Credit Tightening and Misallocation along the Supply Chains

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ABSTRACT

A negative shock in bank credit can transmit to the corporate sector, but the specific channels and consequences are under explored. Using a unique transaction-level dataset of bank-accepted commercial bills (as trade-credit payment instruments to suppliers) in China, we find a tight bank credit regulation is associated with a slow down of bank loan growth, leading to an increase in the issuance of bank-accepted commercial bills. After documenting the substitution between bank loans and commercial bills, we further find that commercial bills crowd out real investment of the supplier firms. The crowding-out is more severe when the bill is less liquid. Our findings identify a novel trade credit channel via which bank credit shock is transmitted to the corporate sector. Different from extant literature, we find the increased usage of trade credit in the form of commercial bills induced by bank credit tightening can have adverse impact on real investments and resource allocation.

JEL Codes: G21, G23, G32, L60
Key Words: Commercial Bills, LDR, Investment, Misallocation

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I Introduction

Shocks to bank credit can transmit to the corporate sector. There is an important literature studying how bank credit tightening or banking shocks affect real sectors (Chava and Purnanandam, 2011; Ivashina, Laeven, and Moral-Benito, 2020). However, the specific channel underlying the effect, is less understood. When bank credit is tightened, do firms respond by altering their financing strategies? Does bank credit tightening affect alternative financing channels such as trade credit? How does the transmission of bank credit tightening have real impact on the firm? A handful of studies attempt to understand the underlying mechanisms, such as Costello (2020), while the evidence is still scarce.

We utilize a propriatery, unique bank-firm and supplier-customer linked dataset for 2011-2017 from China to investigate these questions. The proprietary dataset is from one of the leading bill brokers and comprises 140,000 transactions with commercial bills (or "CB" interchangeably) as the payment method. The dataset provides full information about the identity of the accepting bank and discounting bank branch, the supplier and customer who receives and issues the bill, and detailed contract terms of the bill. Using removal of the loan-to-deposit ratio (LDR) regulation in 2015 in China as a quasi-experiment, we investigate how the tightening of bank loan supply affects the usage of commercial bills, and further affects firms along supply chains. We find that, a slowdown of bank loan growth is associated with an increase in the issuance of commercial bills. There is a substitution between bank loan and trade credit in the form of commercial bills.

Commercial bills are the most important form of trade credit in China, while academic research on this market is almost void. Resembling the antique bills of exchange in Europe (Cuadras-Morató and Rosés, 1998; Santarosa, 2015), commercial bills in China are issued by a customer (*issuer*) who promises to repay its supplier (*receiver*) certain amount on a future date, after the latter's sale of intermediate goods and services. For publicly listed firms, the CB intermediated trade credit is about one quarter of the total trade credit in the CSMAR data. The volume of outstanding bills was about 10% of bank loans at its peak in 2015, according to the social financing scale data from People's Bank of China (PBoC). More than 90% of bills are bank-accepted

bills, i.e., bills accepted by commercial banks in China. In other words, banks are obliged to repay the supplier if the customer defaults, suggesting their credit-enhancing role.[1]

Therefore, our dataset has the merit that it connects bank branches to customer firms, and customer firms to supplier firms. With detailed firm-bank pair and supplier-customer pair information, the dataset allows us to precisely identify the transmission of shocks from bank to firm and from firm to firm along the supply chain. This helps us overcome the first major obstacle in this line of research. The second difficulty is to identify external shocks to credit supply. A fair amount of extant literature uses the 2007-09 credit crisis as banking shocks (Costello, 2020; Huber, 2018), which constitutes a paramount shock to financial institutions but is associated with deterioration on the corporate side as well. We use the LDR regulation in China with the hope to precisely identify exogenous shock to bank loan supply.

Our first observation is a negative association between loan growth rate and commercial bill issuances. This relation is strong and statistically significant before 2015. It disappears after 2015, when the LDR regulation is removed. This finding is consistent with the notion that firms substitute commercial bills for bank loans as the sources of debt financing. When bank loan supply is tightened by banking regulation, customer firms whose demand for credits could not be satisfied, and they shift to their suppliers for trade credit by issuing commercial bills. On the bank side, by accounting rules, when a bank-accepted bill (or "CB" interchangeably) is issued, the amount is recorded as contingent debts instead of outstanding loans on the bank's balance sheet. Therefore, when a negative credit supply shock hit in the form of a loan-to-deposit ratio (LDR) cap on commercial banks in 2010, banks have incentives to limit their loan supplies and shift to CB issuances.

However, loan growth rates are endogenously determined. The observed relationship between loan growth and commercial bill issuances could be due to ommitted variables that affect both bank loan and trade credit. To identify causality, we use the LDR regulation as an exogenous shock to bank loan growth. Enacted in 1994, the LDR regulation requires the amount of outstanding loans of a bank should not exceed 75% of deposit balance. The LDR

[1]Commercial bills could be transferred and endorsed by firms along supply chains. More rigorously, any endorser before the last bearer upon the maturity date have legal obligations to repay the bearer as well.

regulation was loosely implemented for commercial banks until 2008. Thus, a bank's LDR before 2009 represents the market demand and supply equilibrium without external intervention. The LDR regulation became binding from 2008 and was truly in effect from 2009 to 2015, when it was abolished. The removal of LDR regulation is largely unexpected.[2] Therefore, the LDR regulation serves as an ideal laboratory to study the credit tightening effect.

