were spread out over several quarters, and differ between banks in terms of number, timing and magnitude. We use the intervention score to not only capture the mere presence of the intervention but to measure the time-varying exposure to interventions and capital redemptions at the individual borrowing firm-level.

Second, panel data regressions allow us to better deal with the dynamics of change and omitted unobservable variables than pure cross-sectional or pure time-series data (Hsiao, 2003). This could be important given that we study intervention events where contemporaneous correlation of residuals across firms may be non-trivial and omitted unobservable variables could influence the results.

Third, the short-term event study from the previous section captures the expectation effect in stock markets, while panel data analysis captures changes in firms' average stock returns over a longer period, comprising the initial expectation effect and (unexpected) subsequent effects due to the actual increase in bank lending. Considering the short-term and the longer-term perspective with different methods also alleviates the concern that the short-term event study results are up- or downward biased because of the uncertainty surrounding the events. We estimate the following two panel data regression equations:

(5) $$RETURN_{it} = \alpha + \beta_1 INT\_SCO\_DM_{i,t} + \beta_2 R_{mt} + u_i + \varepsilon_{i,t}$$

(6) $$RETURN_{it} = \alpha + \beta_1 INT\_SCO\_AMT_{i,t} + \beta_2 R_{mt} + u_i + \varepsilon_{i,t}$$

We regress each firm's daily stock return $RETURN_{it}$ on its intervention score $INT\_SCO\_DM_{it}$ and $INT\_SCO\_AMT_{it}$, the market factor R_{mt}, and firm fixed effects u_i, as shown in equation (5) and (6). Table 2.4 reports the estimation results.

The table shows that CPP interventions in general have a significantly positive impact on firms' stock returns. The regression results using the full sample show that both INT_SCO_DM (Panel A) and INT_SCO_AMT (Panel B) are positively and significantly related with firms' stock returns. For example, the findings from Model (1) indicate that moving from the first to the third quartile of INT_SCO_DM is associated with an additional daily stock return of 0.042 percentage points, which translates into a substantial additional return per year of 11.34 percentage points. Hence, we find evidence in favor of our Hypothesis H1.

We then categorize firms into three groups according to the types of CPP interventions in their lending banks (i.e., forced only, voluntary only, and mixed) and re-run the regression models of equations (5) and (6) for these groups separately. Firms are categorized as forced only if they only have lending relationships with one of the nine banks that were forced into a bail out by the government on October 28, 2008 (63 firms), while firms are categorized as voluntary only if they only have a relationship with banks that voluntarily participated in the CPP at a later stage (79 firms). "Mixed" firms are those that borrow from banks that were forced to participate and voluntarily participated in the CPP (963 firms). The results, which are not reported here but available upon request, show that for both intervention score measures, the positive valuation effect on firms' stock price performance stays robust and consistent across three categories of intervened firms.

A potential problem with our panel data regressions is that the residuals of a given firm may be time-series dependent (i.e., a firm effect correlated across time) and residuals of a given day may be dependent in the cross-section (i.e., a time effect correlated across firms). We address these issues by using two-way clustered standard errors in Model (2) of Table 2.4, following Petersen (2009). The results are similar to the panel regression shown in Model (1).

TABLE 2.4 Longer-Run Impact of Government Interventions in Banks on Corporate Borrowers' Stock Returns

This table shows the results of panel data regressions (Models 1-4) with firm fixed effects and firm-by-firm time series regressions (Model 5) for the period from August 09, 2007 to December 31, 2009. The dependent variable in Model (1), (2), (4), and (5) is the firm's daily stock return including dividends ($RETURN_{it}$). The dependent variable in Model (3) is the firm's daily excess stock return including dividends over the one-month U.S. Treasury bill rate ($RETURN_{it}$ - R_{ft}). Panel A (Panel B) reports the regression results using INT_SCO_DM (INT_SCO_AMT), the daily market return R_{mt}, the stock market factors, and the post-intervention dummy, respectively, as independent variables. Model (4) in Panel A and B includes the intervention score orthogonalized to the post-intervention dummy as well as the daily market return. *, **, *** indicate coefficients that are significantly different from zero at the 10%, 5%, and 1% level. Variables are defined in the Appendix A2.1.

Panel A. The impact of interventions (dummy) on corporate borrowers' stock returns

	Model (1) Panel data, Huber-White robust standard errors			Model (2) Panel data, two-way clustered standard errors			Model (3) Panel data, Huber-White robust standard errors			Model (4) Panel data, Huber-White robust standard errors			Model (5) Firm-by-firm time-series regressions		
Dep. Var.:	$RETURN_{it}$			$RETURN_{it}$			$RETURN_{it}$ - R_{ft}			$RETURN_{it}$			$RETURN_{it}$		
	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Mean Coeff.	Mean *t*-stat.	sig.
INT_SCO_DM	0.0006	8.03	***	0.0005	2.16	**	0.0005	6.88	***				0.0012	7.06	***
$INT\_SCO\_DM_{orthog}$										0.0004	7.11	***			
R_{mt}	1.1517	484.10	***	1.1530	45.71	***				1.1521	484.2	***	1.1507	78.64	***
R_{mt} - R_{ft}							1.1388	404.06	***						
SMB							0.6593	102.46	***						
HML							0.1287	21.42	***						
Post-intervention dummy										0.0004	6.73	***			
Constant	0.0002	3.76	***	0.0002	1.20		0.0002	3.26	***	0.0004	9.06	***			
Firm fixed effects	Yes			Yes			Yes			Yes			No		
Number of firms	1,156			1,156			1,156			1,156			1,156		
Number of obs.	691,860			691,860			691,860			691,860			1,156		
Adj. R^2	0.254			0.254			0.266			0.255			N/A		

Panel B. The impact of interventions (amount) on corporate borrowers' stock returns

Dep. Var.:	Model (1) Panel data, Huber-White robust standard errors $RETURN_{it}$			Model (2) Panel data, two-way clustered standard errors $RETURN_{it}$			Model (3) Panel data, Huber-White robust standard errors $RETURN_{it} - R_{ft}$			Model (4) Panel data, Huber-White robust standard errors $RETURN_{it}$			Model (5) Firm-by-firm time-series regressions $RETURN_{it}$		
	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Mean Coeff.	Mean *t*-stat.	sig.
INT_SCO_AMT	0.0131	7.86	***	0.0087	2.99	***	0.0114	6.32	***				0.0722	7.37	***
$INT\_SCO\_AMT_{orthog}$										0.0003	6.10	***			
R_{mt}	1.1533	484.89	***	1.1536	45.70	***				1.1522	484.4	***	1.1508	78.65	***
$R_{mt} - R_{ft}$							1.1396	405.27	***						
SMB							0.6598	102.56	***						
HML							0.1277	21.26	***						
Post-intervention dummy										0.0004	8.58	***			
Constant	0.0004	6.83	***	0.0004	2.15	**	0.0003	7.01	***	0.0005	9.06	***			
Firm fixed effects	Yes			Yes			Yes			Yes			No		
Number of firms	1,156			1,156			1,156			1,156			1,156		
Number of obs.	691,860			691,860			691,860			691,860			1,156		
Adj. R^2	0.254			0.254			0.266			0.255			N/A		

Another potential concern is whether our intervention score fully captures the cross-sectional and time-varying dynamics of the impacts of CPP interventions on each firm. For this purpose, we create an indicator variable (Post-intervention dummy) that equals one from the first CPP intervention to the end of the sample period to capture the macro-level time-series effects from interventions. We then orthogonalize the intervention score with this indicator variable and include both variables in the panel regression model with daily data. This approach makes sure that we consider only that part of the intervention score that is left unexplained by the macro effect indicator variable. Model (4) of Table 2.4 shows that the indicator variable (Post-intervention dummy) and the orthogonalized intervention score ($INT\_SCO\_DM_{orthog}$) exhibit positive coefficients that are statistically significant (t-stat=6.73 and 7.11). Thus, the variation in the intervention score does not only reflect the macro-level structural changes to the market as a result of the CPP interventions but also captures both the cross-sectional and time-varying dynamics of the impact of CPP interventions on corporate borrowers' stock returns.

A final problem with our panel data regressions may be that we do not allow the coefficient on the intervention score variables to vary across firms. We therefore repeat our analysis in the spirit of Schipper and Thomson (1983) using daily raw returns over the period the crisis period starting from August 09, 2007 until December 31, 2009 as a dependent variable in 1,156 firm-by-firm time-series regressions and using the intervention score and the daily market return as independent variables. Model (5) of Table 2.4 indicates that the mean of the 1,156 coefficients on INT_SCO_DM equals 0.0012 (with more than 55% of the coefficient estimates being positive). The mean of the 1,156 coefficients on INT_SCO_AMT equals 0.0722 (with more than 57% of the coefficients estimates being positive). These mean values are both significantly different from zero at the 1% level of significance (the same holds for the corresponding medians). We will further analyze the cross-sectional determinants of these coefficients in Section VI.

We conclude that there is strong support for our Hypothesis H1, regardless of whether we conduct a short-term event study, panel data regressions or firm-by-firm time-series regressions. All results consistently show that government intervention in banks had positive spill-over effects on borrowing firms.

2.5.3 The Influence of Firm Characteristics

To test our Hypothesis H2, we consider the influence of pre-crisis firm characteristics and investigate whether firms with certain characteristics are more sensitive to the impact of CPP interventions. We run the daily panel data regression shown in equation (5) on quintiles that we created based on firms' pre-crisis characteristics except for bank-dependence. This empirical approach also makes it possible for us to examine whether the influence of firm characteristics is monotonic or not. The empirical results are reported in Table 2.5.

We obtain two main findings. First, consistent with the results shown in Table 2.4, we note that CPP interventions in general have a positive impact on firms' stock returns in almost all quintile groups. Second, the magnitude of the impact of CPP interventions on firms' stock returns varies depending on firm characteristics.

For firm size, daily stock returns of smaller firms are more sensitive to CPP infusion, which is in line with Hypothesis H2a. However, we note that the difference between quintile 1 and 5 is not significant. Results on firm's financial ratios (Hypotheses H2b: leverage ratio, H2c: profitability, and H2d: Altman's Z-Score) indicate that during adverse economic situations, CPP capital infusion in banks has had a more pronounced impact on stock price performance of more financially distressed firms. Differences between the lowest and highest quintiles are all significant at the 1%-level. Stock returns of less profitable firms are significantly more sensitive to CPP infusions. The CPP interventions have stronger positive valuation impacts on the stock price of firms with lower Altman's Z-score and the impact declines as the Altman's Z-score increases (although not monotonically). This set of results confirms that the borrower's level of financial distress (leverage, profitability, Z-Score) is an important factor that influences the impact of CPP intervention on corporate borrowers' stock returns.

Results on firms' pre-crisis cash holdings indicate that firms that are short on cash benefit significantly more when the government infuses capital in their lending banks, which is in line with Hypothesis H2e. Moreover, conforming to Hypothesis H2f, government capital infusions have more pronounced impacts on firms with lower-liquid stocks (higher bid-ask spread). In addition, we find firms that were most strongly hit by the financial crisis also benefit the most from CPP interventions in their lending banks, which is support for Hypothesis H2g.

TABLE 2.5

Panel Data Regression results by Firm Characteristics

This table shows the results of panel data regressions with firm fixed effects from August 09, 2007 to December 31, 2009. The dependent variable is the firm's daily stock return including dividends ($RETURN_{it}$), and the independent variables are the intervention score INT_SCO_DM and the daily market return R_{mt}. Observations are grouped into one of five quintiles according to one of the eight firm characteristics measured with pre-crisis data from 2007Q2 and firms' crisis stock price performance (from Aug 9, 2007 – Sept 30, 2008). Coefficients of the INT_SCO_DM and *t*-statistics based on Huber-White robust standard errors are reported. *,**, *** indicate coefficients that are significantly different from zero at the 10%, 5%, and 1% level. Variables are defined in the Appendix A2.1.

	Quintile 1 (lowest)			Quintile 2			Quintile 3			Quintile 4			Quintile 5 (highest)			Significance Quintile 5-1	
Quintiles split by	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	*t*-stat.	sig.
Log(Firm size)	0.0007	4.51	***	0.0004	2.60	***	0.0006	3.56	***	0.0006	3.92	***	0.0004	2.15	**	1.04	
Leverage	0.0005	3.54	***	0.0003	2.27	**	0.0005	3.23	***	0.0008	4.23	***	0.0010	4.44	***	-6.39	***
ROA	0.0017	7.22	***	0.0006	3.26	***	0.0003	1.90	*	0.0003	2.24	**	0.0002	1.35		6.86	***
Altman's Z	0.0012	5.35	***	0.0007	3.99	***	0.0004	2.70	***	0.0007	4.47	***	0.0002	1.30		8.28	***
Cash holdings	0.0007	3.68	***	0.0005	3.24	***	0.0008	4.27	***	0.0006	3.56	***	0.0004	2.48	**	1.65	*
Bid-ask spread	0.0003	2.66	***	0.0005	2.73	***	0.0005	3.49	***	0.0005	2.89	***	0.0010	4.91	***	-6.47	***
Crisis performance	0.0029	11.88	***	0.0009	5.33	***	0.0003	2.76	***	-0.0003	-2.60	***	-0.0009	-6.86	***	14.92	***

	Not bank-dependent firms			Bank-dependent firms			Significance between groups	
	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	*t*-stat.	sig.
Bank-dependence	-0.0001	-1.13		0.0005	4.55	***	5.05	***

We find that bank-dependent firms benefit more from the capital infusions in their banks during the financial crisis than less bank-dependent firms, which is consistent with Hypothesis H2h. Results show a significantly positive impact of CPP intervention on bank-dependent firms' daily stock returns, while there is no significant impact of CPP intervention on stock returns of firms that are not bank-dependent. The difference is significant at 1%-level. This result is in line with Chava and Purnanandam (2011), who document stronger positive stock price reactions for bank-dependent firms after a positive liquidity shock to banks due to an unexpected cut of the Fed Funds rate. As discussed earlier, the goal of the CPP capital infusion program is to stimulate bank's lending to the industry by providing extra liquidity to banks. Since bank lending is the primary source of financing for bank-dependent borrowers, they are most sensitive to CPP interventions in banks. It is important to note that all the results presented above remain similar when we use the INT_SCO_AMT instead of the INT_SCO_DM to measure government intervention in banks.

Summarizing, our results provide evidence that firm characteristics influence the impact of the CPP on firm's stock performance. We find that riskier (i.e., more levered, less profitable, more financially distressed) and bank-dependent firms are more sensitive to the positive impact of government capital infusions. These effects are not only significant from a statistical perspective but also economically significant.

2.5.4 The Influence of Bank Characteristics

We now examine the impact of bank characteristics on the sensitivity of firm's stock returns to intervention in these banks. We construct weighted bank characteristics for each firm i at time t by considering the relationship between firm i and its lending bank j, as well as bank j's specific characteristics l (i.e., bank profitability, capital ratio and bank size) at time t.

$$(7) \quad Weighted\ \ Bank\ \ Characteristics_{il,t} = \sum_{j=1}^{n} LR_{ij,t} \times Bank\ \ Characteristics_{jl,t}$$

We refer to Table 2.2 for descriptive statistics on these weighted bank characteristics. For each bank characteristic, we estimate the regression model shown in equation (5) on sub-samples that result from a quintile split based on the weighted bank characteristics measuring during the second quarter of 2007. Table 2.6 reports the results.

TABLE 2.6
Panel Data Regression Results by Bank Characteristics

This table shows the results of panel data regressions with firm fixed effects on daily data from August 9, 2007 to December 31, 2009 (see equation 5 in the paper). The dependent variable is a firm's daily stock return including dividends ($RETURN_{it}$) and the independent variables are the intervention score INT_SCO_DM and the daily market return R_{mt}. Observations are grouped into one of five quintiles of the three bank characteristics, respectively, using pre-crisis data (gathered from 2007Q2). Bank characteristics are averaged across the banks that the firm borrows from using the strength of the bank's lending relationship with the borrowing firm as a weight (see equation 7). Regression coefficients of the INT_SCO_DM and their *t*-statistics based on Huber-White robust standard errors are reported. *,**, *** indicate coefficients that are significantly different from zero at the 10%, 5%, and 1% level. Variables are defined in the Appendix A2.1.

Quintiles split by	Quintile 1(lowest)			Quintile 2			Quintile 3			Quintile 4			Quintile 5 (highest)			Significance Quintile 5-1	
	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	*t*-stat.	sig.
Bank ROA	0.0009	4.62	***	0.0007	2.70	***	0.0006	3.22	***	0.0005	3.73	***	0.0004	3.21	**	1.46	
Bank capital ratio	0.0007	3.28	***	0.0008	5.23	***	0.0006	3.50	***	0.0006	3.61	***	0.0003	2.42	**	2.05	***
Bank size	0.0013	4.75	***	0.0007	3.83	***	0.0003	1.73	*	0.0007	4.54	***	0.0004	3.83	***	2.77	***

First, we find that firms borrowing from the least profitable banks (quintile 1) benefit more from the government capital infusion. As proposed in Hypothesis H3a, the positive impact becomes weaker for those firms that borrow from more profitable banks (quintile 5). However, the difference between quintile 1 and 5 is not significant. Second, stock returns of borrowers of banks with weaker capital ratios are more sensitive to CPP infusions. The effect is strongest for least-capitalized banks' clients (quintiles 1 and 2) and weakest for firms that borrow from banks with the highest capital ratio (quintile 5), which is in line with Hypothesis H3b. We further find that capital infusions matter more for corporate borrowers of smaller banks. Consistent with Hypothesis H3c, the impact of interventions becomes stronger when they borrow from smaller banks. Our finding is consistent with studies that argue that smaller banks with weaker capital ratios were most strongly hit by the crisis and also benefited the most once the negative shock is alleviated by the CPP (e.g., Panetta et al. (2010), Santos (2011)).

2.6 Further Checks

We also estimate cross-sectional regressions using the estimated coefficients on the intervention score obtained from firm-by-firm time series regressions as the dependent variable. We use firm and bank characteristics from the second quarter of 2007 as independent variables. An examination of the pair-wise correlations and variation inflation factors indicates that there is no severe multicollinearity problem. Table 2.7 reports the findings.

Models (1) and (2) are estimated on the full sample, whereas Models (3) and (4) are estimated for those firms with significantly positive coefficients on the intervention score. Moreover, we alternatively include either leverage and firm profitability (ROA) or the Altman's Z-Score. Model (1) and (3) indicate that higher leverage is associated with a higher coefficient on the intervention score. In addition, firm profitability (ROA) and the crisis stock price performance prior to intervention are negatively related to the intervention score coefficient. Model (2) and (4) show that higher bankruptcy risk (lower Altman's Z-score) significantly increases the positive impact of CPP intervention on firms' stock returns. Bank dependence leads to higher coefficients on the intervention score in all four models. We further find that lower bank profitability and smaller bank size is associated with a higher coefficient on the intervention score in firm-by-firm time-series regressions. These findings show that the impact of government interventions on stock returns is more pronounced for firms that having stronger lending

relationship with smaller, and less profitable banks. Overall, the results from Table 2.7 largely confirm our earlier results using panel data regressions.

Next, we investigate potential real effects associated with government intervention in the banking industry. Specifically, we examine potential changes in firms' financial constraints after government interventions in their lead banks. We estimate the corporate borrower's investment-cash flow sensitivity that indicates its dependence on internal financing. We are aware that there has been debate on how to measure financial constraints in the literature (e.g., univariate criteria (firm size, earnings retention, tangible assets, and bond ratings), investment-cash flow-sensitivities, cash holdings-cash flow sensitivities, and various indices such as those by Kaplan and Zingales (1997), Cleary (1999), Whited and Wu (2006), and Hadlock and Pierce (2010)). However, an application of all these methods would be beyond the scope of our paper.

Table 2.8 shows the results of panel data regressions that control for time-varying firm-specific growth and investment opportunities by including the market-to-book ratio and firm-fixed effects and time-fixed effects. The coefficient of cash flow ratio is significantly positive, suggesting that the investments of the average firm depend on their availability of internal finance. We examine whether the investment-cash flow sensitivity has changed by interacting the cash flow ratio with the intervention score. We find that the coefficient on the interaction effect of the cash flow ratio and the intervention score is significantly negative, indicating that firms' cash flow sensitivities have decreased after capital infusions in their banks. Corporate borrowers therefore became less financially constrained after government intervention in their banks. This provides some indication that the government intervention in banks helped to relax financial constraints.

Although the results are consistent with our main findings on firms' stock returns, we feel that these findings should be interpreted with caution. It might be premature to conclude that CPP interventions have positive real effects on firms because of lead-lag effects between intervention and banks' and firms' reactions. In addition, confounding events at the bank and firm level might have delayed or compromised the positive effects of intervention. Moreover, we do not consider potential changes in demand for investment and consumption that might have taken place during the post-intervention period. We acknowledge that these issues complicate the interpretation and make it hard to uncover "clean" real effects in our setting.

TABLE 2.7 Regression Results for the Determinants of the Intervention Score Coefficient

This table shows the results of cross-sectional OLS regressions with β_{1i} (obtained from firm-level time-series regressions $R_{it} = \alpha_i + \beta_{1i} INT\_SCO\_DM_{it} + \beta_{2i} R_{mt} + \varepsilon_{it}$) as dependent variable and firm and bank characteristics as explanatory variables. Model (1) and (2) report the regression results for the full sample which includes 1,125 firms with available data for all variables; Model (3) and (4) report the regression results for 624 firms with positive β_{1i}. The *t*-statistics are based on Huber-White robust standard errors. *, **, *** indicate coefficients that are significantly different from zero at the 10%, 5%, and 1% level. Variables are defined in the Appendix A2.1.

	Model (1)			Model (2)			Model (3)			Model (4)		
Dependent variable: β_{1i}	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.
Firm characteristics												
Log(Firm size)	0.0001	0.98		0.0001	1.07		0.0003	2.22	**	0.0004	2.44	**
Leverage	0.0037	4.02	***				0.0039	3.22	***			
ROA	-0.0106	-2.24	**				-0.0135	-2.68	***			
Crisis performance	-0.0024	-2.33	**	-0.0023	-2.07	**	-0.0018	-2.12	**	-0.0017	-1.79	*
Cash holdings	0.0005	0.58		0.0004	0.47		0.0010	0.95		0.0009	0.85	
Bid-ask spread	0.0238	1.44		0.0179	1.10		0.0408	1.69	*	0.0377	1.58	
Bank-dependence	0.0009	2.57	***	0.0011	2.96	***	0.0019	3.90	***	0.0023	4.11	***
Altman's Z				-0.0004	-4.26	***				-0.0005	-3.62	***
Bank characteristics												
Bank ROA	-0.1550	-1.92	*	-0.1438	-1.76	*	-0.4691	-3.26	***	-0.4499	-3.09	***
Bank capital ratio	0.0003	0.26		0.0004	0.32		-0.0003	-0.34		-0.0003	-0.25	
Log(Bank size)	-0.0003	-2.00	**	-0.0004	-2.44	**	-0.0003	-1.31		-0.0004	-1.75	*
Constant	0.0028	1.29		0.0050	2.32	**	0.0035	1.12		0.0058	1.81	*
Number of obs.	1,125			1,125			624			624		
Adj. R^2	0.098			0.091			0.132			0.116		

TABLE 2.8

Government Intervention in Banks and Corporate Borrowers' Financial Constraints

This table shows the results of a panel data regression with time and firm fixed effects for firms' quarterly capital expenditures during post-intervention crisis period from 2008Q4 to 2009Q4. The dependent variable is the firm's capital expenditure (divided by lagged total assets) and the independent variables are the cash flow ratio, the interaction term of the cash flow ratio and the intervention score INT_SCO_DM, the intervention score INT_SCO_DM, and the market-to-book ratio. The market-to-book ratio is the ratio of the market value of assets to total assets, where the market value is calculated as the sum of market value of equity, total debt, and preferred stock liquidation value less deferred taxes and investment tax credits. The cash flow ratio is calculated as the cash flow from operations divided by lagged total assets. The reported *t*-statistics and level of significance are based on Huber-White robust standard errors. *, **, *** indicate coefficients that are significantly different from zero at the 10%, 5%, and 1% level.