We construct both bank-level and city-level pre-2009 LDR to measure bank lending tightness for the period from 2011 onward. As described before, the LDR cap was not binding before 2009, thus the pre-09 LDR can be used to measure LDR tightness after the regulation became strict. A larger pre-09 LDR represents a tighter requirement on loans during 2011-2017. Indeed, we document a strong negative association between the pre-09 LDR measure and loan growth rates for 2011-2015, with firm characteristics, local economic development, provincial credit quality and year-quarter and location fixed effects being controlled for. Meanwhile, the pre-09 LDR measure is not directly related to commercial bill issuance after 2011. Thus, the pre-09 LDR measure well satisfies the relevance and exclusion requirements for a valid instrument. Using the fitted value of bank loan growth rate, we continue to find a significant and negative association between loan growth and commercial bill issuances. Again, such relationship disappears after 2015, when the LDR cap is removed.

We proceed to examine how the usage of commercial bills affect firms. If the supplier firm that accepts commercial bills have "deep pockets" as conventional literature shows, then usage of commercial bills will not have material impact on the firm's investment decisions. However, contrary to what documented in previous literature (e.g., Petersen and Rajan, 1997; Adelino, Ferreira, Giannetti, and Pires, 2020), the suppliers are more financially constrained in our sample. We observe that 61% bills are issued by an issuer with larger registered capital than the receiver. In the 2011-2012 sub-sample, issuers are 5.7 to 11.01% larger in book value, and 9.46 to 20.29% lower in ROA than their customers. This phenomenon of "reverse" trade credit flow, i.e., from small and profitable firms to large and less profitable ones, holds robustly if we look at all manufacturing firms in the ASIF data. In contrast, we find that trade credit flows from large and less profitable firms to small and more profitable ones in the U.S. Survey of Small Business Finance (SSBF)

[2] quotes from news

data, consistent with what most trade credit literature describes .

The "reverse" trade credit flow may worsen suppliers' financial constraints and eventually, crowd out their investments. This is indeed what we find in the data: an increase in the usage of commercial bills by a supplier firm is associated with a decrease in the supplier firm investment. This finding is similar when we examine large investment, which is define by the investment-to-asset ratio above 20%.

Presumably, the choice of payment method (cash or commercial bills) should not matter to corporate real investment, if commercial bill market is highly liquid and supplier firms can easily cash out the bill. Our finding of the negative association between usage of commercial bills and investment indicates that the commercial bill market is not as liquid as expected.[3] Consistent with this hypothesis, we find the crowd-out effect of commercial bills is more pronounced when the bill is issued by a state-owned firm, or when the acceptance bank is state-owned. This effect is mitigated when the firm has a larger customer base. The crowd-out effect may uncover a possibly adverse effect of trade credit on firms: the usage of commercial bills delays cash payments to suppliers, which constrains the supplier's production and investment.

Finally, we investigate the implications of commercial bills on resource allocation. We use MRPK to measure the gap in return-to-capital between a supplier and its customer. We find the performance gap becomes larger after the usage of commercial bills, and the gap widens when the amount of commercial bill issuances is greater. This result suggests that commercial bills may widen the performance gap along the supply chain. Thus, our study provides important implication for resource allocation efficiencies.

This paper contributes to the literature that discusses how shocks to bank credit have real effects on the corporate sector (Gan, 2007; Jiménez, Mian, Peydró, and Saurina, 2019; Amiti and Weinstein, 2018; Ivashina et al., 2020). It has been well noted that there is a association between banking shocks and corporate sector exists. However, how does the banking shock transmits to other financing channels, and the specific mechanism of the transmission along the supply chain are less understood. Our study provides micro evidence for

[3]Anecdotal evidence shows that a firm located in Shanghai could not find a local bank to discount the bill, and it had to fly to Xinjiang province (more than 2,000 miles straight-line distance) to discount a bill.

the transmission of banking shock along supply chains via the trade credit channel.

Our study is differentiated from extant studies that explore how negative banking shocks affect trade credit supply by *upstream* firms (the supplier) (Boissay and Gropp, 2013; Jacobson and Von Schedvin, 2015; Costello, 2020; Adelino et al., 2020)). Our study, however, identifies a new *demand* side effect: tightening of bank loan supply results in unfilled demand for credit on the customer side, which fueled the growth of the issuance of commercial bills. Frictions in the discounting process results in contraction in real investments on the supplier side, which can be viewed as an adverse effect of using commercial bills. Our study has important efficiency implication in a developing economy like China.

The setting of China has two advantages. First, Fabbri and Klapper (2008) shows that large customers with bargaining powers in the input market borrow from small suppliers in China, implying its potential for understanding the "reverse" trade credit flow. Second, in an underdeveloped financial market, it is large firms that borrow heavily from banks (e.g., Midrigan and Xu, 2014; Bai, Lu, and Tian, 2018) and are hence more prone to the substitution between bank and trade credits when shocks occur.

The rest of the paper is organized as follows. Section II introduces the institutional background of commercial bills in China and discusses related literature. Section III introduces data and sample construction. Section IV studies how bank credit tightening affects the usage of commercial bills. Section V investigates the real effects of the usage of commercial bills. Section VI presents robustness checks and further discussions. Section VII concludes.

II Institutional Background and Related Literature

This section introduces the institutional background of our paper. We introduce commercial bills and how the bill market is impacted by the loan-to-deposit ratio (LDR) regulation in China's banking sector.

A Introduction to Commercial Bills

Commercial bills, *piaoju* in Chinese, are issued by a customer firm to its supplier as a payment method after the latter provides intermediate goods and services. It is a financial instrument that documents the inter-firm trade credit and eligible for endorsements and exchanges. The instrument is similar to promissory notes and bills of exchange widely used in the early industrialization stage of Europe in many aspects (Ashton, 1945; Gorton, 2020). Figure I shows one electronic specimen. The bill specifies face value (i.e., how much the customer owes to the supplier), the issuer (i.e., the customer), the receiver (i.e., the supplier), the issuance date, the due date, the acceptor, and the bank account of the customer at the correspondent bank.

After the issuance, the supplier who receives the bill could keep it until maturity, or endorse and use it as a payment method to its own supplier, and so on and so forth. Any firm who receives the bill could also choose to discount it at local commercial banks or bill brokers at certain discount rates. In the latter case, the broker further discounts the bill at banks that they have business relationship with to profit from the rate difference. Once the bill is discounted at a commercial bank, it enters into the inter-bank market, in which it could be re-discounted by or sold to other commercial banks on repo agreements. It could also be re-discounted by the central bank. Upon the maturity date, the owner of the time, i.e., a bank or a firm, could present the bill to the issuer for repayment. If the issuer defaults, the owner could ask the accepting bank or any prior owner to repay. This property of joint liability rule also exists for bills of exchange and is vital for the bill liquidity (see Santarosa, 2015).

There are two types of bills depending on whether the acceptor is a bank (a.k.a., bankers' acceptance (BA) or *yinpiao* in Chinese) or the customer itself (*shangpiao* in Chinese). Before 2017, more than 90% of the bills issued are bankers' acceptance, suggesting the vital credit-enhancing role played by banks for this inter-firm financing market.[4] Without future confusion, we refer *yinpiao* as commercial bills in our paper.

In addition, before 2017, most bills are handwritten in papers instead of

[4]Generally, the discount rate of *shangpiao* is higher than that of *yinpiao*. For example, *shangpiao* issued by Evergrande had been discounted at a rate higher than 20% years before it defaulted on dollar corporate bonds. *Yinpiao*, in contrast, are discounted at an average rate around 5%.

the latter electronic form. During 2016-2018, People's Bank of China (PBoC) actively urged banks to transit from paper bills to electronic ones. It also founded the Shanghai Commercial Paper Exchange (SHCPE) in 2016 for dual purposes. One is to record all issuance, discounting, re-discounting, and other transaction data of the bill market.[5] The other is to better understand the nexus between its monetary and credit policies and the real sector activities. Yet, different from its predecessors, such as the Bank of England and the Federal Reserve Bank of America (Eichengreen and Flandreau, 2012), PBoC is less active in the re-discounting service with a decade-long flat re-discounting rate of 2.25% from 2011 to 2020.[6]

B Regulatory Framework

Although China's commercial bill market has existed for decades, it picked up a rapid growth since the 2008 financial crisis, when the Banking Regulatory Commission (CBRC) and the PBoC strengthened the loan-to-deposit ratios (LDR) regulation on commercial banks (see in Figure II) .

The loan-to-deposit ratio was enacted in 1994, which specifies the amount of outstanding loan for a bank not exceeding 75% of its deposit balance. With a purpose to avoid excessive credit expansion for the banking sector, the regulation was loosely implemented (Hachem and Song, 2017). Starting from 2008, a strengthened regulation on bank-level LDRs phased in from a yearly basis to a monthly basis and was intensified when the monetary policy tightened in 2010 in combating the rapid post-crisis credit expansion (Hachem and Song, 2017; Chen, Ren, and Zha, 2018).[7] In October 2015, the regulation was then removed. In its official announcement, the regulatory body claimed that the

[5]Since 2016, market participants slowly adapted to this new infrastructure because of learning costs. Thus, the Exchange did not cover the entire market until late 2017. Data on characteristics of the bill market before 2018 is absent, except for the aggregate outstanding volume of un-discounted bills and the amount of bill discounting from the PBoC. Although the Exchange translates its Chinese name, *piaoju*, into *commercial papers*, we use *commercial bills* instead to differentiate it from the commercial paper product in Europe and in the U.S. This naming follows an old tradition of the Bank of England (see https://www.bankofengland.co.uk/quarterly-bulletin/1961/q4/commercial-bills).

[6]Historically, the BoE viewed bills of exchange as important instruments in their domestic money markets. To quote from the article titled *Commercial Bills* in the BoE Quarterly Bulletin (see the link above), one of the BoE's main aim is "to maintain the standards of quality long associated with the London prime bank bill and hence its reputation as a liquid asset of undoubted asecurity".

[7]During the same time period, there were also tight regulations on capital and leverage ratios, following the Basel III framework. Chinese banks well maintained these ratios above the minimum requirements.