Dependent variable: Capital expenditure	Coeff.	*t*-stat.	sig.
Cash flow ratio	0.2009	14.37	***
INT_SCO_DM * cash flow ratio	-0.0351	-3.43	***
INT_SCO_DM	0.0146	8.51	***
Market-to-book ratio	-0.0067	-2.84	***
Constant	0.0340	14.30	***
Time fixed effects	Yes		
Firm fixed effects	Yes		
Number of firms	1,078		
Number of firm-quarter obs.	5,160		
Adj. R^2	0.283		

2.7 Conclusion

We investigate whether the U.S. government capital infusion program for banks, the Capital Purchase Program (CPP), affects corporate borrowers' stock returns during the financial crisis of 2007-2009. Based on detailed information on the firms' borrowing history, we identify credit relationships with banks as channels that transmit financial shocks from banks to their borrowers. Our principal result is that CPP interventions in banks have a significantly positive impact on the borrowing firms' stock returns. The short-term event study indicates that corporate borrowers of banks that obtained CPP capital infusions experience abnormal stock returns of 1.41 percentage points during the 5-day event window. In the panel data analyses, we find that moving from the first to the third quartile of the intervention score is associated with an additional daily stock return of 0.042 percentage points, which translates into a substantial additional return per year of 11.34 percentage points. We further find that the positive impact of CPP intervention is more pronounced for riskier and bank-dependent firms and those that borrow from banks that are less capitalized and smaller. These findings extend the evidence from related studies on negative

credit supply-driven spillover effects from banks to the corporate sector in the first stage of the recent financial crisis and previous crises (Campello et al. (2010), Ivashina and Scharfstein (2010), Lemmon and Roberts (2010), Chava and Purnanandam (2011)).

Our study contributes to the existing literature by identifying significantly positive spillover effects on corporate borrowers when negative shocks to their banks are mitigated. We leave it to future research to analyze whether similar effects exist when economic shocks spill over from the corporate to the banking sector (demand-driven shocks and real economy crises). Our evidence is consistent with the broader view that bank-firm relationships serve as an important transmission channel for positive shocks to banks.

Appendix A2.1. Variable Definitions

Variable category	Variable	Definition	Data source	Measurement period
Firm characteristics	Firm size	Firm total assets	Compustat	2007Q2
	Log(Firm size)	The logarithm of firm's total assets	Compustat	2007Q2
	Leverage	(Long-term debt + short-term debt)/total assets	Compustat	2007Q2
	ROA	Income before extraordinary items/total assets	Compustat	2007Q2
	Altman's Z	Altman (1968)'s Z-score	Compustat	2007Q2
	Bank-dependence	1 for bank-dependent firms (public debt rated as non-investment grade or non-rated firms), and 0 for other firms (public debt rated as investment-grade)	Compustat	2007Q2
	Cash holdings	Cash and marketable securities/total assets	Compustat	2007Q2
	Bid-ask spread	Average daily percentage bid-ask spread	CRSP	2007Q2
	Crisis performance	Firm buy-and-hold stock return during the financial crisis before the CPP	CRSP	9-8-2007 - 30-09-2008
Bank characteristics	Bank ROA	Firm-level weighted bank ROA (based on net income/total asset, see equation (7))	Compustat, FDIC Call Reports, and BankScope	2007Q2
	Bank capital ratio	Firm-level weighted bank capital ratio (based on Tier 1 capital+ Tier 2 capital)/Risk-weighted assets, see equation (7))		2007Q2
	Bank size	Firm-level weighted bank total assets (see equation (7))		2007Q2
	Log(Bank size)	Firm-level weighted log bank size (based on the logarithm of bank's total assets, see equation (7))		2007Q2
Government intervention	INT_SCO_DM	Firm-level CPP intervention score (based on the CPP dummy, see equation (2))	LPC Dealscan and U.S. Department of Treasury	9-8-2007 - 31-12-2009
	INT_SCO_AMT	Firm-level CPP intervention score (based on the amount of CPP infusion, see equation (4)		9-8-2007 - 31-12-2009
	Post-intervention dummy	Firm-level dummy variable that equals one after the first intervention and remains one until the end of the sample period		First intervention - 31-12-2009
Stock market return	Rmt	The value-weighted daily return on all NYSE, AMEX, and NASDAQ stocks	CRSP	9-8-2007 - 31-12-2009
Firm stock return	RETURNit	Daily return (including dividends) on corporate borrower's common stock	CRSP	9-8-2007 - 31-12-2009

Chapter 3
Do Firms Spread Out Bond Maturity to Manage Their Funding Liquidity Risk? *

3.1 Introduction

Managing funding liquidity risk is essential for the success of a firm. Funding liquidity risk arises when a firm cannot meet its financing needs – either being unable to rollover its debt at maturity or being unable to finance new investment opportunities (e.g., Diamond, 1991). When a firm faces severe funding liquidity risk, it may be forced to search for expensive alternative financing sources, undertake a costly debt restructuring process, or even liquidate its assets, possibly at fire-sale prices (e.g., Brunnermeier and Yogo, 2009). Survey evidence suggests that, when deciding on debt issues, one of the primary concerns for CFOs is to avoid the clustering of debt maturity dates (e.g., Graham and Harvey, 2001; Servaes and Tufano, 2006). Ideally, firms with a well-spread maturity structure of outstanding debt expect to straddle the funding liquidity risk fas they have to refinance only a small fraction of their total debt at any point of time. Despite its popularity in practice, research on the corporate debt maturity dispersion is scarce. This raises the question whether and how firms can manage their funding liquidity risk by spreading out the maturity structure of bonds and how effective it is.

In this paper we document the existence and use of bond maturity dispersion to manage funding liquidity risk from three perspectives. First, we identify the types of firms that exhibit a dispersed maturity structure of outstanding bonds over time. Second, we study how firms

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manage their bond maturity dispersion structure through new bond issuances. Third, we evaluate whether bond maturity dispersion helps to mitigate firms' funding liquidity risk. Results suggest a dispersed maturity structure improves the funding access and lowers the funding costs when firms have (re-)financing needs, controlling for other factors. Our findings complement and extend studies that document severe funding liquidity risk and credit risk for firms having a large portion of debt maturing within a short-term horizon, especially for financially constrained firms and during the financial crisis (e.g., Duchin et al. 2010; Almeida et al. 2012; Gopalan et al. 2013).

We focus on publicly listed firms from the US to study whether and how the bond maturity structure is used to manage funding liquidity risk. We consider firms' financing with public debt for several reasons. First, different from the equity financing which has infinite maturity debt financing has fixed maturity. This gives repeatedly rise to corporate funding liquidity risk, making debt finance a natural area to study firms' maturity management. Second, in contrast to the private debt market the public debt market is characterized by a large number of bond investors. This makes public debt renegotiation extremely costly if not impossible when firm faces large liquidity risk, as it requires unanimous bondholder consent under the "Trust Indenture Act" (Smith and Warner, 1979; Buchheit and Gulati, 2002). As the costs of funding liquidity risk of bond financing are higher, firms have an additional incentive to manage the bonds maturity structure to prevent the higher costs associated with liquidity risk. Third, previous research shows that due to the market frictions, firms that have access to public debt market are the ones that are subject to less informational asymmetries (e.g. Myers, 1984; Diamond, 1991; Denis and Mihov, 2003). Public bond offerings are sold to public at a fixed "take-it-or-leave-it basis" (Kwan and Carleton, 2010). Therefore firms that borrow in the bond market have a stronger position vis-à-vis their investors, and there is little input from public investors especially with respect to the design of bond contract features. This implies that those firms would have more flexibility in building up a desired maturity structure using bond financing.

We base our analysis on data on corporate bond taken from the Mergent FISD database. We merge the bond data with a wide set of firm characteristics collected from Compustat and examine which firms maintain a dispersed maturity structure of outstanding bonds. We find that larger, more leveraged, less profitable, growth-oriented, and non-bank dependent firms exhibit the most dispersed maturity structure of outstanding bonds. Next, we look at bond issues activity and investigate the types of firms that maintain a dispersed maturity structure over time by frequently issuing a set of bonds with heterogeneous maturities. The result is in

line with our first finding of firm's maturity structure of outstanding bonds. We find that firms with larger total assets, higher leverage ratio, and a well-spread maturity structure of bonds at issuance issue more frequently, and are more likely to issue multiple bonds with different maturities. A combination of these two financing policies leads to a maturity structure of outstanding bonds that is well spread over time.

In the final step, we examine whether a dispersed maturity structure helps firms manage their funding liquidity risk. Our results indicate that having a dispersed maturity structure improves a firm's funding availability and reduces its funding costs. Firms that have a dispersed bond maturity structure are more likely to meet their (re-)financing needs arising from bonds expiries or new investment opportunities, and they face lower funding costs when they issue new bonds. In addition, we find that the effect is the strongest among firms with higher funding liquidity risk, i.e., firms that are bank-dependent or that have a large proportion of bonds maturing in the short term.

Our study contributes to the classic line of research on how managing funding liquidity concerns may affect firms' choice of debt maturity structure. Diamond (1991) points out that managing liquidity risk is an important consideration when firms decide about the debt maturity. He defined liquidity risk as the risk of a borrower being forced into inefficient liquidation because refinancing is not available. Morris and Shin (2009) argue that liquidity risk could also be seen as the probability of a default due to a run by short-term creditors when the firm would otherwise have been solvent. Theory and empirical evidence suggests that the use of short-term debt exposes firms with funding liquidity risks and higher chance of inefficient liquidation (Diamond, 1991; Guedes and Opler, 1996; Brunnermeier, 2009; Cheng and Milbradt, 2012; He and Xiong, 2012a). Gopalan et al. (2013) show that the liquidity risk associated with having short-term debt also increases firms' credit risk – featured by a severe deterioration in their credit quality. Our research contributes to this strand of literature by showing that spreading out the bond maturity structure is one effective way for firms to manage funding liquidity risk.

Moreover, our paper provides evidence on recent theoretical work about the costs and benefits of maturity dispersion (Choi, et al. 2013; He and Xiong, 2012b; Acharya, et al., 2011). Empirical evidence on the dispersion of corporate bond maturity structure is scarce. The survey of Graham and Harvey (2001) indicates that many firms aim at dispersing their bond maturity structure to "limit the magnitude of refinancing in any given year". The latter has also been emphasized by Servaes and Tufano (2006) as the primary concern for CFOs when making decisions on the bond maturity. The recent studies by Gopalan et al. (2013) and

Almeida et al. (2012) relate to our paper by showing the adverse impact on credit quality and investment for firms having a large proportion of debt maturing within a year. However, an important difference is that our paper focuses on the dispersion of the maturity structure. The theoretical model of Choi et al. (2013) describes the firm's choice between a concentrated or "granular" bond maturity structure as a trade-off between flexibility benefits and transaction costs. Our findings are in line with their model as we show that firms that consistently maintain a well-spread maturity structure over time are the ones that have higher funding availability and lower funding costs and that can afford the transaction costs of maintaining the dispersed maturity structure. Our analysis also provides insights beyond their model as we examine the incremental maturity choice of new bond issues conditional on the maturity structure prior to the issue and the impact of having a dispersed bond maturity structure on funding availability and funding costs. We show that a well-spread maturity structure has a positive impact on corporate funding liquidity.

The rest of the paper proceeds as follows. Section 2 describes data and explains how we measure the dispersion of the maturity of outstanding bonds and new bond issues. Section 3 presents our empirical strategy and reports the main results. Section 4 summarizes the findings of additional analyses. Section 5 concludes.

3.2. Data and Measurement

3.2.1 Data

Our dataset comprises information on firm characteristics, bond characteristics, and macro-economic variables. We collect yearly data on firms' accounting variables and S&P long-term debt ratings from Compustat. We start with all publicly listed firms from the US and exclude utility and financial companies (SIC 4000-4999 or 6000-6999). We collect data on bond issues and maturity structure from the Mergent FISD database and merge it with the Compustat data using firms' CUSIPs. As the FISD database has only sufficient coverage from the early 1990s, we limit the sample period of our analysis from January 1, 1991 to December 31, 2011. The final sample comprises 16,857 firm-year observations from 2,388 firms.

Appendix A3.1 displays the main variables, the variable definitions, and the data sources. We winsorize all accounting variables from Compustat at 1% and 99% level to limit the impact of potential outliers. We consider three macro-economic variables to control for market conditions using data from the Federal Reserve Board. We take into account that it is easier for firms to issue bonds with a lower cost during economic booms than recessions,

which should have an effect on firms' funding availability and funding costs. Table 3.1 provides summary statistics on the main variables.

TABLE 3.1. Summary Statistics

This table reports summary statistics of the main variables. The sample is based on data from the Mergent FISD and Compustat database and comprises 2,236 firms. We exclude utility and financial firms with SIC code of 4000-4999 and of 6000-6999. The sample period starts on January 1, 1991 and ends on December 31, 2011. We report the mean, 25 percentile, median, 75 percentile, standard deviation and units of measurement of the variables. Detailed variable descriptions are provided in the Appendix A3.1.

Variable	Mean	25 Pct.	Median	75 Pct.	St. Dev.	Units
Dispersion	2.016	1.000	1.000	2.130	1.808	1
Maturity	9.255	5.000	7.600	11.092	6.202	Year
Bond_start_yr	1996	1992	1998	2003	10	Year
Firm_size	3874	263	862	2891	9716	Million $
Log_firm_size	6.764	5.574	6.759	7.969	1.825	1
Cash flow volatility	0.069	0.012	0.028	0.068	0.125	1
Leverage	0.328	0.149	0.289	0.448	0.259	1
ROA	0.108	0.075	0.124	0.174	0.139	1
Cash flow	-0.015	-0.021	0.025	0.059	0.172	1
Cash holdings	0.136	0.019	0.061	0.172	0.182	1
Tobin's Q	1.964	1.122	1.463	2.135	1.721	1
Bank dependence	0.710	0.000	1.000	1.000	0.454	1
Number of firms	2236					

Firms in our sample exhibit a mean leverage ratio is 32.8%. Corporate bonds are the key source of debt finance as the median bond-to-total debt ratio is 72%. We also identify the year when the firm issued its first bond and the year when the firm was first assigned a credit rating by Standard and Poor's. It turns out that more than 50% of firms in our sample issued their first bond and/or received a credit rating in the mid-1990s. This observation indicates that the majority of firms have access to the corporate bond market during our sample period.

3.2.2 Maturity Dispersion of Firm's Outstanding Bonds

We create the variable *Dispersion* to quantify the degree to which the maturity structure of outstanding bonds is spread over time. For each firm, we look at all outstanding bonds at the end of each calendar year and measure how much the total volume of outstanding bonds is spread across different maturity years. Intuitively, having 1% of the total volume of bonds equally distributed across one-hundred different maturity years exposes a firm with a lower funding liquidity risk than having all bonds maturing in the same year.

A dispersed bond structure differs from a concentrated structure in two ways. First, it matters how many different years the bonds are maturing in. Second, it matters how different the bond volume maturing in each of the maturity years is. For each firm i we look at all outstanding bond issues which have not matured yet at the end of each calendar year t. We

assign the bonds with the same maturity year *p* to the same group and calculate the aggregate amount of bonds that mature in each maturity year *p*. We divide this number by the total amount of bonds that are outstanding in calendar year *t*. This gives us $w_{i,t,p}$ – the percentage of the total amount of bonds that mature in each particular maturity year *p*. We then calculate the sum of squared percentages $\sum_{p=1}^{n} w_{i,t,p}^2$ and take the inverse of it. This gives the maturity dispersion variable, which corresponds to the inverse of the Herfindahl index of bond volumes maturing in different years. It measures the inverse of concentration – the dispersion of the total amount of outstanding bonds (see Equation (1)):

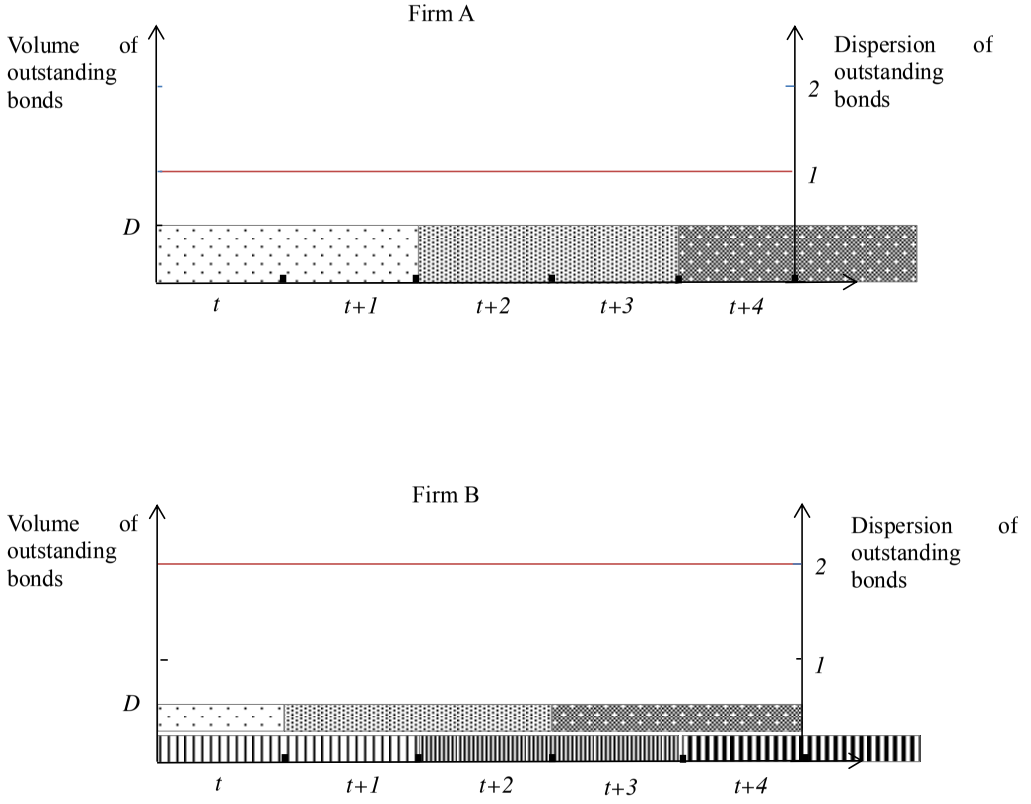
(1) $$Dispersion_{i,t,p} = \frac{1}{\sum_{p=1}^{n} w_{i,t,p}^2}$$

Let us consider an example to illustrate how $Dispersion_{i,t,p}$ measures the maturity structure of outstanding bonds, and what kind of actions could change the dispersion of the maturity structure. Suppose there are two firms A and B, and both firms have the same amount of public debt capacity *D*, meaning that they could only issue bonds up to the maximum amount of *D*. Firms A and B follow different strategies with regard to their maturity structure. The two situations are illustrated in Figure 3.1.

The horizontal axis indicates the time in calendar years. For simplicity we consider the period from year *t* to year *t+4*. The vertical axis shows that the total public debt capacity *D* is the same and assumed constant over time for both firms. Firm A does not follow a maturity dispersion policy. In year *t*, the firm issues only one bond with a maturity of two years that corresponds to 100% of the debt capacity. In *t+2*, when the bond matures, firm A rolls over the bond through issuing a new bond of the same amount *D* and the same maturity of two years. The value of *Dispersion* for firm A equals one according Equation (1). Firm A has a concentrated maturity structure and faces high funding liquidity risk every other year when the bond matures. Firm B builds up a dispersed maturity structure by issuing two bonds with different maturities. At year *t*, firm B divides the total amount of public debt capacity *D* into two and issues two bonds each to the amount of $\frac{D}{2}$ but with different maturities of one year and two years, respectively. Then, in year t+1 and t+2, when the two bonds mature, firm B issues new bonds to the amount of $\frac{D}{2}$ with maturity of 2 years to replace the maturing bonds.

Figure 3.1. Firms' Maturity Dispersion Choice at Bond Issuance

This figure shows firms' bonds issuance activity and their overall maturity dispersion of bonds outstanding. The left vertical axis shows that the total public debt capacity D, and the right vertical axis shows the *Dispersion* of outstanding bonds. Firm A issues one bond with amount of D and maturity of 2 years and then rollover whenever bond matures. Firm B issues two bonds with amount of $\frac{D}{2}$ and maturity of 1 and 2 years and rollover whenever bonds mature. The horizontal axis indicates the time in calendar years.



Firm B has to repeat this policy again until year *t+3* and *t+4* and so forth. The higher value of *Dispersion* for firm B ($\frac{1}{0.5^2+0.5^2} = 2$) indicates a more dispersed maturity structure and means that firm B faces less funding liquidity risk than firm A in expiry years, while it keeps the total amount of outstanding bonds stable over time.

3.2.3 The Incremental Maturity Dispersion Choice at Bond Issuance

Firms can build up and maintain their bond maturity structure at a certain level of dispersion through issuing bonds with particular maturities. The incremental maturity dispersion choice made by firms at issuance leads to a more dispersed or a more concentrated maturity structure of the outstanding bonds over time. Comparing the patterns of the bond issue activities of the two firms shown in Figure 3.1 we observe two key indicators of firm B's incremental dispersion activity at issues. First, the maturity structure of new bonds issued in each issue year is more dispersed. Second, the issue frequency is higher. Firms could build up or maintain well-spread maturity structure over time if they issue bonds with more dispersed maturity structure, and issue bonds more frequently. Following this logic we look at both the maturity dispersion at issuance and the frequency of bond issues.

We use the variable *Dispersion_issue* to measure how dispersed the maturity structure of the new bond issues is. It is constructed in a similar way as the dispersion measure of outstanding bonds, except that we look only at new bond issues rather than at all outstanding bonds. For each firm *i* at the end of each calendar year *t*, we first consider all bonds that are issued during the year and assign bonds to their expiry year *p*. Then, for each of the expiry years *p*, we calculate the fraction of the total amount of issued bonds that mature in an expiry year ($w^*_{i,t,p}$). We then take the inverse of the sum of the squared terms of the fractions and that gives $Dispersion\_issue_{i,t,p}$ (see Equation (2)).

(2) $$Dispersion\_issue_{i,t,p} = \frac{1}{\sum_{p=1}^{n} w^{*2}_{i,t,p}}$$

Intuitively, the higher the value of this variable, the more dispersed is the maturity of the bond issues. The measure has a minimum of one (i.e., there is only one bond issued or bonds with different terms are issued but they have the same maturity), which means no maturity dispersion is observed at issuance. Next, we measure the frequency of firms' bond issues. For each issue year, we measure the time in years that elapsed between the previous year of bond issue and the current year of bond issue and call this variable *Issue_time_gap*. The more frequently a firm issues, the shorter the time gap is.

3.3 Empirical Results

3.3.1 The Maturity Dispersion of Firms' Outstanding Bonds

A major challenge in our analysis is that the current maturity dispersion of outstanding bonds is determined by firms' bond issues from the past, and the latter are determined by firms' business conditions at that time. To investigate what factors influence the degree to which a firm's bond maturities are spread out over time, we have to consider firm characteristics from earlier periods. In this case, the mean maturity of bond issues in our sample is 10 years; this means that firms' current overall maturity structures should be determined by bond issue activities during the past ten years, and the activities should reflect firms conditions back then. Following this logic, we first regress firms' maturity dispersion of outstanding bonds on the average firm characteristics measured over the past 10 years. If the years of firm's existence *t* is shorter than 10 years, we take the average firm characteristics of the past *t* years.