LDR ratio became less relevant because of the increased non-deposit liabilities and non-loan assets on banks' balance sheets post 2008.

The LDR regulation was viewed as the main driving force behind the expansion of China's shadow banking sector. In lowering the LDR, banks increase lending via trust and entrusted loans (Chen et al., 2018; Allen, Qian, Tu, and Yu, 2019) and attract deposits in the form of wealth management products (Acharya, Qian, Su, and Yang, 2020), both of which are off balance sheets.

By the same token, the LDR regulation matters for the commercial bill first because of the accounting rules associated with its acceptance by commercial banks. When accepting a bill, it is a common practice that the bank requires the customer firm to provide a deposit installment as a fraction of the bill value, along with invoices and other documents for the proof of the transaction authenticity. This practice inflates the deposit balance. Meanwhile, compared to granting loans to the customer, the amount of bill acceptances is not counted as part of the outstanding loan, which lowers the loan balance. We elaborate evidence of these practices in Section IIIA.

Second, the LDR regulation discourages commercial banks from discounting bills for a similar accounting reason. When banks discount bills, the value of bill is counted as part as the outstanding loan. For instance, the PBoC reports this activity as "bill financing" under the aggregate loan data. As a result, firms that present bills to local banks for discounting services could be rejected. The lack of liquidity injection from discounting banks exacerbates financial condition of bill owners, often small firms, on top of the direct effect from the credit tightening.

In summary, this section introduces the definition of commercial bills, how it is used for inter-firm trades, and the relation between the LDR regulatory framework and banks' incentive of accepting and discounting them.

C Related Literature

There is a burgeoning literature on the transmission of frictions in the banking sector to the corporate sector. As pointed out by Ivashina et al. (2020), the focus of the more recent research has not been whether such connections exist, but what the economic mechanisms are underlying this connection. One

channel underlying this transmission is via the supply chain and the usage of trade credit. Prior literature, including Meltzer (1960), Kohler, Britton, and Yates (2000), Nilsen (2002) and Mateut, Bougheas, and Mizen (2006), finds that during monetary tightening periods, the supply of trade credit from suppliers could increase to fill up the shortage of bank credit. Trade credit is considered to have a substitutive role for bank credit (e.g., Biais and Gollier, 2015; Wilner, 2000; Cuñat, 2007; Reischer, 2019). When the credit supply for supplier firms changes, they adjust trade credit provision to their customers (Adelino et al., 2020; Costello, 2020).

In this regard, the paper is directly related to literature on trade credit. Trade credit is found prevalent especially in less developed economies (Maksimovic, 2001). Theories of trade credit yield mixed predictions. On one hand, suppliers have superior information about its customer firm and thus are in a better position to provide credit than banks. For example, Biais and Gollier (1997) and Burkart and Elligsen (2017) argue that suppliers have better information and advantage in monitoring customers than banks, and hence have lower cost in provision of finance. Petersen and Rajan (1997), Cuñat (2007) and Jacobson and Von Schedvin (2015) argue that suppliers with better access to finance provide finance to constrained customers, especially when the latter face liquidity shocks and their survivals are endangered.

On the other hand, customer firms may use trade credit to gain bargaining power over suppliers, when information problems are severe. As a result, suppliers could be at a disadvantage due to delayed cash payments. Along this line, Klapper, Laeven, and Rajan (2011) and Fabbri and Klapper (2016) argue the role of bargaining powers in the usage of trade credit. However, empirical evidence showing the link between supplier-customer bargaining power and the usage of trade credit is still lacking, due to the scarce contract-level data. Our study contributes to the literature by using a novel dataset that contains a large number of customers and suppliers on both sides of trade credit terms, rather than a dataset using a small group of suppliers or customers in the literature.

The efficiency discussion of trade credit and bargaining powers hence links our paper to the broad literature on misallocation. Hsieh and Klenow (2009) first find substantial misallocation in Chinese data. Financial frictions in this literature are explicitly modeled as between firms and the financial broker

(Gilchrist, Sim, and Zakrajsek, 2013; Midrigan and Xu, 2014; Moll, 2014) without considering inter-firm credit flows. Inter-firm or inter-sector studies (e.g., Jones, 2011; Acemoglu, Carvalho, Ozdaglar, and Tahbaz-Salehi, 2012; Bartelme and Gorodnichenko, 2015) emphasize the production linkage rather than the financial linkage. We contribute to this literature by analyzing misallocation of short-term working capital along supply chains, subsequent of credit tightening policies.

Our study is also related to the recent literature of shadow banking in China. Although commercial bills we discussed in this paper belong to traditional business of commercial banks in China, the bills provide financing to firms as an alternative to formal bank loans. Hence, one view is that commercial bills is part of shadow banking activities. There is a growing literature exploring and unvealing the motives, features and concequences of shadow banking activities in China. Ehlers, Kong, and Zhu (2018) provides a fairly comprehensive introduction of the intricate banking and shadow banking sectors in China. Zhu et al. (2017) argues that shadow banking in China is not new, and well existed before 1994 when non-bank lending activities were consolidated into city and rural commercial banks. Hachem and Song (2017) argues that the tightening of LDR regulation was important for the great resurgence of shadow banking after 2008. A few papers focused on entrusted loans such as Chen et al. (2018) and Allen et al. (2019). Allen et al. (2019) find that interest rates of entrusted loans are higher between firms that are unaffiliated, and could finally go to real estate industries where the regulatory body discourages investment. Chen et al. (2018) find that the monetary policy becomes ineffective, when loans are still lent out through shadow banking under the tightening regime.

III Data and Sample

This section introduces a transaction-level data of commercial bills. Because of its novelty, we explain in details on summary statistics at the transaction-, bank-, and firm-level. We find that our data cover 10% and 15% of aggregate bill accepting and discounting volumes in China during 2011 - 2017. Accepting banks in our data are large because of the credit enhancing role they play. Most issuer and receiver firms are non-state owned and unlisted and compose

a representative sample of manufacturing firms that are prone to negative credit shocks in China.

A Data Description

This paper uses a proprietary dataset that includes more than 140,000 commercial bill transactions from January 4, 2011 to November 29, 2017 (excluding the year 2013) at one of the leading bill brokers in China.[8] Using their information advantage, brokers connect firms and banks for discounting transactions. For each transaction, the broker records a set of information including the transaction value, the number of commercial bills transacted, the issuing firm (issuer), the receiving firm (receiver), the discounting firm (discounter), the issuance date, the due date, the transaction date, the acceptance bank, the discounting bank, and the discount rate.

Our data decently covers the Chinese bill market. During the period of 2011-2017, the bill issuance volume in our data is about 10% of the overall volume disclosed by listed commercial banks in China.[9] Meanwhile, the volume of discounting in our data is about 15% of the aggregate volume reported in the table of Sources & Uses of Funds of Financial Institutions from PBoC (see details in Table A2 in the appendix). The difference between the two percentages arises because a fraction of bills stay in the industrial sector and remain un-discounted until their maturity.

One nice feature of our data is jointly matching banks and firms *and* pairing customers (i.e., issuers) and suppliers (i.e., receivers). This feature makes it an ideal laboratory to study the transmission of credit shocks via the inter-firm network. Compared to a similar dataset in Costello (2020), the advantage of our data is to observe industry, size, age, and ownership information of all firms from the National Registry of Industry and Commerce (NRIC) and a further rich balance sheet data for a subset of firms from the Annual Survey of Industrial Firms (ASIF) in 2011 and 2012. These firms are small, mostly unlisted and non-state owned, while firms in Costello (2020) are at the rel-

[8]For simplicity, we refer to the time frame of the data as 2011-2017 without further mentioning the missing year of 2013.

[9]The aggregate data on bill issuance, both from listed and unlisted banks, are not available before 2016. PBoC discloses the end-year un-discounted outstanding bills in the table of Social Financing Scales, but not the sum of issuance. This fact does not invalidate our calculation much since most accepting banks are listed.

ative large end of the size distribution. We hence illustrate the monetary transmission for small firms, which is previously less studied.

B Summary Statistics

Transaction-Level Panel A of Table I summarizes the transaction-level statistics. On average, each transaction includes 2 bills and values 19 million CNY. The average discount rates is 4.94%, about 30 basis points higher than the one day repo rate during this time period. These bills have a maturity more than half a year. This long maturity also happened to bills of exchange in England (Ashton, 1945) and is longer than the time interval of 90-or-fewer days in the trade credit literature (Petersen and Rajan, 1997; Giannetti, Burkart, and Ellingsen, 2011). The average duration is close to the average maturity, suggesting that receivers discount their bills at the broker in a few days after the issuance date.[10]

Panel B of Table I further shows the overtime trend of commercial bills transacted. From 2011 to 2017, the total value kept increasing, except for a small drop in 2015 potentially caused by the removal of the LDR regulation. The maturity and duration of bills were also increasing, caused by an increasing fraction of bills with one year maturity. Each year, there were more than 10 thousand unique issuers and receivers that showed up in the transactions, except for the year of 2017. During the entire sample period, there were 44,233 unique issuers, 47,357 unique receivers, 306 unique accepting banks (headquarter), and their 2,981 city-level branches. These accepting banks included all of the big 5 state-owned and 12 joint equity banks and 117 out of 134 city commercial banks in China.

Bank-Level Given names of local bank branches, we merge the bill data to balance sheet data of commercial banks that have publicly issued equity and/or corporate bond, which we refer as the bank *population* later. Panel B of Table II reports the bank-year statistics. Accepting banks on average valued 360.92 billion CNY in total asset, 34% larger than the average asset level (270 billion CNY) of banks during this time period. The relative large

[10]Cautions on this interpretation, however, are needed since we do not observe bills transacted at other brokers, neither those held by firms until maturity.

size is consistent with their credit enhancing role in the bill market. For the same reason, 47% of transacted bills in our data are accepted by joint-equity banks and 27% by state-owned ones.[11]

For other characteristics, the average LDR of accepting banks was 0.65, lower than the population average of 0.67. Note that this population average was higher during 2006-2010 at a level of 0.72. Accepting banks did not have a higher average non-interest income ratio than the population, suggesting that these banks do not accept bills for specializing in this particular non-interest income business. However, these banks have a lower profit growth rate (0.21 versus 0.29 in the population), a lower tier 1 ratio (0.12 versus 0.14 in the population), and a lower capital ratio (0.14 versus 0.16 in the population). Our empirical analysis will show that banks accept bills because of the LDR regulation rather than the capital requirements induced by the Basel III during the same time period.