We estimate a multivariate panel data regression model using robust standard errors clustered at the firm level. Cavalho and Santikian (2012) argue that firms within an industry manage funding liquidity in an interdependent way and their debt maturity decisions also reflect the situation in the industry. We therefore control for industry fixed and time fixed effects. We consider key characteristics such as firm size, cash flow volatility, leverage ratio, profitability, cash holdings, Tobin's Q and bank dependence in the regression. We expect that bigger and non-bank dependent firms face less information asymmetry in the public debt market and thus enjoy more flexibility in establishing dispersed maturity structure of bonds. We use cash flow volatility, leverage ratio and Tobin's Q to capture firms' needs to hedge rollover risks. Firms with higher cash flow volatility and higher leverage are more likely to face a funding illiquidity problem and therefore have incentives to spread out the bond maturity structure more strongly. Earlier studies document that growth firms are more likely to issue short-term bonds to mitigate the underinvestment problems caused by the agency problem (e.g., Myers, 1977; Barclay and Smith, 1995). They face higher costs once hit by funding illiquidity and we thus expect that high-Q firms spread out the payment schedule more strongly to hedge against the funding liquidity risk. Profitability and cash holdings are used as alternative ways to cope with funding liquidity risk. We hypothesize that firms that are less profitable and that hold less cash have stronger incentives to spread out their bonds maturity structure. Table 3.2 reports the regression results.

TABLE 3.2. Maturity Dispersion of Outstanding Bonds and Firm Characteristics

This table reports the results of a panel data regression with industry fixed effects and year fixed effects of firms' maturity structure of outstanding bonds. The dependent variable is the maturity dispersion of firm's outstanding bonds and the explanatory variables are averages of firm characteristics measured over the years t-1 to t-10. The sample period is from January 1, 1991 to December 31, 2011. *, **, *** indicate coefficients that are significantly different from zero at the 10%, 5%, and 1% level. Robust standard errors are employed and clustered at firm level. Variables are defined in the Appendix A3.1.

Dep. Var.:	Dispersion		
	Coeff.	*t*-stat.	sig.
Firm characteristics			
Log_firm_size $_{t-1,t-10}$	0.640	14.64	***
Cash flow volatility $_{t-1,t-10}$	0.264	0.57	
Leverage $_{t-1,t-10}$	1.410	6.31	***
ROA $_{t-1,t-10}$	-1.568	-3.65	***
Cash holdings $_{t-1,t-10}$	0.213	0.74	
Tobin's Q $_{t-1,t-10}$	0.064	1.75	*
Bank dependence $_{t-1,t-10}$	-0.918	-8.63	***
Industry fixed effects	Yes		
Year fixed effects	Yes		
Within R^2	0.355		
Number of obs.	12409		
Number of firms	1695		

We find that firm size positively relates to the dispersion structure of bond outstanding. This result suggests that bigger firms have a more sophisticated policy to spread out their maturity structure over time since they are the ones that could afford the transactions costs associated with repeated access to the public debt market. This finding is in line with the theoretical prediction of Choi et al. (2013). We also find that firms with higher leverage are more likely to have a dispersed maturity structure. A one percentage point increase in the leverage ratio is associated with a 1.41 percentage point increase in the *Dispersion* variable. One explanation is that firms with a relatively high leverage are more exposed to funding liquidity risk than others and therefore strive for a dispersed bond maturity structure to mitigate this risk. Furthermore, profitability negatively relates to the bond maturity dispersion. Less profitable firms tend to face higher costs of financial distress and therefore have a strong interest to establish a diversified maturity structure to mitigate the likelihood of financial distress. Moreover, firms' growth and investment opportunities measured by Tobin's Q positively relate to the maturity dispersion. Firms with higher growth and investment opportunities are known as firms that heavily rely on short-term debt to finance investment opportunities. As short-term bond finance increases the chance of a potential illiquidity problem a well-spread maturity structure is helpful for growth firms. Furthermore, we find that bank dependent firms have a less dispersed maturity structure. Those firms tend to be more financially constrained as they face a smaller set of financing alternatives. Previous research shows that bank-dependent firms exhibit higher informational asymmetries, which

limits their abilities to issue bonds, especially long-term bonds (e.g., Myers, 1984; Diamond, 1991; Rajan, 1992; Denis and Mihov, 2003). As a result, bank-dependent firms are often constrained to issue only short-term bonds and it is harder for them to realize a policy that aims at establishing a dispersed bond maturity structure.

Overall, we find that firms' maturity structure of outstanding bonds reflects their *ability* to spread out the bond maturity and their *need* for doing so.

3.3.2 Incremental Bond Maturity Choices at Issuance

Following the studies of Guedes and Opler (1996) and Denis and Mihov (2003), we examine firms' incremental maturity decisions when they issue new bonds. This approach has several advantages and can be seen as complementary to the analysis of the maturity structure of outstanding bonds. The latter is a cumulative result of a sequence of incremental decisions made by firms at the time of bond issuances in the past. The incremental analysis makes it possible for us to link a firm's maturity choices at issuance with firm characteristics measured before the issue. Moreover, this approach is better suited to capture changes in a firm's incremental maturity choice due to the time-variation in firm characteristics.

We use two alternative dependent variables *Dispersion_issue* and *issue_time_gap*. Both variables capture how issue activity contributes to a dispersed maturity structure of outstanding bonds. As shown in the example in Figure 3.1, the overall maturity structure of outstanding bonds is expected to become more dispersed over time if a firm jointly issues multiple bonds with different maturities (*Dispersion_issue* is high) and/or if the firm issues bonds frequently (*Issue_time_gap* is low). We also expect to find that firms with dispersed maturity structure are also the ones that exhibit incremental maturity dispersion at the time of bond issuances. We use cross-sectional OLS models with industry fixed effects and lags of all explanatory variables including the maturity dispersion of outstanding bonds. We also control for macro-economic factors and use robust standard errors clustered at the firm level. Table 3.3 reports the results.

TABLE 3.3 Maturity Dispersion of Bond Issues, Time Gap Between Issues, and Firm Characteristics

This table reports the results of OLS regression models with industry fixed effects. The dependent variables are (1) the maturity dispersion firms' bond issues (Dispersion_issue) and (2) the time gap between current new issues and the last issues (Issue_time_gap). The explanatory variables are the lagged firm accounting variables, bond maturity structure variables, and variables. The sample period is from January 1, 1991 to December 31, 2011. *, **, *** indicate coefficients that are significantly different from zero at the 10%, 5%, and 1% level. Robust standard errors are employed and clustered at firm level. Variables are defined in the Appendix A.

Dep. Var.:	(1) Dispersion_issue			(2) Issue_time_gap		
	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.
Firm characteristics						
Log_firm_size $_{t-1}$	0.172	10.51	***	-0.291	-5.12	***
Cash flow volatility $_{t-1}$	0.237	2.52	**	0.210	0.53	
Leverage $_{t-1}$	0.109	1.77	*	-1.169	-4.48	***
ROA $_{t-1}$	0.261	2.27	**	0.331	0.81	
Cash holdings $_{t-1}$	0.235	2.64	***	-0.133	-0.4	
Tobin's Q $_{t-1}$	0.011	0.91		-0.130	-3.95	***
Bank dependence $_{t-1}$	-0.094	-2.95	***	-0.375	-3.47	***
Bond_start_yr	-0.001	-0.42		-0.058	-9.33	***
Dispersion $_{t-1}$	0.041	4.01	***	-0.270	-6.42	***
Macro-economic variables						
Term spread $_{t-1}$	-0.013	-0.71		-0.179	-2.67	***
Default spread $_{t-1}$	0.010	0.25		0.548	4.49	***
Risk free $_{t-1}$	0.001	0.07		-0.074	-1.59	
Industry fixed effects	Yes			Yes		
Adj. R^2	0.221			0.153		
Number of obs.	3341			3337		
Number of firms	1120			1118		

The regression results of the two models indicate several interesting patterns. We note that the characteristics of firms that issue bonds with a more dispersed maturity structure largely but not completely overlap with the characteristics of firms that frequently issue bonds. The results are consistent for large firms and firms with higher leverage ratios, indicating that those firms issue bonds more frequently and issue bonds with more dispersed maturity structure at the same time. Over time, these firms are able to achieve the most dispersed maturity structure of outstanding bonds. This is in line with our results from the analysis of the overall maturity dispersion structure. A similar but slightly weaker result is found for firms' cash holdings and growth opportunities. Firms' growth opportunities negatively correlate with the time gap between issues. They positively correlate with maturity dispersion at issue although the impact is not significant. The result are consistent with our previous findings on the overall maturity dispersion of outstanding bonds and in line with the literature suggesting that firms with higher growth opportunities primarily issue short-term bonds, and thus need to issue frequently. It is also interesting to see that firms holding more cash are more likely issue bonds with dispersed maturities, as this potentially indicates that firms use complementary strategies to buffer against liquidity shocks. In addition, we find that firms with higher cash flow volatility issue bonds with more dispersed maturity structure but they do not issue more frequently. The latter suggests that the costs of following a maturity dispersion policy to manage funding liquidity risk might be lower than the costs of frequently issuing corporate bonds.

We further find that the time gap between bond issues negatively correlates with bank dependence and the year when firms first issued bonds, but negatively correlates with the maturity dispersion at issuance. This indicates that these firms are frequent issuers but not spreading out maturity. The related literature shows that those bank dependent firms and firms that recently get access to the bonds market are more financially constrained and subject to high information asymmetries. They do not have the flexibility to issue bonds with both short and long maturity, but are rather constrained to issue short-term bonds (e.g., Diamond, 1991). Patterns in the data confirm this explanation: the average maturity of new bonds issued by bank dependent firms is 9.5 years, which is shorter than the average maturity of 13.6 years for non-bank dependent firms. Similarly, the maturity of new issues for firms that have later access to bond market is 10 years versus 12.3 years for the ones that had earlier access. Taking the evidence together enables us to conclude that the issue activity of bank-dependent firms and firms that have late access to the public debt market is largely limited to bonds with concentrated and short maturity.

Another interesting finding is that the existing maturity dispersion has an important impact on the issue activity. Maturity dispersion of outstanding bonds significantly positively relates to both the maturity dispersion of bonds issues and negatively to the issue time gap (i.e., positively to the issue frequency). This finding suggests that firms with a more dispersed maturity structure continue to follow dispersion policy when issuing new bonds. A one point increase in the maturity dispersion of outstanding bonds is associated with a 4 percentage point increase of maturity dispersion of new issues and a 27.5 percentage point decrease of the time gaps between two issues.

Macro-economic factors matter for the issue time gap but not for the maturity dispersion at issuance. We find that the time gap between issues negatively correlates with the term spread and positively correlates with the default spread between average BAA and AAA rated bonds. This result indicates that firms tap into the public debt market less frequently during recessions when the term spread and risk free rate tend to be lower and the default spread tends to be higher. Taking into account that the average maturity of new bond issues during recessions is on average shorter we conclude that firms face more difficulties to raise external finance and have limited access to the public debt market at that time.

We conclude that firms that are bigger, more leveraged, and that have a more dispersed maturity structure of outstanding bonds are the ones that are more likely to issue more frequently and simultaneously bonds with different maturities.

3.3.3 The Impact of Bond Maturity Dispersion on Funding Liquidity

In this section, we investigate the impact of a dispersed bond maturity structure on firms' funding availability and the funding costs to see whether this strategy helps mitigate funding liquidity risk.

First, we examine the availability of funding by considering the probability of a firm being able to meet its financing needs arising from (i) expiring bonds and (ii) new investment opportunities. We define years when firm's refinancing needs arise due to bonds' expiry if at least one bond expires in that year. We define years when firm's financing needs arise due to new investment if firms' total investments (measured by the sum of firm's capital expenditure, R&D expense, and advertising expense) grow by at least 40% in that year (this happens less than 25% of all firm-year observations in our sample).

Specifically, we create two dummy variables that indicate the success of firms in meeting the two types of financing needs. The dummy variables equal one if at least one new bond is placed by the firm during the year when firm's financing needs arise in either of the two situations, and equal to zero when no bond is issued during the year when financing needs arise. Importantly, in this analysis we do not consider firms' financing activities in years in which no financing need arises. Summary statistics show that on average, successful refinancing of expiring bonds through new issues occurs more frequently (38.6%) than successful financing of new investments (20.4%).

We use Probit models to estimate the probability of successfully (re-)financing. Specifically, we regress the dummy variables of a firm's funding success in year *t* on its lagged maturity structure, controlling for firm characteristics, and macro-economic conditions measured at the end of year *t-1*. Since a well-dispersed maturity structure implies that the firm faces lower funding liquidity risk, we expect that this lower risk increases the firm's funding availability in year *t*, controlling for the other factors. Table 3.4 reports the results.

TABLE 3.4. The Impact of Maturity Dispersion of Outstanding Bonds on Funding Availability

This table reports the results of probit regression models that estimate the likelihood of successfully refinancing (1) expiring bonds (Funding_success_dummy_mat) and (2) new investments (Funding_success_dummy_inv). Explanatory variables are the lagged maturity dispersion of outstanding bonds and lagged bond maturity dispersion, accounting variables and macro-economic variables. The sample period is from January 1, 1991 to December 31, 2011. *, **, *** indicate coefficients that are significantly different from zero at the 10%, 5%, and 1% level. Robust standard errors are employed and clustered at firm level. Variables are defined in the Appendix A3.1.

	(1)			(2)		
Dep. Var.:	Funding_success_dummy_mat			Funding_success_dummy_inv		
	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.
Dispersion $_{t-1}$	0.053	3.28	***	0.136	4.28	***
Firm characteristics						
Log_firm_size $_{t-1}$	0.160	4.53	***	0.169	5.26	***

Table 3.4, continued from the previous page

Cash flow volatility $_{t-1}$	-0.589	-1.09		-0.181	-0.57	
Leverage $_{t-1}$	0.784	3.59	***	0.457	2.83	***
ROA $_{t-1}$	0.360	0.76		-0.518	-1.53	
Cash holdings $_{t-1}$	-1.021	-2.55	**	-0.516	-2.3	**
Tobin's Q $_{t-1}$	0.087	1.94	*	0.068	2.76	***
Bank dependence $_{t-1}$	-0.131	-1.15		0.048	0.53	
Bond_start_yr $_{t-1}$	0.003	0.79		0.014	3	***
Macro-economic variables						
Term spread $_{t-1}$	0.004	0.06		0.133	2.6	***
Default spread $_{t-1}$	0.319	2.86	***	0.119	1	
Risk free $_{t-1}$	-0.031	-0.78		0.052	1.41	
McFadden's Adj. R^2	0.092			0.054		
Number of obs.	1573			2242		
Number of firms	724			1148		

The findings from both regression models point to the same direction. We observe that, ceteris paribus, having a dispersed maturity structure has a significantly positive impact on firm's funding success. A one standard deviation increase in the variable *Dispersion* corresponds to a 9.58 percentage points increase in the probability of successfully refinancing a maturing bond, and a 24.60 percentage points increase in the probability of issuing bonds to finance new investments. Moreover, the impact of firm characteristics is consistent across the two models. Larger firms and firms with a higher leverage ratio, lower cash holdings, and higher growth opportunity are more likely to be able to refinance maturing bonds and/or new investments. Large firms face less information asymmetry and thus are more likely able to refinance when it is needed, while firms with higher leverage ratio, lower cash holdings, and higher growth opportunity are more sensitive to the funding liquidity risk.

We also analyze the impact of having a dispersed maturity structure on corporate funding costs associated with bond finance. According to He and Xiong (2012a), firm's funding liquidity risk leads to an increase in the liquidity premium of corporate bonds and also higher firms' credit risk. The evidence provided by Gopalan et al. (2013) shows that the credit quality deteriorates when the firm faces higher funding liquidity risk caused by a large proportion of short-term debt. We measure firms' costs of bond financing with the average yield spread per year in basis points. This variable captures the average firm-specific costs of bond financing and reflects credit risk and funding liquidity risk in a year. For every new bond issue, we calculate the differences between the yield to maturity of the new bond and the yield on treasury bonds (r_f) with similar a maturity. We then calculate the average spreads of all bonds that firms issue during each year to obtain the average yield spread of the firm's new issues per year. The average *yield spread* in our sample is 246 basis points.

We use the same specifications as in the analysis of firms' funding availability to analyze

whether firms with a more dispersed maturity structure benefit from lower funding costs when they issue new bonds, controlling for firm characteristics and macro-economic conditions. We lag the explanatory variables by one period to avoid potential endogeneity issues. The results are shown in Table 3.5.

TABLE 3.5. The Impact of Bond Maturity Dispersion on Funding Costs

This table reports the results of an OLS regression with industry fixed effects of the funding costs associated with new bond issues (Yield spread) on the lagged maturity dispersion of outstanding bonds, lagged firm characteristics, and macro-economic variables. We measure the yield spread as the average spread between the yield on firm's new issues and the yield of US government bonds with the same maturity in year t. The sample period is from January 1, 1991 to December 31, 2011. *, **, *** indicate coefficients that are significantly different from zero at the 10%, 5%, and 1% level. Robust standard errors are employed and clustered at firm level. Variables are defined in the Appendix A3.1.

Dep. Var.:	Yield spread		
	Coeff.	*t*-stat.	sig.
Dispersion $_{t-1}$	-3.768	-2.23	**
Firm characteristics			
Log_firm_size $_{t-1}$	-17.916	-4.29	***
Cash flow volatility $_{t-1}$	395.650	3.93	***
Leverage $_{t-1}$	129.036	4.59	***
ROA $_{t-1}$	-236.429	-4.27	***
Cash holdings $_{t-1}$	-71.352	-1.3	
Tobin's Q $_{t-1}$	-26.582	-4.79	***
Bank dependence $_{t-1}$	96.450	9.87	***
Bond_start_yr $_{t-1}$	1.050	3.07	***

Table 3.5 – continued from the previous page

Macro-economic variables			
Term spread $_{t-1}$	-96.606	-21.22	***
Default spread $_{t-1}$	108.301	10.57	***
Risk free $_{t-1}$	-42.256	-14.76	***
Industry fixed effects	Yes		
Adj. R^2	0.533		
Number of obs.	2091		
Number of firms	737		

We find that the maturity dispersion of outstanding bonds negatively relates to the firm's funding costs as measured by the yield spread. A one standard deviation increase of the dispersion structure of outstanding bonds reduces the yield spread by 6.81 basis points. This suggests that spreading out the bond maturities effectively improves firms funding costs. In addition, coefficients on firm characteristics indicate that firm fundamentals have significant impact on the costs of firms' new bonds issues. Larger firm size and earlier access to bonds market lower firm's funding costs because of lower information asymmetry and stronger fundamentals. Furthermore, we find that firms are more likely to enjoy lower funding costs in times of favorable macro-economic conditions, as reflected by the coefficients for the term spread, default spread, and risk free rate.

In sum, we show that bond maturity dispersion yields important benefits as it helps increase funding availability and lower funding costs.

3.4. Additional Analyses

3.4.1 The Influence of Maturity Dispersion for Firms with More and Less Funding Liquidity Risk

Our findings indicate that certain types of firms manage to achieve a dispersed maturity structure over time, and having a dispersed maturity of outstanding bonds improve firms' funding availability and funding costs. In the next step, we investigate whether the magnitude of these benefits depends on firms' funding liquidity risk being higher or lower. In this case, we use bank dependence and the average remaining years to maturity of outstanding bonds (short vs. long term) to differentiate between firms.

First, bank-dependent firms are more likely financially constrained and have difficulties in issuing bonds because of the higher information asymmetry compared to non-bank dependent firms. Thus, there is additional room for improvement in the funding availability for bank dependent firms. Based on this reasoning, we expect that bank-dependent firms should exhibit the highest marginal benefits if they succeed in building up a well-spread bond maturity structure.

Second, as the average year to maturity of outstanding bonds becomes shorter the rollover risk in the near future gets bigger. The maturity of outstanding bonds thus partially reflects the level of firms' funding liquidity risk (Gopalan et al., 2013). The related literature documents that having outstanding bonds with a shorter maturity creates large rollover risk and the potential for inefficient liquidation (Froot et al., 1993; Brunnermeier and Yogo, 2009; Cheng and Milbradt, 2012). In this case, as the median maturity of outstanding bonds for all firms is 7.6 years, we create the dummy variable *Short_maturity* that equals one if the firm's average maturity of outstanding bonds is shorter than 7.6 years and zero otherwise. We re-estimate the models of corporate funding availability and funding costs from Table 3.4 and 5 and include the lagged interaction term of *Dispersion* and *Bank dependence*, and alternatively, the lagged interaction term of *Dispersion* and *Short_maturity*. Panel A of Table 3.6 reports the results for bank-dependence and Panel B of Table 3.6 the results for the maturity focus.

TABLE 3.6. The Impact of Maturity Dispersion of Outstanding Bonds on Funding Availability by Bank Dependence and Short-Term Maturity Focus

This table reports the results of probit regression models that estimate the likelihood of successfully refinancing (1) expiring bonds (Funding_success_dummy_mat) and (2) new investments (Funding_success_dummy_inv). Explanatory variables are the lagged maturity dispersion of outstanding bonds and lagged bond maturity

dispersion, accounting variables and macro-economic variables. Panel A shows the impact of bank dependence. Panel B shows the impact of firms' maturity focus, which we measure with the dummy variable Short_maturity (one if the average remaining years to maturity of the outstanding bonds is below the median, otherwise zero). The sample period is from January 1, 1991 to December 31, 2011. *, **, *** indicate coefficients that are significantly different from zero at the 10%, 5%, and 1% level. Robust standard errors are employed and clustered at firm level. Variables are defined in the Appendix A3.1.

Panel A. Bank dependence

Dep. Var.:	(1) Funding_success_dummy_mat			(2) Funding_success_dummy_inv		
	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.
Dispersion $_{t-1}$	0.044	2.81	***	0.110	3.17	***
Bank dependence $_{t-1}$ * Dispersion$_{t-1}$	0.108	2.55	**	0.092	1.69	*
Firm characteristics						
Log_firm_size $_{t-1}$	0.125	3.34	***	0.157	4.87	***
Cash flow volatility $_{t-1}$	-0.559	-1.01		-0.178	-0.56	
Leverage $_{t-1}$	0.733	3.32	***	0.433	2.69	***
ROA $_{t-1}$	0.442	0.92		-0.512	-1.51	
Cash holdings $_{t-1}$	-0.972	-2.4	**	-0.510	-2.27	**
Tobin's Q $_{t-1}$	0.088	1.95	*	0.069	2.79	***
Bond_start_yr$_{t-1}$	0.003	0.76		0.015	3.1	***
Bank dependence$_{t-1}$	-0.506	-3.04	***	-0.137	-1.02	
Economic situation						
Term spread $_{t-1}$	-0.007	-0.12		0.130	2.56	**
Default spread $_{t-1}$	0.334	2.99	***	0.117	0.98	
Risk free $_{t-1}$	-0.036	-0.89		0.051	1.39	
Industry fixed effects	Yes			Yes		
McFadden's Adj. R^2	0.095			0.054		
Number of obs.	1573			2242		
Number of firms	724			1148		

Panel B. Short-term maturity focus

Dep. Var.:	(1) Funding_success_dummy_mat			(2) Funding_success_dummy_inv		
	Coeff.	*t*-stat.	sig.	Coeff.	*t*-stat.	sig.
Dispersion $_{t-1}$	0.165	5.17	***	0.190	4.06	***
Short_maturity $_{t-1}$ * Dispersion $_{t-1}$	0.141	4.23	***	0.076	1.51	
Firm characteristics						
Log_firm_size $_{t-1}$	0.131	3.65	***	0.163	5.11	***
Cash flow volatility $_{t-1}$	-0.514	-0.93		-0.162	-0.5	
Leverage $_{t-1}$	0.644	2.9	***	0.445	2.76	***
ROA $_{t-1}$	0.418	0.86		-0.550	-1.62	
Cash holdings $_{t-1}$	-0.969	-2.4	**	-0.505	-2.26	**
Tobin's Q $_{t-1}$	0.088	1.89	*	0.070	2.87	***
Bond_start_yr$_{t-1}$	0.003	0.79		0.014	2.97	***
Bank dependence$_{t-1}$	-0.109	-0.95		0.044	0.49	
Short_maturity $_{t-1}$	-0.494	-3.24	***	-0.210	-1.97	**
Economic situation						
Term spread $_{t-1}$	0.012	0.2		0.120	2.31	**
Default spread $_{t-1}$	0.311	2.78	***	0.135	1.13	
Risk free $_{t-1}$	-0.025	-0.61		0.046	1.22	
Industry fixed effects	Yes			Yes		
McFadden's Adj. R^2	0.100			0.054		
Number of obs.	1573			2242		
Number of firms	724			1148		

The analysis confirms our expectation that spreading out bond maturity improves the funding availability for firms that face more funding liquidity risk. Panel A of Table 3.6 shows that bank-dependent firms exhibit the highest benefits of having a dispersed bond maturity structure. The economic effect is strong: the coefficient of the interactive term is more than twice as big than the base effect (column (1): 0.108 compared to 0.044) for the probability of refinancing expiring bonds and approximately as big as the base effect for the probability of financing new investment (column (2): 0.092 compared to 0.110), suggesting substantial additional benefits of improving funding availability for bank dependent firms compared to the non-bank dependent ones.