Firm-Level Given names of issuers and receivers, we merge the data to the NRIC database to identify the industry, the address, registered capital size, ownership, and the list of top equity holding companies over 2011-2017. For the 2011-2012 sub-sample, we merge our bill data to the NBS ASIF data to include more firm-level financial and production information. This process reduces our sample to 4,938 unique issuers and 3,710 unique receivers because of the minimum sales required by the ASIF.

Top halves of Panel B and C in Table II describe the firm-year NRIC statistics for issuers and receivers, respectively. About 1% of issuers and receivers are state-owned, which suggests the dominating role of privately owned firms in this bill market. 3% of issuers and 2% receivers are listed, while 1% of issuers and less than 1% of receivers are pre-listed, i.e., invested by venture capitalists that would lead to an IPO. By comparing the state-owned and listing statuses, one could conclude that issuers are in slightly better financial conditions than the receivers.

[11] We highlight accepting banks since our research focus is on studying how credit shocks originate from them permeate via the inter-firm network. Nevertheless, discounting banks are vital in providing the scarce liquidity in the bill market. There are 103 discounting banks (excluding 9 factoring companies and bill brokers) that account for 93% transactions in our data. In contrast to accepting banks, discounting banks are mostly city commercial banks (42% of transactions) and rural cooperative, credit, and commercial banks (48% of transactions).

Further evidence in favor of this conclusion comes from the comparison of the two groups in size and age. According to the registry, the average registered capital for issuers is 134.09 million, which is 28% larger than that of receivers. If we look at pairs of suppliers and customers, 60% of all pair-year observations have issuers larger than receivers. The average age of issuers is 9 years and about 1.5 year older than the receivers. Results are similar if we compare the 25th, 50th, and 75th percentiles of size and age distributions between the two groups. This finding is unlikely driven by the sample selection, since aggregate data from the 2019 annual report of SHCPE confirms that issuers are larger.

In the lower halves of Panel A and B in Table II, we report firm-year ASIF statistics for a subset of relatively large issuers and receivers. We have a more selective sub-sample for receivers in the ASIF, 6.74% of all receivers, while this percentage for issuers is 9.46%. As a result, receivers are now relatively larger in their 75th percentile and the mean. However, paired analysis still suggests that 57% of issuers are larger, with an average book value of asset 30% larger than the receivers. For other firm-level characteristics, issuers and receivers are similar in the distributions of ROA and leverage ratio. Receivers have better operating performances with higher asset turnover and output to asset ratio, and they also have a higher receivable to asset ratio than the issuers' payable to asset ratio. Meanwhile, receivers invest less than issuers. We will investigate how these firm-level characteristics are associated with bill activities in the following sections.

Further Comments on the Data Representativeness To gauge the representativeness of our data, we have shown: (i) the data covers 10 to 15% of aggregate volumes in bill acceptance and discounting; (ii) the data covers all major large accepting banks in China. We next describe another two dimensions of the data to support its representativeness for the Chinese bill market.

First, the industry and size distributions for issuers and receivers in the bill data are close to those in the ASIF data. We are not able to compare firms in the bill data to all firms in China, since the NRIC does not release descriptive statistics on firm size and industry distributions.[12] When compared to the ASIF counterpart, Figure A1 shows that the bill data covers a broad set

[12]We acquire the NRIC information for each firm via Application Programming Interface (API).

of manufacturing industries for both issuers and receivers and therefore could speak to the aggregate effect of credit tightening. Meanwhile, Figure A2 shows that issuers and receivers are relatively large among the ASIF firms. However, they are much smaller than the listed firms. An average firm in our data is about 4 to 5 times of an average ASIF firm (224 million CNY) but only 1.8% to 2.2% of an average listed firm (46,200 million CNY). The data hence covers firms that could meaningfully face financing difficulties during the tightening period and potentially pass the shock to their suppliers.

Second, the ownership type distribution of accepting banks in our data is close to that reported by SHCPE in later years. During 2011-2017, 18%, 47%, and 27% of bills in our data are accepted by state-owned, joint-equity, and city commercial banks, respectively. These numbers are fairly close to the three percentages of 18%, 42%, and 25% in the 2018 SHCPE annual report. Therefore, the data is also representative on the side of accepting banks.

To sum up, this section introduces a novel data of commercial bills in China. We first find that accepting banks are large in size to play the credit enhancing role for bills. We then find that participating firms in this market are mostly non-state owned and unlisted, i.e., those who are prone to negative credit shocks. We lastly find that as trade credit borrowers, issuers of commercial bills are larger than the receivers, in contrast to the image of smaller customers commonly portrayed in the literature (e.g., Petersen and Rajan, 1997; Costello, 2020; Adelino et al., 2020).

IV Loan-to-CB Substitution

This section studies: (i) how banks substitute loan for bills because of the LDR regulation; (ii) as a result, how firms shift to the bill payment to their suppliers. Our identification relies on the cross-bank and cross-city variation in the regulation tightness and the exogenous removal of the regulation in Oct. 2015. The exogeneity of policy shocks makes our identification less subject to the challenge studies on the 08 crisis face, in which the change of equilibrium credit quantity could be a mixed result of changes in both supply and demand.