Panel B of Table 3.6 shows that firms that focus on bond finance with short maturities exhibit the highest benefits of having a dispersed bond maturity structure. We see that having short-term outstanding bonds increases the probability of successfully refinancing expiry bonds by 30.6 percentage points, which is almost twice as compared to the impact of bond dispersion on refinancing success for firms with bonds maturing in longer term.

We also test the influence on firms' funding costs (not reported here). We find that having a dispersed maturity structure creates benefits for bank-dependent firms and firms with short-term outstanding bonds. However, these effects are not statistically significant. This result implies that having a dispersed maturity structure lowers the funding costs for weaker and stronger firms in a more equivalent matter. Having a dispersed maturity structure primarily translates into improved funding availability (and thus funding liquidity) but the market still considers the lower credit quality of these firms and thus demands a higher premium.

In sum, our finding suggests that having a well-spread bond maturity structure creates additional benefits in form of higher funding availability for firms that face higher funding liquidity risk.

3.4.2 The Maturity-Weighted Dispersion Variable and the Heterogeneity in Maturity Structure

When we investigate firms' maturity structure it matters how far the maturities of different bonds are away from each other. For example, the maturity structure for firms with two bonds of equal amounts that mature in year $t+5$ and $t+6$ is different from firms with two bonds of equal amounts that mature in year $t+1$ and $t+10$. The key difference between the two situations is how stretched out are the years to maturity, or how heterogeneous are they are. We consider use a modified version of the variable *Dispersion* to capture the heterogeneity. We calculate the deviations of all the years to maturity of all bonds from the average years to maturity of the outstanding bonds to account for the heterogeneity in bond maturity. We add

this maturity deviation $\left|m_{i,t,p} - \bar{m}_{i,t}\right|$ as a weight to the formula to calculate the variable *Dispersion* and get an alternative variable for bonds dispersion, which we label *Dispersion_maturity_weighted* (see Equation (3)). We avoid zero or negative weights by taking the absolute value of the difference between an individual maturity and the average maturity and add one to the value.

(3) $$Dispersion\_maturity\_weighted_{i,t,p} = \frac{1}{\sum_{p=1}^{n} w_{i,t,p}^2 \frac{1}{\left|m_{i,t,p} - \bar{m}_{i,t}\right|+1}}$$

The variable has a mean of 8.803 and a median of 2.5. Intuitively, the more heterogeneous the maturity of outstanding bonds is, the higher the score is. We compare this variable with our original dispersion measure and conduct the same set of analyses using the maturity weighted dispersion variable. We find that this variable highly correlates with *Dispersion* as Pearson's correlation coefficient equals to 0.826. The regression results on the relationship between firm characteristics and weighted dispersion are largely similar to results using the original variable – firm size, leverage, and Tobin's Q are positively related to the weighted dispersion, and bank dependence is negatively related to it. Results for the incremental dispersion at bonds issues also largely resemble our findings using the *Dispersion*.

We further use the maturity weighted dispersion variable to test the impact on firms' funding availability and funding costs. Results show that the maturity weighted dispersion measure decreases firm's funding costs to a similar degree as the *Dispersion* does. We observe a significant positive impact on firm's new investment funding activities but no significant impact on funding expiring bonds. We further show that the impacts are much stronger for bank dependent firms and firms with outstanding bonds of short maturities, which is consistent with the findings from Table 3.6. We conclude that the results using the maturity weighted dispersion variable yields similar results as the variable *Dispersion*.

3.4.3 The Fraction of Funding Needs Met

In addition to the probability of whether financing needs are met it is useful to examine to which extent firm's financing needs are met. Instead of using dummy variables we now calculate the ratio of "financing raised over financing needed" for the two cases mentioned in Section 3.3. The variable is zero if there are financing needs but zero dollar-amount of bonds is issued in the year. We find that when new bonds are issued to replace existing bonds' expiry, the median refinancing ratio is 2.2, meaning that the new bonds issued on average are more than enough to cover the amount of bonds maturing. The refinancing ratio is 4.67 for cases when there is an increase in the investment. Thus, the two types of financing needs are

more than sufficient when firms issue bonds during the year. We also re-estimate the same regressions as in Table 3.4 but now use the weighted dispersion variable.

We find that the dispersion of outstanding bonds has a significant and positive impact on the fraction of financing needs that is met when a firm has new investment opportunities. A one point increase in the maturity dispersion relates to an 8.84 percentage point increase in the fraction of financing needs that are met when firms have new investment opportunities. Overall, the results point to the same direction as our findings with the dummy variables. Having a dispersed maturity structure not only matters for the probability of a refinancing but also matters for the extent to which funding needs are met.

3.4.4 Firms' Reliance on Bond Financing

One concern might be that bond maturity dispersion is less or not relevant for firms that do not heavily rely on bonds financing. To investigate this issue, we compare the dispersion of firm's overall maturity structure for firms that rely more and less on bond financing and also check the difference in their bond issues activity. We measure to what degree firms rely on bond financing using firms' bond to total debt ratio and create two subsamples of firms according to the median bond ratio (72% in our sample). We rerun the tests similar to the ones in Table 3.2 and 3 on the two subsamples of firms with higher and lower bond ratio separately.

The results are consistent with the findings using the full sample. We find that the relationship between firm's maturity dispersion of outstanding bonds and various firm characteristics stays largely unchanged across the two sub-samples of firms with different bonds to debt ratios. Analysis on firms' new bonds issuance also exhibit comparable patterns across the two sub-samples. Overall, we find that firms that rely less on bond finance also manage the bonds maturity dispersion overtime through their bond issuance activities.

3.5 Conclusion

In this paper we investigate whether and how firms manage funding liquidity risk through spreading out the maturity of bonds. We examine the dispersion of US firms' bond maturity structure over time and at issuance during the period 1991-2011 and their impact on funding availability and funding costs.

We find that larger, more leveraged, less profitable, growth-oriented, and non-bank dependent firms exhibit the largest maturity dispersion of outstanding bonds. Firms maintain

such dispersed maturity structure by frequently issuing sets of bonds with different maturities. We also find that having a more dispersed maturity structure helps increase funding availability and lower funding costs. Interestingly, the effects are stronger for firms with a higher exposure to funding liquidity risks. The result is consistent with the survey evidence documented in the previous research, and suggests that certain firms effectively follow a maturity dispersion policy. Finally, our paper also extends the literature on the firms' rollover risk management, and we show that firms could successfully mitigate the funding liquidity risk through building up and maintaining a dispersed bond maturity structure over time.

Appendix A3.1. Variable Definitions

Variable	Definition	Data source
Firm characteristics		
Firm size	Total assets	Compustat
Log_firm_size	Logarithm of total assets	Compustat
Cash flow volatility	Standard deviation of the cash flow from the past three year t-2 to year t	Compustat
Leverage	(Long-term debt + short-term debt)/total assets	Compustat
ROA	Income before extraordinary items/total assets	Compustat
Cash flow	(Income before extraordinary items – dividends total)/total asset	Compustat
Cash holdings	Cash and marketable securities/total assets	Compustat
Tobin's Q	Firm market value/total assets	Compustat
Bank dependence	One for bank-dependent firms (non-investment grade rated or non-rated firms), and zero for other firms (rated as investment-grade)	Compustat
Bond_Start_yr	Year in which firm issues bonds for the first time	FISD

Maturity dispersion of outstanding bonds and bond issues		
Dispersion$_{i,t,p}$	Dispersion of volume of outstanding bonds. $Dispersion_{i,t,p} = \frac{1}{\sum_{p=1}^{n} w_{i,t,p}^2}$ (where $w_{i,t,p}$ is the fraction of the total volume of outstanding bonds that mature in the same year p)	FISD
Dispersion_maturity_weighted$_{i,t,p}$	Maturity weighted dispersion of volume of bond outstanding. $Dispersion\_maturity\_weighted_{i,t,p} = \frac{1}{\sum_{p=1}^{n} w_{i,t,p}^2 \frac{1}{\lvert m_{i,t,p} - \bar{m}_{i,t} \rvert + 1}}$ (where $\bar{m}_{i,t}$ is the average maturity of outstanding bonds. $w_{i,t,p}$ is the fraction of total volume of outstanding bonds that mature in the same year p)	FISD
Dispersion_issue	Dispersion of volume of issued bonds. Dispersion_issue$_{i,t,p}$ $\frac{1}{\sum_{p=1}^{n} w_{i,t,p}^{*2}}$ (where $w_{i,t,p}^{*2}$ is the fraction of total volume of issued bonds that mature in the same year p)	FISD
Issue_time_gap	time in years between the current bond issue year and the previous bond issue year	FISD
Short_maturity	One if the firm's outstanding bonds maturity is shorter than 7.6 years (the median remaining years to maturity of outstanding bonds in our sample), and 0 otherwise	FISD
Macro-economic variables		
Risk free rate	Yearly average of 3-month government T-bill rate	Fed
Default spread	Yearly average of the difference in yields between Moody's BAA and AAA rated corporate bonds	Fed
Term spread	Yearly average of the difference in yields between 10-year and 6-month US government bonds (T-bills)	Fed
Funding liquidity and funding costs		
Funding_success_dummy_mat$_{i,t}$	One if at least one of the firm i's bonds expires and the firm is able to issue at least one bond in the same year t, and zero if no bond is issued in a bond expiry year t.	FISD
Funding_success_dummy_inv$_{i,t}$	One if the firm i's investments grow by 40% in the same year and the firm issues at least one bond in the same year t, and zero if no bond is issued in year t in which the firm i's investments grow by 40%.	FISD & Compustat
Yield spread$_{i,t}$	The average difference between the yield to maturity of the firm's bond issues and the yield to maturity of US government bonds with the same maturity of all bonds issues in year t measured in basis points	FISD

Chapter 4
Bank Entry Mode, Labor Market Flexibility and Economic Activity*

4.1 Introduction

Since Schumpeter (1912) who first pointed out the importance of banking system in economic progress, the link between financial development and economic growth has been a subject of debate. Over the past three decades, the banking sector has been progressively deregulated around the globe. Looking at the interstate banking expansions in the United States, recent studies highlight the positive impact on local economic activity as a result of an increase in bank competition and financial integration (Jayaratne and Strahan 1996; Huang 2008). In bank expansions, knowledge about the local market can act as an important barrier for potential entrants to compete with incumbent banks (Dell'Ariccia and Marquez 2004). Studies show the lack of the direct access to local information is a disadvantage for banks seeking to enter a new market (Dell'Ariccia et al. 1999). How can banks get local information when they plan to expand across state borders? In the banking industry, employees (e.g., loan officers) are the ones who collect and update information about local clients (Petersen and Rajan 1994). To this end, I focus on the key

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channel through which an out-of-market bank could gain access to local information: the mobility of incumbent bank employees with critical knowledge of local markets.

Entrant banks gain access to important local information by hiring incumbent banks employees to work for their new branches. However, if local labor market frictions restrict this inter-organizational labor mobility, entrant banks cannot gain access to local information through hiring; they will have to acquire existing incumbent branches instead. This potential entrance scenario indicates that the modes of bank entry may be affected by local labor market flexibility.

In this paper, I investigate whether the accessibility of local information through labor mobility influences entrant banks' strategy on how to enter into the local market following the U.S. interstate branching deregulation. The main challenge in establishing the causal effect is to identify exogenous variation in the local labor market. In order to do this, I focus on the changes in jurisdictional enforcement of the non-compete covenants. Such a regulation introduces frictions into the labor market and imposes significant constraints on the mobility of the labor force in the same industry. The enforcement on the non-compete covenants reduces local employee turnover, and restricts entry banks' access to local information. As the former chief of the antitrust division of the U.S. Department of Justice stated, "the branch manager and loan officers are critical in local small business and retail lending and that tying up good branch managers or loan officers with non-compete agreements can be detrimental to new entrant banks' ability to attract or retain customers" (Kramer 1999, p323). I exploit the heterogeneity in enforcement of non-compete agreements across different states and over time, and use it to explain the dynamics of banks' entry modes during the post- interstate banking deregulation era in the U.S. from 1994 to 2010. A difference-in-differences approach is used to identify the causal relationship between local labor market flexibility and out-of-state banks' mode of market entry.

Banks use two different approaches when they enter a new market. Are there different economic consequences associated with each approach? In the first approach, new branches established by out-of-market banks increase the total number of credit providers in the market, and lead to a more competitive credit market. In the second approach, the number of credit providers remains constant when local branches are acquired by entrant banks. An increase in bank competition after interstate bank branching deregulation ultimately contributed to improvement in local bank service, credit availability, economic growth, and job creation (Black and Strahan 2002; Dick 2006; Rice and Strahan 2010; Chodorow-Reich 2014), whereas it is less clear if banks enter

local market using the second approach. This indicates that the local economy will benefit more from new market entrants who establish new branches. To test the prediction, I compare the real consequence on local credit market and economic activity after banks enter a new market by establishing branches versus through mergers and acquisitions (M&As) of existing branches.

The main result from the difference-in-differences analysis shows that the relaxation of enforcement of non-compete agreements causes an average 37.3 percentage point increase in the proportion of out-of-state banks entering the market by establishing branches (in contrast to acquisitions). To mitigate the concerns about unobserved heterogeneity, I build on Huang (2008) and test the impact of non-compete enforcement on banks' entry modes only using contiguous counties bordering the law-change states. The result shows that the positive impact of labor market flexibility on the likelihood that a bank expands by establishing branches in new markets remains robust. I then differentiate the real consequences on credit market and local economic activity after out-of-state banks enter a new market by establishing a branch rather than acquiring a branch through an M&A. I find that establishment of a new branch increases local credit market competition, leads to an increase in small business lending, more economic activity, and faster per capita income growth. For instance, adding one new branch in the county increases the amount of loans to small businesses by 0.591 percentage points. The effect is also economically significant – as it is equivalent to a 5.2% increase compared to the average changes in the amount of loans to small businesses across counties and over time. Interestingly no significant effect could be observed on the local credit market or economy after local branches are acquired by out-of-state banks.

In addition, I conduct various robustness checks including a placebo experiment and alternative measurements, and the results substantiate the validity of the empirical tests and increases confidence in the interpretation of the main finding. Overall, the evidence indicates that the accessibility of local information through labor turnover in the target market matters for banks when they are considering how to enter a new market. Their decisions could ultimately facilitate financial and economic development in the local market.

This study contributes to the literature on the role of local information for the financial industry. Petersen and Rajan (2002) show that local lenders collect information about small firms through loan contracts, and enjoy an informational advantage over more remote competitors. Empirical evidence shows that lenders also collect information about local borrowers through

other financial services such as checking account agreements, which also helps to improve lending decisions (Mester et al. 2007; Norden and Weber 2010). Bird and Knopf (2014) shows that mobility of local knowledge impedes de novo banks creation and affects wage and profitability of commercial banks. Studies show that the local information possessed by incumbent banks including their lending relationships with borrowers serves as an entry barrier for banks looking to enter the market; it also affects the competitive structure of the local banking industry (Dell'Ariccia et al. 1999; Dell'Ariccia and Marquez 2004). Without access to the local information, entrant banks are especially susceptible to the "winner's curse" problem in bank lending (Broecker 1990; Schaffer 1998). Because of their lack of information about the local market, those banks may often "win" some deals from poor quality borrowers that were previously rejected by local banks (Rajan 1992; Ogura 2006), and are more likely to experience higher loan default rates (Bofondi and Gobbi 2006). Berger and Dick (2007) show that banks that entered a market earlier, and make significant investments in building branch networks are able to gain better access to the local borrowers and depositors, thus gradually reducing the information disadvantages. The importance of locally collected information is also reflected in findings from financial institutions of other kinds and in general (e.g., Coval and Moskowitz 1999, 2001). Focusing on labor mobility as the channel for local information to flow across banks; my findings highlight the importance of local information accessibility for banks expanding into new markets. Banks choose different entry modes in response to the flexibility of the local labor market.

This paper is related to the studies on the interplay between law, finance, and growth. It has long been argued that the development of financial systems contributes to economic growth (e.g., Schumpeter 1969; McKinnon 1973). A large amount of recent research strengthened this view and documents supporting evidence at the country level (King and Levine 1993; Levine and Zervos 1998), as well as at the firm level (Demirgüç-Kunt and Maksimovic 1998; Guiso et al. 2004; Allen et al. 2005). Noticeably, many studies use the U.S. interstate banking reforms to identify the causality among law, finance, and economic growth. In general, studies document that bank expansion after the law was implemented increased local bank competition and financial integration, which ultimately led to the local economic growth (Jayaratne and Strahan 1996; Huang 2008). In particular, credit competition improves bank services (Dick 2006), expands credit availability and lowers interest rates (Zarutskie 2006; Rice and Strahan 2010), limits the access to credit for underperforming firms (Bertrand et al. 2007), and stimulates entrepreneurship and

corporate innovation (Black and Strahan 2002; Amore et al. 2013; Chava et al 2013). This paper contributes to this literature by highlighting the economic consequences associated with different modes of bank entry, which I argue are affected by the changes in the levels of labor law enforceability in the target market. This paper also adds new evidence to the classical law and finance literature. Previous studies primarily focus on the role of the enforcement of legal systems in the area of investor protection and show that strong law enforcement, which provides the best legal protections of the investors, also facilitates financial market development (La Porta et al. 2001). By linking the development in the banking sector to law enforcement in the area of labor competition, I show that the flexible labor law enforcement leads to bank entries through establishing branches and facilitating local economic development.

The rest of the paper is organized as follows. In Section 1, I discuss the institutional background, data and measurement for the main variables. The empirical strategy and results are reported in Section 2. The findings from robustness tests and further checks are discussed in Section 3. Concluding remarks are given in Section 4.

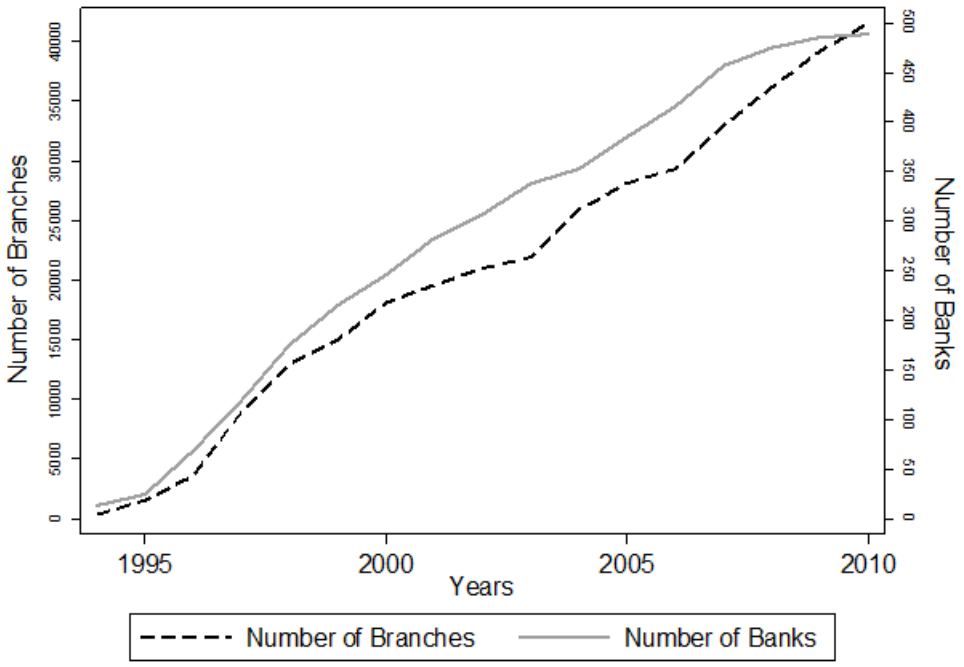
4.2 Institutional Background, Data and the Measurement

4.2.1 The Modes of U.S. Banks' Interstate Expansions

The unique history and regulation of the U.S. banking industry has created a relatively fragmented banking market with currently around 6,000 independent institutions that mainly operate in one specific geographic region. Prior to 1970s, interstate bank branching and acquisition were largely prohibited. The McFadden Act of 1927 together with the Douglas Amendment to the Bank Holding Companies of 1956 effectively forbade bank expansion either in the form of establishing new branches or acquiring banks across state lines. Even intrastate branching was highly constrained as many states maintained a unit banking system, which only allowed banks to have one full-service office.

The process of bank deregulation in the U.S. started around 1970 when many states started to abandon the unit banking system and allowed for bank expansion within state borders. The passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act (IBBEA) in 1994 not only has removed any restrictions left on interstate acquisitions, but also for the permitted banks to establish branches across state borders. The number of out-of-state branches increased dramatically from 308 at the end of 1994 after enactment of IBBEA to 43,201 in June 2013.

Figure 4.1 The Number of Interstate Branches Operated by FDIC-insured Commercial Banks during 1994-2010

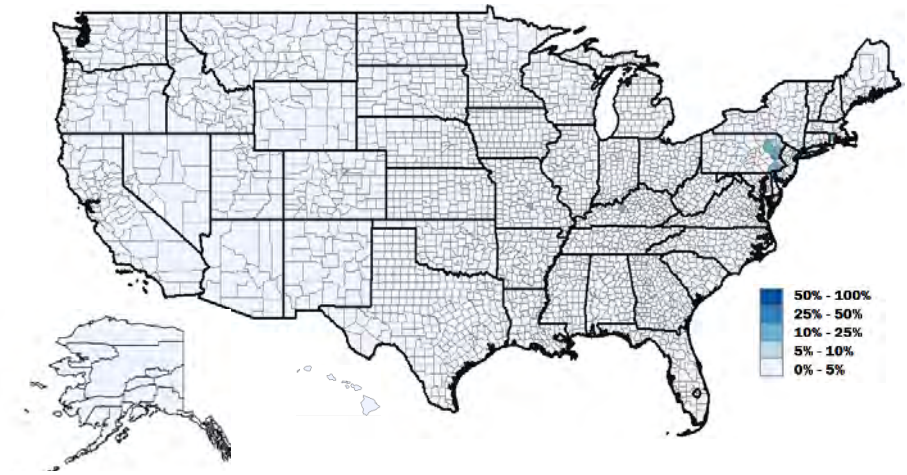


Figures 4.1 and 4.2 show the interstate bank expansion after the enactment of IBBEA. Interstate branching has become increasingly important over the past two decades. Branches owned by out-of-state banks outnumber those of in-state banks in many states (e.g., 61.4% in Michigan, 63.1% in California, and 86.5% in Arizona in June 2013).