A The Perspective of Banks

To study the loan-to-CB substitution of banks, we first introduce further details on the dual nature of the LDR regulation. Specifically, banks are subject to the regulation not only on their consolidated balance sheets, but also at the city branch-level. Accordingly, our measures on the regulation tightness of a bank branch include one at the bank headquarter-level and the other at the city-level.

More Details on the Regulation Our evidence on the regulation details comes from the policy archive of the then China Banking and Regulatory Commission (CBRC, now the China Banking and Insurance Regulatory Commission (CBRIC)).[13]

While monitoring at the headquarter-level is straightforward, evidence shows that the monitoring is also at the city-level. Here are two examples from Shanghai and Xi'an.

> CBRC Shanghai urged foreign banks at Shanghai to meet the loan-to-deposit regulation requirement...According to statistics, the overall ratio for all foreign banks at Shanghai fell below 70% by the end of 2011...Under the guidance of CBRC Shanghai, foreign banks used monthly average of daily LDRs as monitoring targets... (March 31, 2012)

> Bank of Beijing (Xi'an, Shaanxi Province)... set the LDR as a core performance criteria for all branches ... (Dec 4, 2014)

In both cases, the city-level branches of banks are urged to maintain a LDR level below the 75% red line with incentives aligned.[14]

At the same time, the CBRC also noticed the loan-to-CB substitution. Here are two examples from Zhejiang and Hainan provinces.

[13] See http://www.cbirc.gov.cn/cn/view/pages/index/index.html. We attach screenshots of the following policy statements from the CBRIC website in Figure A3, A4, A5, and A6 in the appendix.

[14] We notice a policy tone change with respect to the LDR regulation around 2015. After the removal of the regulation, the CBRC local offices urged city-level branches to lend more and promote the LDR levels. For example, they encouraged lendings to support local SMEs and anti-poverty projects.

> CBRC Zhejiang office campaigned to regulate the banking industry in Zhejiang province...Key aspects to regulate:... (6) off-balance sheet activities.... Banks should further enhance their risk management over commercial bills, letters of credit, wealth management products. Banks shall not draw deposits from firms in the name of collateral for bill acceptances ... (Feb 9, 2012)

> In the meeting of economic analysis for the first quarter this year, the CBRC required banks not to push firms involuntarily to issue commercial bills to replace loans. Hainan office followed the requirement with various means ... (July 17, 2015)

The first example illustrates that during this time period, banks accepted bills in order to increase deposits and decrease their LDRs, a motivation we described in Section 2. The second example implies that the substitution is driven by the change on the supply side of banks, not that on the demand side of firms.

Bank-Level Evidence To empirically test whether the LDR regulations induce the loan-to-CB substitution, we first need a measure to quantify the tightness of regulation a local branch faced during 2011-2015. Since there are no balance sheet information at the local branch-level, we construct two proxies as an alternative: average LDRs at both the bank- and city-level before 2009. The idea is that higher pre-09 LDRs for banks absent regulations, tighter constraints they have in meeting the post-11 regulations.

For the city c branch of bank b, we calculate the bank-level average LDR before 2009 as

$$LDR_{b,pre09} = \sum_{year=2006}^{2008} LDR_{b,year} \tag{1}$$

We start from 2006, the first year in which most bank-level balance sheet information became available, and exclude 2009 and 2010 because of the surge of outstanding loan s due to the 4 trillion stimulus plan. Accordingly, we

calculate the city-level average LDR before 200 9 as

$$LDR_{c,pre09} = \sum_{b \in B_c} \sum_{year=2006}^{2008} mshare_{bc,year} LDR_{b,year} \tag{2}$$

where the $mshare_{bc,year}$ is the location share of bank b in city c among the set of all banks B_c.[15] The CBRIC discloses financial certificate information for each banking locations operating in China. We calculate this market share as the number of bank b's locations divided by the total number of all banking locations in city c.[16] Another method to calculate $LDR_{c,pre09}$ is to divide the city-level loan outstanding by the total deposit. Nevertheless, this measure also includes loans from non-depository financial institutions (e.g., trust companies). We thus prefer the one of equation (2).

Figure III and IV illustrate a negative relationship between the loan growth rate and the average LDR before 2009, at both the bank- and city-level. For consistency with the latter regression analysis, our bank-level loan growth rate, $LoanGrowth_{bt}$, is at a quarterly frequency and city-level loan growth rate, $LoanGrowth_{cpt}$, is at an annual frequency since 224 out of 285 cities in China do not regularly report quarterly loan balance during 2011-2017. Both figures suggest a more pronounced negative relationship before 2015, compared to that after 2015. In other words, when the LDR regulation is effective, fewer loans are lent out at banks and cities more constrained by the regulation requirement. A subsequent question is whether this effect implies more bill acceptances at these banks in these cities. The answer is not obvious since banks could circumvent the regulation via lending more trust and entrust loans (Allen et al., 2019; Chen et al., 2018) and attracting more deposits from their competitors (Acharya et al., 2020).

To answer the question, we use the following quarterly OLS regression

[15] In this paper, we define a *branch* as the city-level banking office and a *location* as a physical place that are open to the public for banking services.