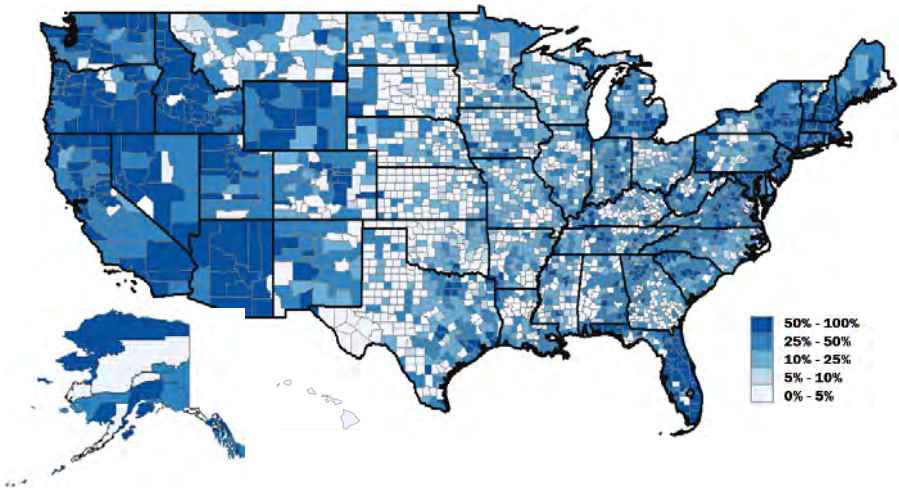
I collect data on U.S. commercial banks' interstate expansion activity after the enactment of IBBEA, and construct measures for bank's entry modes. The data are for the period from 1994 to 2010. Using the summary of deposit data from the Federal Deposit Insurance Company (FDIC), I obtain information on the establishment of bank branches, as well as branches' ownership changes due to M&As. Based on the information, I aggregate the total number of out-of-state bank entries through new branch establishment and incumbent branch acquisition at the county and year level. I calculate the ratio of total bank entries through established branches in each county for each year over time.

Figure 4.2 The Interstate Branching Expansion of the U.S. Banking Industry

Panel A. Interstate Branches as a Percentage of Total Offices, Dec. 1994



Panel B. Interstate Branches as a Percentage of Total Offices, Dec. 2010



County is often considered as a proxy for the local market in banking studies (e.g., Berger et al. 1999; Huang 2008), as valuable local information and bank-firm relationship can only be preserved at a short distance, as suggested by Petersen and Rajan (2002). Also a county-level study minimizes the potential endogeneity problem in this case as the change in state legal enforcement is less likely to be driven by the economic situation in a particular county (Huang 2008).

I also zoom in all events when a bank enters an out-of-state market and analyze the mode of banks' interstate expansion decision at the commercial bank level. I construct a dummy variable equal to one if the bank establishes a new branch and zero if it acquires a local incumbent branch. I collect data from the FDIC Call Report to capture bank characteristics such as bank age, size, liquidity, profitability, and capitalization ratio. In addition, I consider the geographic distance between the target state and the home state where the bank is headquartered as a proxy for the entrant bank's familiarity with the target market.[1] My final dataset includes information on 59,270 events of 698 out-of-state bank entries into 2,309 counties across U.S. from 1994 to 2010. I exclude Delaware as the target market from the analysis since its unique tax regime may influence the local development of the financial industry and outside banks' entry mode.

4.2.2 The Enforceability of Non-Compete Covenants

A non-compete covenant is an employment contract in which an employee pledges not to work for a competitive firm for a designated period of time after resigning or being dismissed. Firms spend time and resources to accumulate knowledge, develop a product, and compile a client base. The non-compete covenants are designed to protect such corporate knowledge and confidential information that could otherwise be taken away as employees take jobs with competing firms (Franco and Mitchell 2008). The enforcement of non-compete contracts restrains labor market flexibility and cross-firm information flow (Fallick et al. 2006; Marx et al. 2009). Non-compete contracts are part of standard employment packages for executives, R&D staff, salespeople, and loan officers, among others, who have access to proprietary firm-specific information. Survey evidence suggests that around 90% of these employees have to sign non-compete agreements (Leonard 2001; Kaplan and Stromberg 2003). Recent study also document that the enforcement of non-compete covenant impedes the creation of new banks, and also affects banks' labor costs and

[1] I extract spatial information on the distance between states from the package developed by Scott Merryman. Source: http://econpapers.repec.org/software/bocbocode/s448405.htm.

profitability (Bird and Knopf 2014). Enforcement of these agreements helps incumbent banks preserve their informational advantage over new competitors (Kramer 1999). In the U.S., firms are free to write any sort of employment contract, but the enforcement of non-compete covenants is left to the states. The nature of what a firm can claim as a legitimate protectable interest depends on the state jurisdiction, and there is great variation across states and over time in the enforcement of the non-compete covenants.

Following Garmaise (2011), I capture the cross-state variations in the labor market flexibility using the noncompetition enforcement index (*NC_score*). This index measures the extent to which the covenant not to compete is enforced at the state level, and it captures several important dimensions of the enforcement documented in Malsberger (2004)[2]. The *NC_score* ranges from zero in California where non-compete covenants are not enforceable to nine in Florida where the noncompetition agreement is the most strictly enforced. As the *NC_score* only covers a period from 1994-2004, I collect additional information to identify changes in non-compete enforcements in each state over the whole sample period. I am able to identify five shocks to the non-compete enforcement during the post deregulation period of 1994-2010 based on the analyses from the legal and management literature (Garmaise 2011; Malsberger 2011; Marx and Fleming 2011). To be specific, Idaho (Id. SB1393) strengthened the non-compete law by extending firms' ability to enforce the non-compete in 2008, while New York (Ny. S02393) and Oregon (Or. SB248) have relaxed the enforcement of the non-compete covenants. The enforcement of non-compete covenants was radically relaxed in Louisiana (La. R.S. 23:921) in 2001 after the supreme court's ruling of *SWAT 24 Shreveport Bossier, Inc. v. Bond, 808 So. 2d 294*, and state legislation reversed the change in 2003.

The states' changes in the enforcement of non-compete covenants serve as natural experiments of shocks to local labor market flexibility. They are largely exogenous to the decision-making process of out-of-state banks on how to expand into a local market. The changes in the non-compete enforcement due to a court's judicial decision is largely an idiosyncratic function of the particular case and the character of the justices. Also, there is no obvious reason to believe that the primary intention for state legislation to change non-compete enforcement is to influence the way in which potential out-of-state banks choose to enter a local market. In the empirical setup, I also control the local market condition, political climate, and banking market

[2] For a complete overview of the construction of the index of enforcement of the non-compete covenants, see Malsberger (2004) and Garmaise (2011).

structure over time to further mitigate the possible endogeneity concerns.

4.2.3 Economic Conditions and Political Climate

In addition to have the legal enforcement of non-compete covenants as the main explanatory variable to estimate bank's entry mode, I also control for other variables such as local market conditions and political climate. Extracting data from various sources such as the U.S. Census Bureau, Census County Business Pattern, Bureau of Economic Analysis, and Bureau of Labor Statistics, I construct variables such as market size, growth perspective, and credit market conditions to measure local market conditions. To proxy for the political climate in that state in a particular year, I manually collected archival data from website of the U.S. House of Representatives and calculate the percentage of the House of Representatives that are Democratic Party members for each state.

To measure the economic implication of different modes of bank entries, I look at local bank competition, small business lending and economic activity. I measure the changes in the competitive structure of the local credit market using the Herfindahl index of local branch deposits concentration calculated at the county level. I collect local small business lending data from the Community Recovery Act database from the Federal Financial Institutions Examination Council (FFIEC). I calculate the yearly change in the total volume, as well as the amount of small business lending in the target counties over time. I calculate the yearly change in the local per capital income growth, number of establishments in the private sector, and unemployment rate to proxy for changes in the local economic activity after banks entries through branching and M&As. The final dataset includes 9,553 county-year observations of the U.S. from 1994 to 2010. Table 4.1 provides an overview of the main variables, as well as the summary statistics.

Table 4.1 Definitions of the Main Variables and Summary Statistics

Variable	Definition	Mean	Median	S.D.
Characteristics of the local market (Sources: U.S. Bureau of Economic Analysis, County Business Patterns database, Bureau of Labor Statistics, FDIC Summary of Deposit, American Bankruptcy Institute, House of Representatives)				
Local market size	Total number of establishment of the target state	190177.7	143949	164619.1
Local bank competition	Herfindahl Index calculated based on the deposit size of the local banks of the target state	0.071	0.059	0.059
Local per capita income	Per capita income of the target state	28987.16	28773	5064.2
Average size of local firms	Average nr of employees a firm has in the target state	15.434	15.859	1.84
personal income growth rate	Percentage change in the personal income of the target county	4.038	3.97	5.367
%Δ local unemployment rate	Percentage change in the local unemployment rate of the target county	4.579	0	21.86
Total population	Total population of the target county	92220.41	25039	301093.8
Political balance	Percentage of U.S. House of Representatives that are members of Democratic Party for a state and in a given year	42.67	44.44	23.97
Bank entry variables (Sources: FDIC Summary of Deposit, Scott Merryman (2005))				
Nr of bank entries via branching	the number of out-of-state bank entries in the target county through establishing new branches	1.067	0	2.971
Nr of bank entries via M&A	the number of out-of-state banks entries in the target county through acquiring existing local branches	4.863	2	11.013
Home-target distance	The geographical distance between bank home state and the target state	763.054	543	602.033
Bank characteristics (Source: FDIC Call report)				
Bank age	Years since the date the bank or the oldest bank owned by the bank holding company was established	101.14	100	38.972
Bank size	Bank total asset	1.64E+08	7.26E+07	2.30E+08
Bank liquidity	The ratio of cash to bank total deposit	0.079	0.074	0.042
Bank ROA	The ratio of annualized net income to total asset	0.008	0.008	0.005
Bank capital ratio	The ratio of the sum of bank tier1and tier2 capital to total assets	0.116	0.111	0.062

Table 4.1 – continued from the previous page

Local labor market flexibility (Sources: Garmaise (2011); and Census QWI)				
NC_score	The intensity of non-compete enforcement	4.383	5	1.801
Local job turnover in the commercial banking industry	Yearly average of $\frac{\text{number of hires in quarter } t + \text{number of separations in quarter } t+1}{\text{the full-quarter employment}}$ in the industry of "credit intermediation and related activity" (with the first three digits of NAICs codes of 522) of the target county	0.04	0.034	0.036
Small business lending data (Source: FFIEC CRA database)				
%Δ volume of SME loans	Percentage change in the volume of SME loans – loans whose original amounts are $1 million or less and that were reported on the institution's Call Report or TFR as either "Loans secured by nonfarm or nonresidential real estate" or "Commercial and industrial loans."	0.188	0.05	0.715
%Δ number of SME loans	Percentage change in the number of SME loans (definition see above)	0.188	0.104	0.393

4.3 Empirical Results

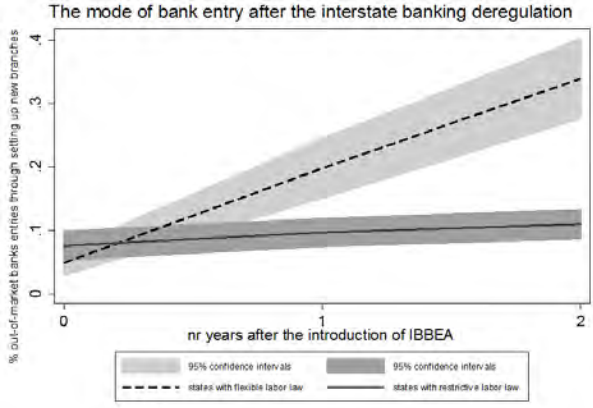
4.3.1 Cross-Sectional Analysis of Banks Entry Mode after IBBEA

As shown in the previous section, there is a wide dispersion of enforcement of non-compete laws across states. Depending on the accessibility to the local information, out-of-state banks choose one of the two ways to penetrate the market: establish new branches or M&As. As a first step, I look into the cross-sectional heterogeneity in the primary banks entry mode across the U.S. after the IBBEA and link it to various levels of legal enforcement of non-compete covenants across states prior to the passage of IBBEA. In Figure 4.3, I compare the relative importance of bank entries through establishing new branching in states with flexible labor markets versus in states with less flexible labor markets. I use the intensity of enforcement of non-compete covenants (*NC_score*) and the job turnover in the local commercial banking industry to proxy for the local labor market flexibility. I find that a relatively higher percentage of out-of-state banks enter new markets by establishing new branches in places with relaxed enforcement of non-compete covenants and higher labor turnover in the commercial banking industry, after the interstate banking deregulation took place.

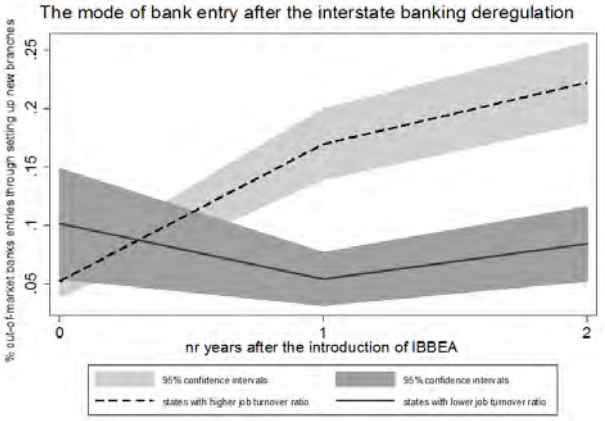
Figure 4.3 Bank Entry Modes and Labor Market Flexibility

This figure shows the relationship between bank entry modes and the local market flexibility during the first three years after banking deregulation. The broken line shows the average percentage of bank entries through establishing branches bank entries in states with flexible labor laws, and the solid line shows the mean percentage of out-of-market banks entries through establishing new branches in states with restrictive labor laws. And the grey shaded areas illustrate the lower and upper bounds measured at 95% confidence interval. In Panel A, the flexibility/restrictive labor market states are defined using the median split of the *NC_score* prior to the IBBEA; and in Panel B, the two groups of states are defined using the mean split of *local job turnover in the commercial banking industry* prior to IBBEA.

Panel A. Labor Market Flexibility measured by *NC_score*



Panel B: Labor Market Flexibility measured by the Average Job Turnover Ratio in the Commercial Banking Industry



I continue to investigate the link between the heterogeneity of bank entry mode and variation in local legal enforcement of non-compete covenants in a regression setting. I begin with calculating the percentage of out-of-state banks that enter each county in the U.S. through branch establishment during the first one to three years after IBBEA implementation in the state where the county locates. I regress the percentage of bank entries via branching on the non-compete enforcement while controlling for the local market conditions such as market size, bank concentration, growth perspectives, etc. as well as political climate prior to the enactment of the IBBEA in that state. A cross-sectional comparison is suitable in this case as the *NC_score* measure varies largely across states but remains largely stable over the years it convers. The results are shown in Table 4.2.

Table 4.2 Labor Market Flexibility and Bank Entry Modes – County- level Analysis

This table presents estimated coefficients from cross-sectional regressions that relate banks entry mode to local labor market flexibility. The dependent variable is the number of out-of-state banks entries through establishing new branches as a percentage of total number of out-of-state bank entries (branching plus M&A) in a county. The labor market flexibility is measured using *NC_score*, which reflects the intensity of non-compete enforcement prior to the IBBEA. The analyses are conducted using yearly data. In models (1), (2), and (3), the dependent variables are measured using all out-of-state bank entries over the period of one year, two years, and three years after the implementation of IBBEA, respectively. I control for lagged state and county characteristics, and use robust standard errors. *t*-statistics are shown in parentheses. *, **, and *** denote an estimate that is statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dep. Var.: **Ratio of bank entries through branching**	In the first year after IBBEA	In the first two years after IBBEA	In the first three years after IBBEA
Labor market flexibility			
NC_score prior to the enactment of IBBEA	-0.017**	-0.022***	-0.006**
	(-2.26)	(-4.86)	(-2.05)

Table 4.2 – continued from the previous page

State controls			
Local market size	-0.000	-0.000**	-0.000
	(-0.94)	(-2.38)	(-1.34)
Local bank competition	0.222	0.246	0.646***
	(0.88)	(1.28)	(4.21)
Local per capita income	0.000***	0.000***	0.000***
	(5.48)	(5.62)	(3.71)
Average size of local firms	-0.003	-0.004	0.01***
	(-0.42)	(-0.64)	(2.86)
Political Balance	0.098	0.088*	-0.003
	(1.56)	(1.75)	(-0.11)
County controls			
Personal income growth rate	0.002	-0.001	-0.001
	(0.62)	(-0.54)	(-1.27)
Total population	0.000	0.000	0.000*
	(0.7)	(1.38)	(1.86)
Adj. R^2	0.105	0.075	0.036
Number of obs.	744	1055	1463

Results from the cross-sectional analysis show a negative relationship between the intensity of non-compete enforcement and the ratio of out-of-state banks entering through establishing new branches after banking deregulation. This means that where the local non-compete law is more restrictive, fewer out-of-state banks will enter the market through branching. The coefficients on the *NC_score* remain consistently negative in columns (1) to (3), regardless of the time window. This indicates that the cross-state difference in the legal enforcement of non-compete covenants continues to affect the entry modes of out-of-state banks into local markets even after the interstate banking reform. The result is robust after controlling for local political, economic, and market situations, which might influence both the non-compete enforcement and banks entry mode. In addition, the result is also economically significant. During the first year after bank deregulation, moving to a county with one point higher in the non-compete enforcement intensity leads to a 1.7 percentage point decrease in the ratio of bank entries through establishing branches. This value is equivalent to a 13.5% decrease compared to the sample mean.

I then use logistic regression to investigate out-of-state banks' entry mode decision each event they enters a local market, I test whether the choice between branching and M&A entry is affected by the intensity of non-compete enforcement. The bank-level entry mode dummy variable equals one if an out-of-state bank enters the local market via setting up branches and zero if this entry is completed via a M&A. I regress the entry mode dummy on the local

NC_score. I control for county and bank characteristics prior to the deregulation of interstate branching, as well as geographical distance between the expanding bank's home state and target state. I include the year fixed effects to control for the unobservable shocks that affect all counties in certain years.

Table 4.3 Labor Market Flexibility and Bank Entry Modes –Bank-level Analysis

This table presents estimated coefficients from logistic regressions that relate banks entry mode to local labor market flexibility. Conditional upon each time of an out-of-state bank's entry, the dependent variable of bank entry dummy equals one if the out-of-state bank enters via establishing branches, and it is zero if the bank enters through M&A with a local bank branch. The labor market flexibility is measured using *NC_score*, which reflects the intensity of non-compete enforcement prior to the IBBEA. The analyses are conducted using yearly data. In models (1), (2), and (3), I conduct logistic regression for all out-of-state bank entries over the period of one year, two years, and three years after the implementation of IBBEA, respectively. I control for lagged state and bank characteristics, as well as year fixed effects. Marginal effects with associated significance for the *NC_score* variable are reported in square brackets. Robust standard errors are clustered at bank level and at state level. *t*-statistics are shown in parentheses. *, **, and *** denote an estimate that is statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dep. Var.: **Bank entry mode dummy**	Banks entry mode in the first year after IBBEA	Banks entry mode in the first three years after IBBEA	Banks entry mode in the first three years after IBBEA
Labor market flexibility			
NC_score prior to the enactment of IBBEA	-0.318**	-0.157***	-0.039
	(-2.36)	(-3.24)	(-0.78)
	[-0.020**]	[-0.013***]	[-0.003]
State controls			
Local market size	0.000	0.000	0.000
	(0.8)	(0.46)	(0.03)
Local bank competition	10.355***	12.884***	10.351***
	(3.08)	(3.99)	(2.83)
Local per capita income	0.000***	0.000***	0.000**
	(3.44)	(4.47)	(2.1)
Average size of local firms	0.091	-0.031	0.003
	(0.73)	(-0.64)	(0.05)
Political balance	-0.988	-0.788	-1.071
	(-0.68)	(-0.83)	(-1.38)
Home-target distance	0.000	0.000	0.000
	(0.16)	(0.6)	(0.75)
Bank controls			
Bank age	0.032**	0.012	0.007
	(2.14)	(0.99)	(0.67)
Bank size	0.000	-0.000	0.000
	(0.22)	(-1.52)	(0.32)
Bank liquidity	-3.579	-1.757	-9.498
	(-0.37)	(-0.34)	(-1.56)
Bank ROA	-326.479*	-291.563**	-176.452
	(-1.7)	(-2.06)	(-1.5)
Bank capital ratio	1.097	1.676	10.747
	(0.89)	(0.23)	(1.08)
Year fixed effects	Yes	Yes	Yes
McFadden Adj. R^2	0.146	0.092	0.054
Number of obs.	4684		

The results in Table 4.3 are consistent with the findings from the county-level analysis (Table 4.2). I find that more restrictive local enforcement of non-compete covenants decreases the likelihood for out-of-state banks to establish new branches as compared to acquiring local branches. The effect appears economically significant; the unconditional probability of bank's entry through establishing branching is 7.7%, the marginal effect of -0.02 for bank entry mode in the first year after IBBEA indicates that a one-point increase in the intensity of non-compete enforcement decreases the probability of out-of-banks to enter through establishing a branch by 26% (0.02/0.077). In columns 2 and 3, I repeat the analysis using a longer test period after the IBBEA. The sign of the coefficients and the marginal effects are consistent with the results using one year. Overall, the results of both the county-level and bank-level analyses indicate that the intensity of non-compete enforcement is an important factor that affect out-of-state banks' decision of how to enter a local market right after interstate banking deregulation.

4.3.2 Difference-in-Differences Analysis of Bank Entry Mode

The cross-sectional regression shows that after IBBEA, out-of-state banks use different modes to enter local markets. Their choice depends upon the intensity of non-compete enforcement. I use a difference-in-differences (DD) approach to examine whether there is a causal relationship between local labor market flexibility and banks' entry mode. I identify changes in the intensity of state legal enforcement of non-compete covenants over the sample period from 1994 to 2010. I construct a DD indicator *relaxation of non-compete enforcement* to capture those changes. In the three cases in which the non-compete enforcement becomes more relaxed, I set the indicator equal to zero for all years preceding the year that the non-compete enforcement was relaxed, and one afterwards. And I set the indicator value reversely in the other two cases in which states strengthened the non-compete enforcement (i.e., set the indicator to one for all years preceding the year that law enforcement was strengthened and zero afterwards). The model specification is:

(1) $$Ratio\ of\ bank\ entries\ through\ branching_{c,t} = \alpha + \beta_1 Relaxation\ of\ noncompete\ enforcement_{s,t-1} + \beta_2 Controls_{s,c,t-1} + \omega_c + \mu_t + \varepsilon_{ct}.$$

Model (1) tests the impact of relaxation of non-compete enforcement on bank entry mode at the target county and year level, where *c* represents county, *s* represents the state, and *t* represents year. The ratio of bank entries through branching is the measure of county-level bank entry mode, relaxation of non-compete enforcement is the DD indicator, and β_1 is the DD estimate, which

captures the effects of the relaxation of the non-compete enforcement on the modes of entry by out-of-state banks. I control for variables that capture the local economic, political, and market characteristics. For instance, I control for the wealth level and business condition of the local market using the local per capita income; local competitive landscape of banking industry using Herfindahl index of banks' deposit size; and the importance of smaller-size firms using the average number of employees hired in local firms. I control the state political climate using the fraction of Democratic congressional members who represent their states in the U.S. House of Representatives. I also include total population and personal income growth rate to capture the size and growth perspectives of the local economy. Including those variables mitigates the concern that local business conditions and political climate may affect both changes in the non-compete enforcement and out-of-state banks entry mode decision. In addition, I include county fixed effect ω_i and year fixed effect μ_t to control for both time-invariant unobservable county factors and nation-wide shocks that happened during a particular year that could possibly affect both changes in the non-compete enforcement and banks entry mode. I cluster the standard error at the state level to address the concern that the residuals might be serially correlated within a state, as well as any serial correlation induced by the small variation in the DD indicator (Bertrand et al. 2004).

Table 4.4 Relaxation of Non-compete Enforcement and Bank Entry Mode

This table presents estimated coefficients from difference-in-differences (DD) analyses of the impact of the change in non-compete enforcement on the mode of out-of-state bank entry into counties after the commencement of IBBEA using OLS regressions. The dependent variable is the number of out-of-state banks entries through establishing new branches as a percentage of total number of out-of-state bank entries (branching plus M&A) in a county. The coefficient on *Relaxation of non-compete enforcement* captures the DD estimate of the impact of the relaxation of non-compete enforcement on out-of-state banks' interstate entry mode. Model (1) is conducted using all counties in the U.S. Model (2) is conducted using only contiguous counties on the border of law-changed states and neighboring states in order to control for the unobserved variable bias. I control for lagged state and county characteristics, county fixed effects, and year fixed effects in both regressions and also contiguous county paired fixed effects in model (2). The analyses are conducted using yearly data covering the period from January 1994 to December 2010. Robust standard errors are clustered at the state level. *t*-statistics are shown in parentheses. *, **, and *** denote an estimate that is statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)
Dep. Var.: **Ratio of bank entries through branching**	All counties in the U.S.	Contiguous counties on the border of the law-change states and neighboring states
Changes in labor law		
Relaxation of non-compete enforcement$_{t-1}$	0.373*** (3.63)	0.323*** (2.9)
State controls		
Local market size$_{t-1}$	-0.000* (-1.71)	-0.000 (-1.44)

Table 4.4 – continued from the previous page

Local bank competition$_{t-1}$	0.635*	0.579
	(1.67)	(1.00)
Local per capita income$_{t-1}$	-0.000*	-0.000
	(-1.94)	(-0.99)
Average size of local firms$_{t-1}$	0.112***	-0.037
	(2.54)	(-0.4)
Political Balance$_{t-1}$	0.098	0.327**
	(1.11)	(2.09)
County controls		
Personal income growth rate$_{t-1}$	0.000	0.001
	(0.03)	(0.11)
Total population$_{t-1}$	0.000	0.000
	(0.29)	(0.41)
County fixed effects	yes	yes
Neighboring county paired fixed effects	no	yes
Year fixed effects	yes	yes
Within-sample R^2	0.091	0.317
Number of counties	2309	129
Number of obs.	9553	1407

Column 1 of Table 4.4 reports the DD estimates of the impact of changes in the non-compete enforcement on banks' entry modes. The baseline regression result of column 1 indicates that the relaxation of non-compete enforcement on average leads to 37.3 percentage point increase in the proportion of banks entering a target market by establishing branches. Considering the average ratio of bank entries through establishing branches (25.3%), the economic significance is sizable.

Next, I repeat the analysis using a logit regression model to investigate the impact of changes in non-compete enforcement on the decision of banks entry mode at the bank level. The regression is conducted using observations for each bank entry. The dependent variable *Bank entry mode* is a dummy variable that equals one if an entrant bank set up a branch in the target market and zero if it acquires a local branch instead. The regression model is:

$$(2) \qquad Bank\ entry\ mode_{b,c,t} = \alpha + \beta_1 Relaxation\ of\ noncompete\ enforcement_{s,t-1} + \beta_2 Controls_{b,s,c,t-1} + \mu_t + \varepsilon_{bct}$$

Similar to the Model (1), I use the relaxation of the non-compete enforcement as the DD indicator for the local information flow. The coefficient of β_1 indicates the impact of the change in the labor law on bank's entry mode decision. I expect to observe a shift in the preference of banks' entry mode from acquiring existing incumbent branches to establishing new branches after non-compete enforcement was relaxed. To control for the heterogeneity in the local market and the entry banks, I include control variables at the county, state, and bank level. I also control for the geographic distance between the entry bank's headquarters and the target state. The further the

distance, the less local information the entry bank would have prior to the entry, which makes a M&A likely. I include time fixed effects to control for the shocks that happen to both control and treatment groups in the same year. And I cluster the standard error at both the state and bank level to account for the correlations in the error terms. The result is reported in column 1 of Table 4.5. The findings are consistent with the result (Table 4.4, column 1) using the county-level bank entry mode analysis. The relaxation of non-compete enforcement leads to an increase in the probability of bank entries through branching. Considering that the unconditional probability of bank entry via branching is 0.177, the marginal effect of 0.121 for bank entry mode indicates the relaxation of non-compete enforcement results in a 68.36% increase in the likelihood that out-of-state banks will enter new markets by establishing new branches (0.121/0.177).

To further refine the identification strategy and mitigate concerns about unobserved heterogeneity, I repeat the DD analysis using a sample that consists only of contiguous counties lying on the border of states that experience changes in the non-compete enforcement. Contiguous counties are geographically close, so they are likely to subject to the same unobserved factors, such as trends in economic development or shocks to the local economy (e.g., resource discovery, natural hazards) (Holmes 1998; Huang 2008). The model specification is:

(3) $$Ratio\ of\ bank\ entries\ through\ branching_{c,t} = \alpha + \beta_1 \mathrm{R}elaxation\ of\ noncompetes_{s,t-1} + \beta_2 Controls_{s,c,t-1} + \omega_c + \omega_{cc} + \mu_t + \varepsilon_{ccct}$$

The test is similar to the regression discontinuity design by Black (1999) and the major difference between Model (3) and Model (1) is that I now include the contiguous county fixed effects, ω_{cc}, that control for the unobserved linear time trend and common shocks that happened to contiguous counties that might influence out-of-state banks' entry mode. Column 2 of Table 4.4 reports the within-county level response of the ratio of bank entry to the relaxation of non-compete enforcement. The result shows that the percentage of bank entries through branching has significantly risen in counties from states that experience a relaxation of non-compete enforcement. The relaxation of non-compete enforcement on average results in 32.3 percentage point increase in the proportion of banks entering a target market by establishing branches. The economic magnitude of the impact is substantial and comparable to the DD estimates from the full sample regression. This shows that the causal relationship between the relaxation of local non-compete enforcement and the increase of the bank entries through branching remains robust

after taking into account the unobservable trends and shocks to the target market. A similar pattern is documented by applying a bank-level logistic regression on bank entries into contiguous counties (Table 4.5, column 2). The results again confirm the positive impact of labor market flexibility on bank entries into new markets by establishing new branches.

Table 4.5 Relaxation of Non-compete Enforcement and Bank Entry Mode – Bank-level Analysis

This table presents estimated coefficients from difference-in-differences (DD) analyses of the impact of the change in non-compete enforcement on the mode of out-of-state bank entry after the commencement of IBBEA to year 2010 using logistic regressions. Conditional on one out-of-state bank's entry, the dependent variable of bank entry dummy equals one if the out-of-state bank enters via establishing branches, and it is zero if the bank enters through a M&A with a local bank branch. The coefficient on *Relaxation of non-compete enforcement* captures the DD estimate of the impact of the relaxation of the non-compete enforcement on out-of-state banks' interstate entry mode. Model (1) is conducted using all counties in the U.S. Model (2) is conducted using only contiguous counties on the border of law-changed states and neighboring states in order to control for the unobserved variable bias. I control for lagged state and county characteristics, as well as year fixed effects in both regressions. Marginal effects with associated significance for law change in the diff-in-diff variable are reported in square brackets. Robust standard errors are clustered at the bank level and at state level. *t*-statistics are shown in parentheses. *, **, and *** denote an estimate that is statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)
Dep. Var.: **Bank entry mode dummy**	All counties in the U.S.	Contiguous counties on the border of the law-change states and neighboring states
Changes in labor law		
Relaxation of non-compete enforcement$_{t-1}$	0.893*	0.612***
	(1.64)	(2.91)
	[0.121***]	[0.069*]
State controls		
Local market size $_{t-1}$	0.000*	-0.000
	(1.89)	(-1.60)
Local bank competition$_{t-1}$	2.394**	10.051***
	(1.96)	(5.48)
Local per capita income$_{t-1}$	0.000	0.000
	(0.4)	(0.48)
Average size of local firms$_{t-1}$	0.075	-0.000
	(1.27)	(0.00)
Political Balance$_{t-1}$	-0.486*	0.794*
	(-1.74)	(1.88)
Home-target distance$_{t-1}$	0.000	-0.000
	(1.22)	(-0.59)
Bank controls		
Bank age$_{t-1}$	-0.005	-0.009
	(-1.52)	(-1.05)
Bank size$_{t-1}$	-0.000	-0.000*
	(-0.73)	(-1.92)
Bank liquidity$_{t-1}$	-0.293	3.12
	(-0.85)	(0.54)
Bank ROA$_{t-1}$	37.506	-43.71
	(0.83)	(-0.89)
Bank capital ratio$_{t-1}$	3.038	2.65
	(0.89)	(1.05)
Year fixed effects	Yes	Yes
McFadden Adj. R^2	0.076	0.182
Number of obs.	59270	7435

4.3.3 Economic Implications

Banks choose different modes to expand across state borders depending on the accessibility of local information. In this section, I investigate the economic repercussions on local bank competition, credit availability, and economic activity after banks enter new markets. Dick (2006), Zarutskie (2006) and Rice and Strahan (2010) document the increase in bank competition following the interstate branching deregulation. The deregulation benefited local clients by improving the service level of banks, along with the credit supply. I take a further step and compare the differences in how banking competition changes after out-of-banks enter new markets by establishing new branches and through acquiring local branches. I argue the two modes of entry have different effects on the competitive landscape of the local credit market. I regress the changes in local credit market competition on different modes of bank entries in the preceding year of bank entries. The model specification is:

$$(4)\quad \Delta credit\ market\ competition_{c,t} = \alpha + \beta_1 Nr\ of\ bank\ entries\ through\ branching_{c,t-1} + \beta_2 Nr\ of\ M\&A\ entries_{c,t-1} + \beta_3 Controls_{s,c,t-1} + \omega_c + \mu_t + \varepsilon_{ct}$$

where β_1 and β_2 capture the impact of two different bank entry modes on the competitive landscape of the local banking market. I control for the local market conditions at the state and county level, and include county and year fixed effects ω_c and μ_t, respectively, to mitigate the omitted variable bias. The results reported in column 1 of Table 4.6 show that the Herfindahl index decreases, which means an increase in local banking market competition after bank entries through establishing branches; there is no change in the competitive structure after bank entries via M&As.

Table 4.6 Economic Implications of Bank Entries Modes

This table presents estimated coefficients from panel data regressions of the impact of different modes of interstate bank entries on the local bank credit market and economy. I measure the dependent variables using the average percentage change in the small business credit market and local economy one year following bank entries. Dependent variables in model (1) capture the changes in the bank competition of local market, dependents in models (2)-(3) capture the changes in the local small business lending, and dependents in models (4)-(6) capture the changes on the local economic activity. The analyses are conducted using yearly data covering the period from January 1994 to December 2010. I control for lagged state and county characteristics, county fixed effects, and year fixed effects. Robust standard errors are clustered at the state level. *t*-statistics are shown in parentheses. *, **, and *** denote an estimate that is statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.:	%Δ Herfindahl index of bank competition	%Δ volume of small business loans	%Δ number of small business loans	%Δ per capita personal income	%Δ nr of establish-ment	%Δ local unemploy-ment rate
Bank entries						
Nr of bank entries via branching$_{t-1}$	-0.002**	0.591***	0.441***	0.056**	0.056***	-0.123
	(-2.26)	(4.46)	(3.32)	(2.13)	(3.72)	(-1.11)

Table 4.6 – continued from the previous page

Nr of bank entries via M&A$_{t-1}$	0.000	0.039	0.015	-0.005	-0.007**	0.046*
	(0.00)	(0.82)	(0.29)	(-0.75)	(-2.13)	(1.73)
State controls						
Local market size$_{t-1}$	-0.000	-0.000*	-0.000	-0.000	-0.000	0.000*
	(-0.81)	(-1.71)	(-1.48)	(-0.34)	(-0.83)	(1.74)
Herfindahl Index of banks$_{t-1}$	-0.025	12.082	6.4	-0.899	0.355	-25.978***
	(-1.22)	(0.75)	(0.63)	(-0.66)	(0.21)	(-2.7)
Local per capita income$_{t-1}$	-0.000	0.000	0.000	-0.000***	-0.000	0.001**
	(-1.06)	(0.06)	(0.02)	(-3.78)	(-0.87)	(2.18)
Average size of local firms$_{t-1}$	0.000	-5.789**	-5.83***	0.727*	0.946***	-1.919
	(0.1)	(-2.1)	(-3.08)	(1.83)	(4.06)	(-0.85)
Political Balance$_{t-1}$	-0.007	-16.167**	-6.553	0.113	0.24	4.491
	(-1.14)	(-2.32)	(-1.5)	(0.18)	(0.64)	(1.01)
County controls						
Personal income growth rate$_{t-1}$	0.000	-0.035	-0.017		0.025***	-0.009
	(1.3)	(-0.21)	(-0.33)		(3.92)	(-0.25)
Total population$_{t-1}$	0.000	0.000***	0.000**	-0.000***	-0.000***	-0.000
	(0.8)	(3.08)	(2.43)	(-4.07)	(-4.19)	(-0.18)
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Within-sample R^2	0.003	0.107	0.577	0.279	0.111	0.589
Number of obs.	36164	36170	36170	36174	36164	36152

Changes in the competitive structure of the local banking market after new out-of-state banks are added is likely to be reflected in the local credit market, especially in the small business lending market. Because of the severe information asymmetry problem between local opaque small businesses and banks, those firms tend to be financially constrained in the pre-deregulation era. As a result, small businesses are likely to gain better access to credit after newly established branches expand the credit base in the lending market. Focusing on the small business lending helps us to understand changes in the credit market. I follow a regression setup similar to model (4) using changes in local small business lending as the dependent variable. The model specification is:

(5) $$\Delta Small\ business\ lending_{c,t} = \alpha + \beta_1 Nr\ of\ bank\ entries\ through\ branching_{c,t-1} + \beta_2 Nr\ of\ M\&A\ entries_{c,t-1} + \beta_3 Controls_{s,c,t-1} + \omega_c + \mu_t + \varepsilon_{ct}$$

Consistent with my hypothesis, the results in column 2 of Table 4.6 indicate that newly established branches by out-of-state banks increase the credit supply to small businesses. One newly established branch contributes 0.591 percentage point of additional growth in the amount of small business lending. This is equivalent to a 5.2% increase, considering the average growth rate of local small business lending is 11.39%, which suggests the result is economically

meaningful. Next, the results show that the M&As of out-of-state banks do not have a clear impact on the local small business lending market.

In addition, I also look at the changes in the number of loans to local small businesses and the finding is consistent with the evidence observed using the loan volume. The result show that adding one new branch in the county increases the number of loans to small businesses by 0.441 percentage points, which is equivalent to a 4.9% increase compared to the average increase in the number of loans to small businesses. Also, there does not appear to be a change in number of small business loans after out-of-state bank M&As. I conclude that there is a substantial shift in the local credit market following new branches established by out-of-state banks, which benefit local clients ultimately. This is consistent with research that documents that credit competition expands credit availability for local small businesses (Petersen and Rajan 1994; Beck et al. 2004; Zarutskie 2006; Rice and Strahan 2010), whereas bank consolidation fails to have a positive impact on local small business lending growth (e.g., Berger et al. 1998).

Small businesses are the key to regional job creation and economic growth (Chodorow-Reich 2014). A bank entry through branching increases local bank competition, improves credit availability for small businesses, and should facilitate local economic activity. So I examine changes in three different aspects of the local economic activity: unemployment, number of establishments, and per capita real income growth. The model specification is:

(6) $$\Delta Local\ economic\ activities_{c,t} = \alpha + \beta_1 Nr\ of\ bank\ entries\ through\ branching_{c,t-1} + \beta_2 Nr\ of\ M\&A\ entries_{c,t-1} + \beta_3 Controls_{s,c,t-1} + \omega_c + \mu_t + \varepsilon_{ct}$$

I find that the establishment of one new bank branch results in 0.056 percentage point increase in the growth rate of per capita real income in that county in the following year, whereas branch M&A does not accelerate the income growth. Also, bank entries through establishing branches are associated with an increase in the number of establishments in private sector in the following year. The growth in the number of establishments indicates that the local economy is expanding faster after the establishment of one branch. The incremental rate of establishment expansion is 22.3% compared with the average expansion rate of the number of local establishments. This means that on average establishing one branch leads to an increase of 80 establishments in the county. I also find that bank entries through M&As slow down the increase in establishments, although the economic significance is much lower. Finally, I find that branch M&As increases the local unemployment rate, while no significant effect is observed following bank entries through

branching. This indicates that the job growth rate is lower than the destruction rate, and more people ended up unemployed. In general, my finding adds to previous research that documents that credit market development stimulates local economic activity and improves employment outcomes (Black and Strahan 2002; Amore et al. 2013; Chava et al 2013; Chodorow-Reich 2014).

Taking the evidence together, I conclude that bank entries through branching increase bank competition, improve credit availability for small business lending, and ultimately stimulates the local economy, whereas there is no clear economic impact on the local credit market after a branch acquisition.

4.4. Robustness Tests and Further Analysis

4.4.1 Alternative Measure of the Local Labor Market Flexibility

In the analysis, I use the intensity of legal enforcement of local non-compete covenants as the main measure for the level of labor market flexibility. I construct an alternative measure for labor market flexibility by directly looking at the labor mobility within the local banking industry. I collect county-level data on the local job turnover in the commercial banking industry (with the first three digits of NAICs codes of 522) from the Census Quarterly Workforce Indicators (QWI) database. I calculate the year-average turnover ratio in the local commercial banking industry in each target county after the enactment of IBBEA. There is a significant negative correlation between the new local job turnover variable and the *NC_score* at the 1% confidence level. This indicates that a restrictive non-compete enforcement restricts local inter-organizational labor mobility. The negative correlation of -0.05 indicates that the labor mobility variable contains extra information that is not completely explained by the differences in the legal enforcement.

To ensure the comparability of the test results with the earlier analysis using the *NC_score*, I apply a similar set of tests and check for the impact on the bank's entry mode aggregated at county level and at the bank level. I use the job turnover rate prior to the enactment of IBBEA to avoid a potential reverse causality problem. The result of the first test is shown in Appendix Table A4.1. Consistent with expectations, *local job turnover in the commercial banking industry* has a positive effect on the ratio of out-of-state bank entries through establishing branches. The result is also economically significant. A one percentage point increase in the local inter-organizational job mobility in the commercial banking industry increases the ratio of out-of-

state bank entries through establishing branches by 2.38 percentage points during the first year after the IBBEA. I continue to investigate banks' entry mode decision at bank level using a logistic regression. The results are shown in Appendix Table A4.2 and are consistent with the findings using *NC_score*. I find that the initial difference in local job mobility matters for the mode of bank entry. A higher initial job turnover rate increases the likelihood that out-of-state banks establish branches when entering a new market.

Compared with the *NC_score*, an important feature of the local labor mobility variable is that it varies significantly across years and counties. This makes it suitable to use the fixed effects panel data regression model. I use lagged *local job turnover in the commercial banking industry* as the main explanatory variable. I test the impact on the bank entry mode aggregated at the county and bank level. The results are reported in Appendix Tables A3 and A4, respectively. The significant positive effect of the local job turnover on banks' branching entry remains robust using the new regression specifications. The economic significance remains large: a one percentage point increase in the local job turnover ratio increases the likelihood of bank entries through branching by 7.8 percentage points (1.376%/17.7%). The result confirms my finding using the non-compete enforcement as the measure for labor market flexibility (as shown in Table 4.2 and 3).

4.4.2 Placebo Tests

I employ a difference-in-differences analysis to establish the causal relationship between the intensity of state legal enforcement of non-compete covenants and out-of-state banks' entry mode. The research design relies on the parallel trend assumption, in which the control and treatment states should share the same common trend and subject to no other idiosyncratic shock that affect one group of states and not the other at the same time. I design a placebo experiment to show that the conditions of applying the DD approach are met in this case. I create fictitious shocks in the non-compete enforcement that happened in years that are different from the actual shocks in the treatment states. I test whether fictitious shocks influence the entry mode of out-of-state banks. If the common trend assumption is true and there are no other shocks affecting either group, there should not be observable significant positive effects on the ratio of branching entry after the "placebo" shocks took place.

To mimic the real effects of the changes in the enforcement of non-compete covenants, I

create a placebo relaxation of the non-compete enforcement variable, which is a dummy variable that switches to one after the fictitious shocks to non-compete enforcement take place. I construct two placebo DD indicators that switch to one two years and three years prior to the actual shock and repeat the analysis as shown in models (1). I apply the experiment on the whole sample including all U.S. counties that experience out-of-state bank entries, as well as on the subsample that includes only contiguous counties on the borders to better control for unobservable heterogeneity. The results are reported in Appendix Tables A5. In all cases, the placebo relaxation in the non-compete enforcement fails to yield any significant positive effects on bank entries through establishing branches. Next, I repeat the placebo experiment using a logit regression model similar to Model(2) to investigate the impact of changes in non-compete enforcement on the decision of banks entry mode at the bank level. Again, the results (not reported here) confirms my findings from the county-level analysis, and the placebo relaxation of non-compete enforcement doesn't have any significant positive impact on bank mode decision. The results show that the parallel trend assumption for the DD method is not violated and the causal effect between changes in the non-compete enforcement and bank entry mode remains robust.

4.4.3 Longer-Term Economic Implications

In the previous section, I document different implications on the local credit market and economic activity after out-of-state banks enter new markets in the previous year. It is possible that it takes longer for the real effects on bank lending and the local economy to be detected. In this section, I examine the changes in the local credit market and economic activity for a longer period of time after bank entries with different modes.

I conduct panel data regression using models (4) and (5). I calculate the dependent variable of the cumulative percentage changes in the competitive structure of local banks, small business lending growth, and economic activity for a two- and three-year window after bank entry. The results are shown in Panel A and B of Appendix Tables A6. The number of branches established by out-of-state banks increases credit market competition and facilitates the growth of small business lending in the target county. The total amount of loans to small business, along with the total number of loans increased significantly after out-of-state banks established branches. These results are largely consistent with earlier findings using a one-year window shown in Table 4.6. A similar positive effect is documented on the expansion rate of the number

of local establishment.

Consistent patterns emerge when looking at the longer-period effects of out-of-state banks M&As. Combining earlier results using a one-year window, M&A entries by out-of-state banks do not change the credit market structure for local small businesses. The establishment of new branches by out-of-state banks on the other hand leads to more competition and results in additional growth in the local small business lending market, which is beneficial to the local economy.

4.5 Conclusion

Interstate deregulations in the U.S. banking industry lifted entry barriers that had protected the local inefficient banks, and ultimately led to faster economic growth. Getting access to local information is important for out-of-market banks seeking to enter new markets (Dell'Ariccia et al. 1999). In this study, I argue that the mobility of incumbent bank employees is the key channel through which out-of-state banks can get access to local information. Banks choose different modes to enter a local market depending on the labor market flexibility. I exploit the heterogeneity in the non-compete enforcement as exogenous variations in labor market flexibility and test whether it affects the way banks enter new markets — through establishment of new branches or through M&As of existing branches — in the process of interstate bank expansion.

The main result shows a positive causal relationship between the relaxation of non-compete enforcement in the local market and the likelihood for out-of-state banks to enter the market via establishing new branches. I further explore the economic implications of different modes of banks entry. I find an increase in bank competition in the local market and an improvement in credit availability for local small businesses after out-of-state banks' entries through establishing branches, but not when they enter using M&As of incumbent branches. Moreover, when banks enter a new market by establishing local branches, they facilitate local economic activity based on evidence from the growth in the number of establishments and per capita real income. I conduct multiple robustness checks and the main results remain unchanged.

Schumpeter (1912) was the first to question whether financial development could stimulate real economic progress. Along with many others, I add to the discussion by focusing on labor mobility. My findings highlight the importance of local information accessibility for banks expanding into new markets. Banks choose different modes to acquire local information in

response to the flexibility of the local labor market. The difference in entry modes has different implications for local economic activity. Bank entries via new branches - but not via acquisition of incumbent banks' branches - significantly increase bank competition, improve the availability of credit to small businesses, and facilitate economic growth. This study has important policy implications. The findings show that policymakers should pay attention to the local labor legislation in order to unleash the full benefit of financial development on real growth.

Appendix Table A4.1. County-Level Analysis of Bank Entry Modes – Alternative Measure of Labor Market Flexibility

This table presents estimated coefficients from cross-sectional regressions that relate banks entry mode to local labor market flexibility after the enactment of IBBEA. The dependent variable is the number of out-of-state banks entries through establishing new branches as a percentage of total number of out-of-state bank entries (branching plus M&A) in a county. I measure the labor market flexibility using lagged (by one year) actual local job turnover in the commercial banking industry. The analyses are conducted using yearly data. In models (1), (2), and (3), the dependent variables are measured using all out-of-state bank entries over the period of one year, two years, and three years after the implementation of IBBEA, respectively. I control for lagged state and county characteristics. I use robust standard errors. *t*-statistics are shown in parentheses. *, **, and *** denote an estimate that is statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dep. Var.: **Ratio of bank entries through branching**	in the first year after IBBEA	in the first two years after IBBEA	in the first three years after IBBEA
Labor market flexibility			
Local job turnover in the commercial banking industry prior to the enactment of IBBEA	2.378***	1.644***	1.391***
	(4.3)	(3.73)	(3.94)
State controls			
Local market size$_{t-1}$	-0.000***	-0.000***	0.000
	(-3.35)	(-2.93)	(0.45)
Local bank competition$_{t-1}$	-0.964	0.323	0.936***
	(-1.22)	(0.71)	(2.68)
Local per capita income $_{t-1}$	0.000*	0.000**	0.000
	(1.92)	(2.45)	(0.09)
Average size of local firms $_{t-1}$	-0.051**	-0.025	0.003
	(-2.11)	(-1.26)	(0.24)
Political Balance $_{t-1}$	0.726***	0.345**	0.123
	(3.54)	(2.32)	(1.54)
County controls			
Personal income growth rate $_{t-1}$	0.009	0.006	0.001
	(1.52)	(1.26)	(0.27)
Total population $_{t-1}$	0.000	0.000	0.000
	(0.27)	(0.59)	(0.31)
Adj. R^2	0.214	0.095	0.066
Number of obs.	207	316	413

Appendix Table A4.2. Bank-Level Analysis of Bank Entry Modes – Alternative Measure of Labor Market Flexibility

This table presents estimated coefficients from logistic regressions that relate banks entry mode to local labor market flexibility. The dependent variable of bank entry dummy equals one if the out-of-state bank enters the county by setting up new branches, and it is zero if the out-of-state bank enters a county through M&A with a local bank branch. I measure the labor market flexibility using the lagged (by one year) actual local job turnover in commercial banking industry. The analyses are conducted using yearly data. Models (1), (2), and (3) are conducted using all out-of-state bank entries over the period of one year, two years, and three years after the implementation of IBBEA, respectively. I control for lagged state and bank characteristics, as well year fixed effects. Marginal effects with associated significance for the job turnover variable are reported in in square brackets. Robust standard errors are clustered at bank and at state level. *t*-statistics are shown in parentheses and *, **, and *** denote an estimate that is statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dep. Var.: **Bank entry mode dummy**	in the first year after IBBEA	in the first two years after IBBEA	in the first three years after IBBEA
Labor market flexibility			
Local job turnover in the commercial banking industry $_{t-1}$	19.496*	13.073***	7.976***
	(1.84)	(2.91)	(2.7)
	[0.832*]	[1.042***]	[0.632**]
State controls			
Local market size $_{t-1}$	-0.000***	0.000	0.000
	(-2.91)	(0.37)	(0.03)
Local bank competition $_{t-1}$	-20.313	1.208	3.312
	(-1.25)	(0.3)	(0.84)
Local per capita income $_{t-1}$	0.001***	0.000	0.000**
	(2.86)	(1.4)	(2.1)
Average size of local firms $_{t-1}$	1.324**	-0.402**	-0.264*
	(2.08)	(-2.14)	(-1.92)
Political Balance $_{t-1}$	3.634	0.671	-0.113
	(1.21)	(0.72)	(-0.14)
Home-target distance $_{t-1}$	0.002	0.000	0.000
	(1.4)	(0.72)	(0.82)
Bank controls			
Bank age $_{t-1}$	0.064	0.013	0.006
	(1.59)	(0.94)	(0.57)
Bank size $_{t-1}$	0.000	-0.000	-0.000
	(0.59)	(-1.41)	(-0.02)
Bank liquidity $_{t-1}$	6.482	-5.075	-13.78
	(0.35)	(-0.73)	(-1.44)
Bank ROA $_{t-1}$	-628.64**	-332.158*	-208.469
	(-2.03)	(-1.72)	(-1.44)
Bank capital ratio $_{t-1}$	11.092	9.801	14.457
	(0.43)	(0.53)	(1.18)
Year fixed effects	Yes	Yes	Yes
McFadden Adjusted R^2	0.361	0.133	0.083
Number of obs.	1396	4822	8398

Appendix Table A4.3. County-Level Panel-Data Analysis of Bank Entry Modes – Alternative Measure of Labor Market Flexibility

This table presents estimated coefficients from panel regression that relate banks entry mode to local labor market flexibility after the enactment of IBBEA. The dependent variable is the number of out-of-state bank entries by establishing new branches as a percentage of total number of out-of-state bank entries (branching plus M&A) in a county. I measure the labor market flexibility using lagged (by one year) actual county-level job turnover in the commercial banking industry. The analyses are conducted using yearly data at county level. I control for lagged state and county characteristics, as well as county and year fixed effects. Robust standard errors are clustered at the state level. *t*-statistics are shown in parentheses and *, **, and *** denote an estimate that is statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

Dep. Var.:	**Ratio of bank entries through branching**
Labor market flexibility	
Local job turnover in the commercial banking industry $_{t-1}$	0.647**
	(2.04)
State controls	
Local market size $_{t-1}$	-0.000
	(-1.43)
Local bank competition $_{t-1}$	0.537
	(1.11)
Local per capita income $_{t-1}$	-0.000
	(-0.92)
Average size of local firms $_{t-1}$	0.112**
	(2.16)
Political Balance $_{t-1}$	0.056
	(0.57)
County controls	
Personal income growth rate $_{t-1}$	-0.001
	(-0.54)
Total population $_{t-1}$	-0.000
	(-0.98)
County fixed effects	Yes
Year fixed effects	Yes
McFadden Adj. R^2	0.091
Number of obs.	7810

Appendix Table A4.4. Bank-Level Panel-Data Analysis of Bank Entry Modes – Alternative Measure of Labor Market Flexibility

This table presents estimated coefficients from logistic regression that relate banks entry mode to local market flexibility. The dependent variable of bank entry dummy equals one if the out-of-state bank enters the county by setting up branches, and it is zero if the out-of-state bank enters a county through M&A with a local bank branch. I measure the labor market flexibility using the lagged (by one year) actual local job turnover in the commercial banking industry. The analyses are conducted using yearly data at the commercial bank level. I control for lagged state and bank characteristics, as well as year fixed effects. Marginal effects with associated significance for the local job turnover variable are reported in square brackets. Robust standard errors are clustered at the bank and state levels. *t*-statistics are shown in parentheses. *, **, and *** denote an estimate that is statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

Dep. Var.:	**Bank entry mode dummy**
Labor market flexibility	
Local job turnover in the commercial banking industry $_{t-1}$	9.763***
	(6.85)
	[1.376***]
State controls	
Local market size $_{t-1}$	0.000
	(1.43)
Local bank competition $_{t-1}$	1.602
	(1.63)
Local per capita income $_{t-1}$	0.000
	(0.06)
Average size of local firms $_{t-1}$	0.038
	(0.76)
Political Balance $_{t-1}$	-0.039
	(-0.2)
Home-target distance $_{t-1}$	0.000
	(0.85)
Bank controls	
Bank age $_{t-1}$	-0.007**
	(-2.1)
Bank size $_{t-1}$	-0.000
	(-0.66)
Bank liquidity $_{t-1}$	-0.419
	(-1.02)
Bank ROA $_{t-1}$	65.864
	(1.5)
Bank capital ratio $_{t-1}$	3.307
	(0.78)
Year fixed effects	Yes
McFadden Adj. R^2	0.084
Number of obs.	51267

Appendix Table A4.5. Placebo Experiment of the Relaxation of Non-compete Enforcement and Bank Entry Mode – County-level Analysis

This table presents estimated coefficients from difference-in-differences (DD) analyses of the impact of fictitious changes in non-compete enforcement on the mode of out-of-state bank entry into counties after the enactment of IBBEA using OLS regressions. I run placebo experiments in which I create fictitious changes in non-compete enforcement that have taken place two and three years before the real changes in the four states, and test their effects on bank entry mode in Panels A and B, respectively. The dependent variable is the number of out-of-state banks entries by establishing new branches as a percentage of total number of out-of-state bank entries (branching plus M&A) in a county. The coefficients on *Placebo relaxation of non-compete enforcement* capture the DD estimate of the impact of the fictitious relaxation of the non-compete enforcement on out-of-state banks' interstate entry mode. Model (1) is conducted using all counties in the U.S. Model (2) is conducted using only contiguous counties on the border of law-changed states and neighboring states in order to control for the unobserved variable bias. I control for lagged state and county characteristics, county fixed effects, and year fixed effects in both regressions and also contiguous county paired fixed effects in model (2). The analyses are conducted using yearly data covering the period from January 1994 to December 2010. Robust standard errors are clustered at state level. *t*-statistics are shown in parentheses. *, **, and *** denote an estimate that is statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

Panel A. Placebo Relaxation of Non-compete Enforcement Assumed to Have Taken Place Two Years Earlier

	(1)	(2)
Dep. Var.: **Ratio of bank entries through branching**	All counties in the U.S.	Contiguous counties on the border of the law-change states and neighboring states
Fictitious changes in labor law		
Placebo relaxation of non-compete enforcement $_{t-1}$	-0.025	-0.049
	(-0.36)	(-0.54)
State controls		
Local market size $_{t-1}$	-0.000	-0.000
	(-1.51)	(-0.59)
Local bank competition $_{t-1}$	0.664*	0.615
	(1.75)	(0.9)
Local per capita income $_{t-1}$	-0.000	-0.000
	(-1.47)	(-0.85)
Average size of local firms $_{t-1}$	0.102**	-0.099
	(2.22)	(-0.99)
Political Balance $_{t-1}$	0.092	0.276
	(1.08)	(1.68)
County controls		
Personal income growth rate $_{t-1}$	-0.000	0.002
	(-0.02)	(0.27)
Total population $_{t-1}$	0.000	0.000
	(0.12)	(0.71)
County fixed effects	yes	Yes
Neighboring county paired fixed effects	no	Yes
Year fixed effects	yes	Yes
Within-sample R^2	0.086	0.300
Number of counties	2309	129
Number of obs.	9553	1407

Panel B. Placebo Relaxation of Non-compete Enforcement Assumed to Have Taken Place Three Years Earlier

	(1)	(2)
Dep. Var.: **Ratio of bank entries through branching**	All counties in the U.S.	Counties on the border of the law-change states and neighboring states
Fictitious Changes in labor law		
Placebo relaxation of non-compete enforcement $_{t-1}$	-0.025	-0.146*
	(-0.42)	(-1.75)
State controls		
Local market size $_{t-1}$	-0.000	-0.000
	(-1.5)	(-0.42)
Local bank competition $_{t-1}$	0.662*	0.667
	(1.76)	(0.95)
Local per capita income $_{t-1}$	-0.000	-0.000
	(-1.47)	(-0.65)
Average size of local firms $_{t-1}$	0.102**	-0.129
	(2.23)	(-1.24)
Political Balance $_{t-1}$	0.092	0.288*
	(1.08)	(1.77)
County controls		
Personal income growth rate $_{t-1}$	-0.000	0.001
	(-0.02)	(0.23)
Total population $_{t-1}$	0.000	0.000
	(0.12)	(0.88)
County fixed effects	yes	yes
Neighboring county paired fixed effects	no	yes
Year fixed effects	yes	yes
Within-sample R^2	0.086	0.308
Number of counties	2309	129
Number of obs.	9553	1407

Appendix Table A4.6. Longer-Period Economic Implications of Bank Entries Modes

This table presents estimated coefficients from panel data regressions of the impact of different modes of interstate bank entries on the local bank credit market and the economy. I measure the dependent variables using the average percentage change in the small business credit market and local economy in a two-year and three-year period of time following bank entries. The results are reported in Panel A and Panel B, respectively. Dependent variables in model (1) capture the changes in the bank competition of the local market, dependents in models (2)-(3) capture the changes in the local small business lending, and dependents in models (4)-(6) capture the changes on the local economic activity. The analyses are conducted using yearly data covering the period from January 1994 to December 2010. I control for lagged state and county characteristics, as well as county fixed effects and year fixed effects. Robust standard errors are clustered at the state level. *t*-statistics are shown in parentheses. *, **, and *** denote an estimate that is statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

Panel A. Changes in Economic Situation Two Years after Bank Entries

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.:	%Δ Herfindahl index of bank competition$_{t,t+2}$	%Δ volume of small business loans$_{t,t+2}$	%Δ number of small business loans$_{t,t+2}$	%Δ per capita personal income$_{t,t+2}$	%Δ nr of establish-ment $_{t,t+2}$	%Δ local unemploy-ment rate$_{t,t+2}$
Bank entries						
Nr of bank entries via branching$_{t-1}$	-0.002	0.380***	0.387***	0.027	0.052***	-0.137
	(-1.41)	(4.34)	(4.26)	(1.61)	(3.8)	(-1.5)
Nr of bank entries via M&A$_{t-1}$	0.000	-0.001	-0.003	-0.001	-0.004	0.014
	(0.44)	(-0.03)	(-0.12)	(-0.15)	(-1.22)	(0.64)
State controls						
Local market size $_{t-1}$	-0.000	-0.000**	-0.000	-0.000	-0.000	0.000***
	(-1.45)	(-2.32)	(-1.5)	(-0.48)	(-1.29)	(2.58)
Herfindahl Index of banks $_{t-1}$	-0.035	17.021	14.943	-0.463	1.169	-19.148**
	(-1.05)	(1.53)	(1.62)	(-0.37)	(0.74)	(-2.11)
Local per capita income $_{t-1}$	-0.000	0.000	-0.000	-0.000***	-0.000	0.001***
	(-1.27)	(0.19)	(-0.52)	(-3.98)	(-0.85)	(2.91)
Average size of local firms $_{t-1}$	0.000	-2.17	-4.074***	0.472	1.022***	-2.182
	(0.05)	(-1.59)	(-2.81)	(1.61)	(3.94)	(-1.09)
Political Balance $_{t-1}$	-0.008	-8.546*	-4.412	0.005	0.062	2.321
	(-0.68)	(-1.74)	(-1.14)	(0.01)	(0.16)	(0.7)
County controls						
Personal income growth rate $_{t-1}$	0.000	-0.011	-0.049*		0.016***	0.067***
	(1.02)	(-0.26)	(-1.93)		(5.6)	(2.55)
Total population $_{t-1}$	0.000	0.000***	0.000*	-0.000***	-0.000***	-0.000
	(0.49)	(2.86)	(1.83)	(-3.98)	(-4.07)	(-1.11)
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Within-sample R^2	0.002	0.263	0.754	0.318	0.163	0.664
Number of obs.	33102	36170	36170	36174	36164	36145

Panel B. Changes in Economic Situation Three Years after Bank Entries

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.:	%Δ Herfindahl index of bank competition$_{t,t+3}$	%Δ volume of small business loans$_{t,t+3}$	%Δ number of small business loans$_{t,t+3}$	%Δ per capita personal income$_{t,t+3}$	%Δ nr of establish-ment$_{t,t+3}$	%Δ local unemploy-ment rate$_{t,t+3}$
Bank entries						
Nr of bank entries via branching$_{t-1}$	-0.003*	0.26***	0.306***	0.012	0.052***	-0.062
	(-1.95)	(4.12)	(4.53)	(0.73)	(3.32)	(-0.81)
Nr of bank entries via M&A$_{t-1}$	0.000	-0.009	-0.036**	0.001	-0.002	0.005
	(0.51)	(-0.48)	(-2.44)	(0.28)	(-0.52)	(0.23)
State controls						
Local market size $_{t-1}$	-0.000	-0.000**	-0.000	-0.000	-0.000	0.000***
	(-1.26)	(-2.17)	(-1.57)	(-1.08)	(-1.41)	(3.13)
Herfindahl Index of banks $_{t-1}$	-0.045	21.555**	18.096**	2.571	1.146	-16.956**
	(-1.18)	(2.1)	(2.26)	(1.29)	(0.91)	(-2.11)
Local per capita income $_{t-1}$	-0.000	-0.000	-0.000	-0.000***	-0.000	0.001***
	(-1)	(-0.18)	(-1.4)	(-4.27)	(-1.52)	(3.07)
Average size of local firms $_{t-1}$	0.004	-1.06	-2.336**	0.582*	0.979***	-1.428
	(0.69)	(-0.95)	(-2.18)	(1.83)	(3.65)	(-0.87)
Political Balance $_{t-1}$	-0.013	-7.148	-3.147	-0.257	0.131	2.098
	(-0.69)	(-1.62)	(-0.87)	(-0.35)	(0.34)	(0.82)
County controls						
Personal income growth rate $_{t-1}$	0.000**	0.054	0.001		0.005	0.077***
	(2.01)	(1.15)	(0.03)		(1.1)	(3.21)
Total population $_{t-1}$	0.000	0.000**	0.000	-0.000***	-0.000***	-0.000**
	(0.39)	(2.33)	(0.97)	(-3.61)	(-3.76)	(-2.01)
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Within-sample R^2	0.002	0.341	0.815	0.195	0.206	0.689
Number of obs.	30042	36170	36170	33118	33108	36145

Chapter 5
Summary and Conclusion

This dissertation bundles three empirical studies in the area of corporate finance and banking. These studies investigate corporates' financing activity with a special focus on the interaction between the banking industry and corporate borrowers. By showing how changes in the banking industry affect firms' financing decision and performance, this dissertation highlights the important role of the banking industry in shaping the real economy in a world of market friction in place.

Chapter 2 asks the question whether and how government interventions in the U.S. banking sector have benefited the U.S. corporate borrowers during the financial crisis of 2007-2009. We focus on firms' stock performance and find that government capital infusions in banks have a significantly positive impact on borrowing firms' stock returns. The effect is more pronounced for riskier and bank-dependent firms and those that borrow from banks that are less capitalized and smaller. Our study highlights positive effects from government interventions during the crisis, documenting that an alleviation of financial shocks to banks has led to significantly positive valuation effects in the corporate sector. Our evidence suggests that in an economic recession, policy makers could restart the economic engine by carefully implementing a policy with the specific goal of reactivating the bank lending channel. If a government implements this policy carefully, capital injections into banks could be one effective way to restart bank lending to the real economy. As observed in our paper, such a policy would especially benefit businesses which are smaller and subject to tighter financial constraints, those firms are the keys to boost economic recovery and to provide new and continuing employment opportunities.

Chapter 3 looks into firm's bond maturity dispersion activity and the impact on firms'

funding liquidity. We find that larger, more leveraged, less profitable, growth-oriented, and non-bank dependent firms exhibit the largest maturity dispersion of outstanding bonds. Such dispersion is maintained by frequently issuing sets of bonds with different maturities. We further find that more bond maturity dispersion results in higher funding availability and lower funding costs. The effects are stronger for firms that face more funding liquidity risk. The evidence suggests that spreading out bond maturities is an effective corporate policy to manage funding liquidity risk. And the finding is consistent with recent evidence that shows firms successfully avoided severe funding liquidity risk during crisis were the ones that have been careful managing their debt maturity schedule prior to the crisis time.

Chapter 4 studies the role of local information accessibility in the process of bank expansions. I investigate whether labor market frictions in the target market influence the mode in which out-of-state banks enter the new market following the U.S. interstate banking deregulation and consequently affect local economic activity. I argue that the mobility of local incumbent bank employees is one key channel through which an out-of-state bank could gain access to local information. And the labor market flexibility is an exogenous factor that affects banks' entry mode decision. The result shows that banks enter new markets by establishing new branches after the relaxation of non-compete enforcement in the target market, while they enter by acquiring incumbent banks' branches after the enforcement becomes restrictive in the target market. Interestingly, only bank entries via new branches significantly increase bank competition, improve the availability of credit to small businesses, and facilitate economic growth. The main contributions are two-folds: first, the paper highlights the importance of human capital for the banking industry and empirically shows that getting access to local knowledge is an important consideration for banks that enter a new market. Second, the results indicate that policymakers should take into account that local labor legislation (and its enforcement) if they want to unleash the positive impact of financial development on the real economy.

Nederlandse samenvatting
(Summary in Dutch)

Dit proefschrift bundelt drie empirische studies op het gebied van bankieren en ondernemingsfinanciering. Door te laten zien hoe veranderingen in de bancaire sector de financieringsbesluiten en prestaties van bedrijven beïnvloeden, benadrukt dit proefschrift de belangrijke rol van de banksector in het vormgeven van de reële economie.

Hoofdstuk 2 stelt de vraag of en hoe Amerikaanse kredietnemers hebben kunnen profiteren van de overheidsinterventies in de banksector tijdens de financiële crisis van 2007-2009. Wij richten ons op de aandelenkoersen van bedrijven en vinden dat kapitaalinjecties door de overheid in de bankensector een significant positief effect hebben gehad op de aandelenrendementen van zakelijke kredietnemers. Het effect is sterker aanwezig voor risicovollere en bank-afhankelijke bedrijven, en voor bedrijven die lenen van banken die minder gekapitaliseerd en kleiner zijn. Onze studie wijst op de positieve effecten van overheidsinterventies tijdens de crisis en laat zien dat een verzachting van de financiële schokken voor banken heeft geleid tot aanzienlijke positieve waarderingseffecten in de zakelijke sector. Onze resultaten duiden erop dat beleidsmakers door een zorgvuldig beleid de kredietverlening door banken aan de reële economie opnieuw kunnen opstarten. Zoals uit het onderzoek blijkt, is een dergelijk beleid vooral bevordelijk voor kleinere bedrijven die onderhevig zijn aan meer financiële beperkingen.

Hoofdstuk 3 kijkt naar de opbouw van de looptijd van obligatieleningen die een onderneming heeft uitstaan en de impact hiervan op de financieringsliquiditeit van deze bedrijven. Wij vinden dat grotere, meer met schulden gefinancierde, minder rendabele, groei-georiënteerde, en niet-bancair afhankelijke bedrijven de grootste uiteenlopende looptijden van de uitstaande obligaties hebben. Een dergelijke dispersie wordt onderhouden door een regelmatige

uitgifte van obligaties met verschillende looptijden. Wij vinden verder dat een grotere dispersie in looptijden resulteert in een hogere beschikbaarheid van financiële middelen en lagere financieringskosten. Deze resultaten tonen dat het uitspreiden van de looptijden van obligaties een effectief beleid is om het risico van financieringsliquiditeit te beheersen.

Hoofdstuk 4 bestudeert de rol van de toegankelijkheid van lokale informatie in het proces van bankexpansie. Er wordt onderzocht of fricties in de arbeidsmarkt invloed hebben op de wijze waarop Amerikaanse banken afkomstig uit een bepaalde staat hun activiteiten uitbreiden naar andere Amerikaanse staten nadat deregulering dit heeft mogelijk heeft gemaakt. Ook wordt het effect op de lokale economische activiteit in kaart gebracht. De mobiliteit van de lokale gevestigde medewerkers van een bank is een belangrijk kanaal waarlangs nieuw toetredende banken toegang tot lokale informatie zouden kunnen krijgen. Het resultaat toont dat banken nieuwe markten betreden door het oprichten van nieuwe vestigingen in geval van een soepeler concurrentiebeding. In markten waarin het de arbeidsmobiliteit door een niet-concurrentiebeding beperkt is wordt vaker gekozen voor overnames van gevestigde banken. Indien banken nieuwe vestigingen openen verhoogt dit de concurrentie tussen banken, verbetert het de beschikbaarheid van krediet voor kleine bedrijven en wordt de economische groei bevorderd. Deze resultaten tonen het belang van menselijk kapitaal voor de banksector en dat het krijgen van toegang tot lokale kennis een belangrijke overweging is voor banken die een nieuwe markt betreden. De resultaten geven tevens aan dat beleidsmakers rekening moeten houden met de lokale arbeidswetgeving (en handhaving) als ze de positieve impact van de financiële sector op de reële economie willen realiseren.

Bibliography

Acharya, V., Gale, D., Yorulmazer, T., (2011). Rollover risk and market freezes. Journal of Finance, 66(4), 1177-1209.

Adams, R., (2012). Governance and the financial crisis. International Review of Finance, 12, 7-38.

Allen, F., Qian, J., and Qian, M. (2005). Law, finance, and economic growth in China. Journal of Financial Economics, 77(1), 57-116.

Almeida, H., Campello, M., Laranjeira, B., Weisbenner, S., (2012). Corporate debt maturity and the real effects of the 2007 credit crisis. Critical Finance Review, 1, 3-58

Altman, E. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. Journal of Finance, 23, 589-609.

Amore, M., Schneider, C., and Žaldokas, A. (2013). Credit supply and corporate innovation. Journal of Financial Economics, 109(3), 835-855.

Bae, K.; J. Kang; and C. Lim. (2002). The value of durable bank relationships: Evidence from Korean banking shocks. Journal of Financial Economics, 64, 181-214.

Barclay, M., & Smith, C. W., (1995). The maturity structure of corporate debt. Journal of Finance, 50(2), 609-631.

Bayazitova, D., and A. Shivdasani. (2012). Assessing TARP. Review of Financial Studies, 25, 377-407.

Beck, T., Demirgüç-Kunt, A., and Maksimovic, V. (2004). Bank competition and access to finance: International evidence. Journal of Money, Credit, and Banking, 36(3), 627-648.

Berger, A., and Dick, A. (2007). Entry into banking markets and the early-mover advantage. Journal of Money, Credit and Banking, 39(4), 775-807.

Berger, A., and G. Udell. (1995). Relationship lending and lines of credit in small firm finance. Journal of Business, 68, 351-381.

Berger, A., Demsetz, R., and Strahan, P. (1999). The consolidation of the financial services industry: Causes, consequences, and implications for the future. Journal of Banking &

Finance, 23(2), 135-194.

Berger, A., Saunders, A., Scalise, J., and Udell, G. (1998). The effects of bank mergers and acquisitions on small business lending. Journal of Financial Economics, 50(2), 187-229.

Bertrand, M., Schoar, A., and Thesmar, D. (2007). Banking deregulation and industry structure: Evidence from the French banking reforms of 1985. Journal of Finance, 62(2), 597-628.

Bharath, S.; S. Dahiya; A. Saunders; and A. Srinivasan. (2011) Lending relationships and loan contract terms. Review of Financial Studies, 24, 1141-1203

Bharath, S.; S. Dahiya; A. Saunders; and A. Srinivasan. (2007) So what do I get? The bank's view of lending relationships. Journal of Financial Economics, 85, 368-419.

Bird, R. C., & Knopf, J. D. (2014). The impact of local knowledge on banking. Journal of Financial Services Research, 1-20.

Black, S. (1999). Do better schools matter? Parental valuation of elementary education. Quarterly Journal of Economics, 114(2), 577-599.

Black, S., and Strahan, P. (2002). Entrepreneurship and bank credit availability. Journal of Finance, 57(6), 2807-2833.

Bofondi, M., and Gobbi, G. (2006). Informational barriers to entry into credit markets. Review of Finance, 10(1), 39-67.

Bolton, P., and D. Scharfstein. (1996). Optimal debt structure and the number of creditors. Journal of Political Economy, 104, 1-25.

Boot, A. (2000) Relationship banking: what do we know? Journal of Financial Intermediation, 9, 7-25.

Broecker, T. (1990). Credit-worthiness tests and interbank competition. Econometrica: Journal of the Econometric Society, 58(2), 429-452.

Brunnermeier, M. K., (2009). Deciphering the liquidity and credit crunch 2007–08. Journal of Economic Perspectives 23:77–100.

Brunnermeier, M. K., Yogo, M., (2009). A note on liquidity risk management. Working paper No. w14727. National Bureau of Economic Research

Buchheit, L. C., Gulati, G. M., (2002). Sovereign bonds and the collective will. Emory LJ, 51, 1317.

Campello, M., J. Graham, and C. Harvey. (2010). The real effects of financial constraints: evidence from a financial crisis. Journal of Financial Economics, 97, 470-487.

Carvalho, D., Santikian, L., (2012). Liquidity management and industry interactions: evidence from debt maturity choices. Working paper.

Carvalho, D.; M. Ferreira; and P. Matos. (2011) Lending Relationships and the Effect of Bank Distress: Evidence from the 2007-2008 Financial Crisis. Journal of Financial and Quantitative Analysis, Forthcoming.

Cecchetti, S. (2009) "Crisis and Responses: The Federal Reserve in the Early Stages of the Financial Crisis." Journal of Economic Perspectives, 23, 51-76.

Chava, S., and A. Purnanandam. (2011) "The Effect of Banking Crisis on Bank-Dependent Borrowers." Journal of Financial Economics, 99, 116-135.

Chava, S., and M. Roberts. (2008) How Does Financing Impact Investment? The Role of Debt Covenants. Journal of Finance, 63, 2085-2121.

Chava, S., Oettl, A., Subramanian, A., and Subramanian, K. (2013). Banking deregulation and innovation. Journal of Financial Economics, 109(3), 759-774.

Cheng, H., Milbradt, K., (2012). The hazards of debt: Rollover freezes, incentives, and bailouts. Review of Financial Studies, 25(4), 1070-1110.

Chodorow-Reich, G. (2014). The employment effects of credit market disruptions: firm-level evidence from the 2008–9 financial crisis. Quarterly Journal of Economics, 129(1), 1-59.

Choi, J., Hackbarth, D., Zechner, J., (2013). Granularity of corporate debt. Working paper.

Ciccarelli, M.; A. Maddaloni; and J. Peydro. (2010) "Trusting the Bankers: A New Look at the Credit Channel of Monetary Policy." Working Paper, European Central Bank.

Cleary, S., (1999) The Relationship between Firm Investment and Financial Status. Journal of Finance, 54, 673-692.

Cole, R. (1998) The Importance of Relationships to the Availability of Credit. Journal of Banking and Finance, 22 , 959-977.

Coval, J. and Moskowitz, T. (1999). Home bias at home: Local equity preference in domestic portfolios. Journal of Finance, 54(6), 2045-2073.

Coval, J., and Moskowitz, T. (2001). The geography of investment: Informed trading and asset prices. Journal of Political Economy, 109(4), 811-841.

Dell'Ariccia, G.; E. Detragiache; and R. Rajan.(2008) The Real Effect of Banking Crises. Journal of Financial Intermediation, 17, 89-112.

Dell'Ariccia, G., and Marquez, R. (2004). Information and bank credit allocation. Journal of

Financial Economics, 72(1), 185-214.

Dell'Ariccia, G., Friedman, E., and Marquez, R. (1999). Adverse selection as a barrier to entry in the banking industry. RAND Journal of Economics, 30(3), 515-534.

Demirgüç-Kunt, A., and Maksimovic, V. (1998). Law, finance, and firm growth. Journal of Finance, 53(6), 2107-2137.

Denis, D. J., Mihov, V. T., (2003). The choice among bank debt, non-bank private debt, and public debt: evidence from new corporate borrowings. Journal of Financial Economics, 70(1), 3-28.

Dennis, S.; D. Nandy; and I. Sharpe. (2000) The Determinants of Contract Terms in Bank Revolving Credit Agreements. Journal of Financial and Quantitative Analysis, 35, 87-110.

Detragiache, E.; P. Garella; and L. Guiso. (2000) Multiple versus Single Banking Relationships: Theory and Evidence. Journal of Finance, 55, 1133–1161.

Diamond, D. W., (1991). Debt maturity structure and liquidity risk. The Quarterly Journal of Economics, 106(3), 709-737.

Dick, A. (2006). Nationwide branching and its impact on market structure, quality, and cank performance. Journal of Business, 79(2), 567-592.

Drucker, S., and M. Puri. (2005) On the Benefits of Concurrent Lending and Underwriting. Journal of Finance, 60, 2763-2799.

Duchin, R., Ozbas, O., Sensoy, B. A., (2010). Costly external finance, corporate investment, and the subprime mortgage credit crisis. Journal of Financial Economics, 97(3), 418-435.

Elsas, R., and J. Krahnen. (1998) Is Relationship Lending Special? Evidence from Credit-File Data in Germany. Journal of Banking and Finance, 22, 1283-1316.

Elyasiani, E.; L. Mester; and M. Pagano. (2011) Large Capital Infusions, Investor Reactions, and the Return and Risk Performance of Financial Institutions over the Business Cycle and Recent Financial Crisis. Working Paper, Federal Reserve Bank of Philadelphia.

Fahlenbrach, R., and R. Stulz. (2011) Bank CEO Incentives and the Credit Crisis. Journal of Financial Economics, 99, 11-26.

Fallick, B., Fleischman, C., and Rebitzer, J. (2006). Job-hopping in Silicon Valley: some evidence concerning the microfoundations of a high-technology cluster. Review of Economics and Statistics, 88(3), 472-481.

Fama, E., and K. French. (1993) Common Risk Factors in the Returns on Stocks and Bonds.

Journal of Financial Economics, 33, 3-56

Franco, A., and Mitchell, M. (2008). Covenants not to compete, labor mobility, and industry dynamics. Journal of Economics and Management Strategy, 17(3), 581-606.

Froot, K. A., Scharfstein, D., Stein, J. C., (1993). Risk managements coordinating corporate investment and financing policies. Journal of Finance, 48(5), 1629-1658.

Gambacorta, L., and P. Mistrulli. Does Bank Capital Affect Lending Behavior? Journal of Financial Intermediation, 13 (2004), 436-457.

Garmaise, M. (2011). Ties that truly bind: Noncompetition agreements, executive compensation, and firm investment. Journal of Law, Economics, and Organization, 27(2), 376-425.

Giannetti, M., and A. Simonov. (2013) On the real effects of bank bailouts: Micro evidence from Japan. American Economic Journal: Macroeconomics, 5.1, 135-167.

Gokcen, U. (2010) Market Value of Banking Relationships: New Evidence from the Financial Crisis of 2008. Working Paper, Koc University.

Gopalan, R., Song, F., Yerramilli, V., 2013. Debt maturity structure and credit quality. Journal of Financial and Quantitative Analysis. Forthcoming.

Gopalan, R.; G. Udell; and V. Yerramilli. (2011) Why Do Firms Form New Banking Relationships? Journal of Financial and Quantitative Analysis, 46, 1335-1365.

Graham, J. R., Harvey, C. R., (2001). The theory and practice of corporate finance: Evidence from the field. Journal of financial economics, 60(2), 187-243.

Guedes, J., Opler, T., (1996). The determinants of the maturity of corporate debt issues. Journal of Finance, 51(5), 1809-1833.

Guiso, L., Sapienza, P., and Zingales, L. (2004). Does local financial development matter?. Quarterly Journal of Economics, 119(3), 929-969.

Hadlock, C., and J. Pierce. (2010) New Evidence on Measuring Financial Constraints: Moving Beyond the KZ Index. Review of Financial Studies, 23, 1909-1940.

He, Z., & Xiong, W., (2012a). Rollover risk and credit risk. Journal of Finance, 67(2), 391-430.

He, Z., Xiong, W., (2012b). Dynamic debt runs. Review of Financial Studies, 25(6), 1799-1843.

Holmes, T. (1998). The effect of state policies on the location of manufacturing: evidence from state borders. Journal of Political Economy, 106(4), 667–705.

Hsiao, C. (2003) Analysis of Panel Data, 2nd ed. Cambridge MA: Cambridge University Press.

Huang, R. (2008). Evaluating the real effect of bank branching deregulation: Comparing

contiguous counties across U.S. state borders. Journal of Financial Economics, 87(3), 678-705.

Ivashina, V., and D. Scharfstein. (2010) Bank Lending During the Financial Crisis of 2008."Journal of Financial Economics, 97, 319-338.

James, C. (1987) Some Evidence on the Uniqueness of Bank Loans. Journal of Financial Economics, 19, 217-36.

Jayaratne, J., and Strahan, P. (1996). The finance-growth nexus: evidence from bank branch deregulation. Quarterly Journal of Economics, 111(3), 639–670.

Kang, J., and R. Stulz (2000) Do Banking Shocks Affect Borrowing Firm Performance? An Analysis of the Japanese Experience. Journal of Business, 73, 1-23.

Kaplan, S., and L. Zingales (1997) Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints? Quarterly Journal of Economics, 112, 169-215.

Kaplan, S., and Stromberg, P. (2003). Financial contracting theory meets the real world: An empirical analysis of venture capital contracts. Review of Economic Studies, 70(2):281-315

Kashyap, A.; O. Lamont; and J. Stein. (1994) Credit Conditions and the Cyclical Behavior of Inventories. Quarterly Journal of Economics, 109, 565-92.

Kim, W. (2010) Market Reaction to Limiting Executive Compensation: Evidence from TARP Firms. Working Paper, Dickinson College.

King, R., and Levine, R. (1993). Finance and growth: Schumpeter might be right. Quarterly Journal of Economics, 108(3), 717–738.

Kishan, R., and T. Opiela. (2000) Bank Size, Bank Capital and the Bank Lending Channel. Journal of Money, Credit and Banking, 32, 121-141.

Kramer, R. (1999). "Mega-mergers" in the banking industry, Antitrust Division, U.S. Department of Justice, Washington D.C.

Kwan, S. H., Carleton, W. T., (2010). Financial contracting and the choice between private placement and publicly offered bonds. Journal of Money, Credit and Banking, 42(5), 907-929.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., and Vishny, R. (2001). Law and Finance. 26-68. Springer Berlin Heidelberg.

Lemmon, M., and M. Roberts. (2010)The Response of Corporate Financing and Investment to Changes in the Supply of Credit. Journal of Financial and Quantitative Analysis, 45, 555-

587.

Leonard, B. (2001). Recruiting from the competition. HR Magazine 46(2), 78-83.

Levine, R., and Zervos, S. (1998). Stock markets, banks, and economic growth. American Economic Review, 88(3), 537-558.

Li, L. (2013) TARP Funds Distribution and Bank Loan Growth. Working Paper, University of Kansas.

Malsberger, B. M. (2004, 2009). Covenants not to compete: a state-by-state survey. Bloomberg BNA, 4th edition, 9th edition

Marx, M., and Fleming, L. (2011). Non-compete agreements: barriers to entry… and exit? In Innovation Policy and the Economy, 12, 39-64. University of Chicago Press.

Marx, M., Strumsky, D., and Fleming, L. (2009). Mobility, skills, and the Michigan non-compete experiment. Management Science, 55(6), 875-889.

McKinnon, R. (1973). Money and capital in economic development. Brookings Institution Press.

Mester, L., Nakamura, L., and Renault, M. (2007). Transactions accounts and loan monitoring. Review of Financial Studies, 20(3), 529-556.

Morris, S., Shin, H. S., (2009). Illiquidity component of credit risk. Working paper. Princeton University.

Myers, S. C., (1977). Determinants of corporate borrowing. Journal of Financial Economics, 5(2), 147-175.

Myers, S. C., (1984). The capital structure puzzle. Journal of Finance, 39(3), 574-592.

Norden, L., and Weber, M. (2010). Credit line usage, checking account activity, and default risk of bank borrowers. Review of Financial Studies, 23(10), 3665-3699.

Norden, L., Roosenboom, R., and Wang, T. (2013) The Impact of Government Intervention in Banks on Corporate Borrowers' Stock Returns. Journal of Financial and Quantitative Analysis (2013) 48(5), 1635-1662

Norden, L., Roosenboom, R., and Wang, T. (2015) Do Firms Spread Out Bond Maturity to Manage Funding Liquidity Risk? Working Paper

Ogura, Y. (2006). Learning from a rival bank and lending boom. Journal of Financial Intermediation, 15(4), 535-555.

Ongena, S.; D. Smith; and D. Michalsen. (2003) Firms and their Distressed Banks: Lessons from

the Norwegian Banking Crisis, Journal of Financial Economics, 67, 81-112.

Ongena, S.; G. Jiménez; J. Peydro; and J. Saurina. (2010) Credit Supply: Identifying Balance-Sheet Channels with Loan Applications and Granted Loans. Working Paper, European Central Bank.

Panetta, F.; T. Faeh; G. Grande; C. Ho; M. King; A. Levy; F. Signoretti; M. Taboga; and A. Zaghini. (2010) "An Assessment of Financial Sector Rescue Programmes." Working Paper, Bank of Italy.

Petersen, M. (2009) Estimating Standard Errors in Finance Panel Datasets: Comparing Approaches. Review of Financial Studies, 22, 435–480.

Petersen, M., and Rajan, R. (1994). The benefits of lending relationships: Evidence from small business data. Journal of Finance, 49(1), 3-37.

Petersen, M., and Rajan, R. (2002). Does distance still matter? The information revolution in small business lending. Journal of Finance, 57(6), 2533-2570.

Rajan, R. (1992). Insiders and outsiders: The choice between informed and arm's-length debt. Journal of Finance, 47(4), 1367-1400.

Rajan, R. (1992) "Insiders and Outsiders: The Choice Between Informed and Arms Length Debt." Journal of Finance, 47, 1367- 1400.

Rajan, R., 1992. Insiders and Outsiders: The choice between informed and arm's-length debt. Journal of Finance 47, 1367-1400.

Reinhart, C., and K. Rogoff. (2009) The Aftermath of Financial Crises. American Economic Review, 99, 466-72.

Rice, T., and Strahan, P. (2010). Does credit competition affect small-firm finance? Journal of Finance, 65(3), 861-889.

Santos, J. "Bank Corporate Loan Pricing Following the Subprime Crisis." Review of Financial Studies, 24 (2011), 1916-1943.

Schenone, C. "The Effect of Banking Relationships on the Firm's IPO Underpricing." Journal of Finance, 59 (2004), 2903-2958.

Schipper, K., and R. Thompson. Evidence on the Capitalized Value of Merger Activity for Acquiring Firms. Journal of Financial Economics, 11 (1983), 85-119.

Schumpeter, J. (1912). Theorie der wirtschaftlichen Entwicklung. Duncker and Humblot.

Schumpeter, J.(1961). The theory of economic development: An inquiry into profits, capital,

credit, interest, and the business cycle. Translated by Redvers Opie. Oxford University Press.

Servaes, H., Tufano, P., (2006). The theory and practice of corporate debt structure. Deutsche Bank, New York, NY.

Shaffer, S. (1998). The winner's curse in banking. Journal of Financial Intermediation, 7(4), 359-392.

Shin, B.; S. Park; and G. Udell. Lending Relationships, Credit Availability, Firm Value and Banking Crises. Working Paper, Korea Securities Research Institute, Indiana University Bloomington and Yonsei University (2008).

SIGTARP. Quarterly Report to Congress (January 30, 2010).

Slovin, M.; M. Sushka; and J. Polonchek. (1993) The Value of Bank Durability: Borrowers as Bank Stakeholders. Journal of Finance, 68, 247-266.

Smith, W., Warner, J., (1979). On financial contracting: An analysis of bond covenants. Journal of Financial Economics 7.2: 117-161.

Taliaferro, R. (2009) Where Did the Money Go? Commitments, Troubled Assets, New Lending, and the Capital Purchase Program. Working Paper, Harvard Business School

U.S. Congress. (October 3, 2008) Emergency Economic Stabilization Act. H. R. 1424, Second Session.

Veronesi, P., and L. Zingales. (2010) Paulson's Gift. Journal of Financial Economics, 97, 339-368.

Wang, T. (2015) Bank Entry Mode, Labor Market Flexibility and Economic Activity, Working paper

Whited, T., and G. Wu. (2006) Financial Constraints Risk. Review of Financial Studies, 19, 531-559.

Zarutskie, R. (2006). Evidence on the effects of bank competition on firm borrowing and investment. Journal of Financial Economics, 81(3), 503-537.

Biography

Teng Wang was born on December 7, 1984 in China. He obtained his Bachelor's Degree in Economics and Business from the University of Amsterdam, majoring in Finance and International Economics. During his undergraduate studies, Teng did internships at the market research department at Royal Philips Electronics. Between 2008 and 2010, Teng did the Mphil studies in Finance at Erasmus University, and he graduated with distinction (cum laude). During this period, he held several research assistant positions in various research units within the Erasmus Research Institute of Management (ERIM), such as China Business Center and the Department of Finance.

With his doctoral research proposal entitled "The Impact of Government Intervention in the Banking Industry on Corporate Sector", Teng was awarded the Mosaic grant from National Science Foundation of the Netherlands (NWO) and the Dutch Ministry of Education, Culture, and Science. With generous financial support of this prestigious grant, Teng started his four-year doctoral research at the Department of Finance at RSM Erasmus University in 2011. His main research interests are in the areas of financial intermediation and corporate finance, but they also extend to financial economics and law and finance.

During his PhD trajectory, Teng visited several leading academic institutions and has followed courses taught by many leading scholars in the field of financial economics, such as Franklin Allen, Jarrad Harford, Greg Udell, David Yermack, Barry Eichengreen, Edward Miguel, and Steven Ogena. His work has been presented at several international conferences, such as the EFA, the IFABS Conference, the Australasian Finance and Banking Conferences, the Corporate Finance Day, the MoFiR workshop in Banking and the CICF conference. One of his research papers has been published in the *Journal of Financial and Quantitative Analysis*, and another paper was recently offered revise-and-resubmit from a prominent academic journal.

Teng has been involved in teaching courses at both the undergraduate and graduate level in the areas of corporate finance, banking, and valuation. Starting from September 2015, Teng will be working as an economist at the Board of Governors of the Federal Reserve System.

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