[16] See Acharya et al. (2020) that defines banks' market shares using the same formula in a context of measuring city-level banking competitions in China.

$$\begin{aligned}\text{CbAccepted}_{cbpt} = \beta_0 &+ \beta_1 LoanGrowth_{bt} * Pre15 + \gamma_1 LoanGrowth_{bt} * Post15 \\ &+ \beta_2 LoanGrowth_{cpt} * Pre15 + \gamma_2 LoanGrowth_{cpt} * Post15 \\ &+ \beta_X X_{cbpt} + \epsilon_{cbpt} \end{aligned} \tag{3}$$

where CbAccepted_{cbpt} are the log maturity-adjusted bill value accepted at bank b in city c of province p. The $Pre15$ dummy equals 1 before the third quarter of 2015 and 0 otherwise. Vice versa for $Post15$.

Control variables of X in equation (3) include the log annual GDP of the city, $lnGDP_{ct}$, average maturity of bills accepted, $lnAvgMaturity_{cbpt}$, the quarterly bank-level non-performing loan (NPL) ratio, NPL_{bt}, the log quarterly asset, $logAsset_{bt}$, and the ownership dummies, $StateOwn_b$ and $JointEquity_b$ of the headquarter banks. We control for the NPL ratios since banks may prefer bill acceptances by the additional information provided by the transaction invoices in firms' acceptance applications. The dummy, $StateOwn_b$ or $JointEquity_b$, equals to 1 if the bank is state-owned or joint-equity owned, respectively, and 0 otherwise. The default type of bank is city-commercial if both $StateOwn_b$ and $JointEquity_b$ equal to 0.

Table III presents results and suggests that indeed bill acceptances increase while loan growth slows before 2015. In column (1) with year-quarter and province FEs, we find that a one standard deviation decrease in the quarterly bank-level loan growth rate (14 p.p.) is significantly associated with 7.06% increases in the bill acceptance, which is approximately 16 million CNY and 22% of the average acceptance value across city-level branches. A similar amount increase of bill acceptances is associated with a one standard deviation decrease in the city-level loan growth rate (5 p.p.). After 2015, this relationship becomes insignificant and the coefficient of $LoanGrowth_{cpt}$ even flips the sign.

To ensure that our identification does not come from the cross-branch or cross-bank variation, we add the branch FE in column (2) - (3) and the bank FE in column (4) - (5). Further, column (2) (column (4)) uses a subsample of branches (banks) that accept bills both before and after 2015 to focus on the intensive margin. Similarly, column (3) (column (5)) uses a subsample of branches (banks) that accept bills every year. Results show that in column (2) to (5), the effect from the headquarter banks vanishes, while the effect

from the city-level loan growth rates robustly remains. Table III also suggests that across banks, small and joint-equity banks located in economic developed cities with bad quality loans are more likely to accept bills. But once the bank FE or the branch FE is controlled, i.e., using the within-bank or within-branch variation, we find that state-owned and joint-equity banks are less likely to accept bills, compared to city-commercial banks. Meanwhile, the NPL ratio is not significantly associated with bill acceptance activities of banks.

Results from equation (3) mix the substitution effect with the complementarity effect between loan and bill acceptances. While we emphasize the substitution here, one strand of the literature shows that the provision of trade credit increases when there is a positive credit shock (*complementarity effect*), vice versa (see e.g., Alfaro, García-Santana, and Moral-Benito, 2020; Costello, 2020). In fact, the positive sign of γ_2 in Table III shows evidence of this effect. To disentangle the substitution effect induced by the LDR regulation, we use $LDR_{b,pre09}$ and $LDR_{c,pre09}$ to instrument $LoanGrowth_{bt}$ and $LoanGrowth_{cpt}$, respectively. We divide the sample into before- and after-2015 subsamples for the IV estimation.

Table IV presents the IV estimation results. In the first stage regressions, $LDR_{b,pre09}$ and $LDR_{c,pre09}$ are negatively associated with $LoanGrowth_{bt}$ and $LoanGrowth_{cpt}$ before 2015, respectively. After 2015, the negative relationship between $LDR_{b,pre09}$ and $LoanGrowth_{bt}$ remains significant but with a smaller coefficient, while that between $LDR_{c,pre09}$ and $LoanGrowth_{cpt}$ becomes insignificant. Consistent with the scatter plots and CBRC reports, this result implies that the LDR regulation before 2015 constrains loan lending at both the bank-level and the city-level.

For second stage regressions, results in the before-2015 subsample consistently show that bill acceptances are higher at banks and cities where loan growth slows. Coefficients of $LoanGrowth_{bt}$ and $LoanGrowth_{cpt}$ increase substantially to 4.41 and 45.69, compared to 0.50 and 1.54 in Table III. In other words, by teasing out the complementarity effect, a one standard deviation decrease of loan growth rates at the bank-level (at the city-level) now increases bill acceptances by 141 million CNY (475 million CNY), which is about 2 (6.5) times of the average bill acceptance across city-level branches. Such a relationship is not significant after 2015. Therefore, we conclude that via a decelerated loan growth, the LDR regulation in China during 2011-2015

stimulates the bill market.

In summary, this subsection documents how the LDR regulation at the city- and bank-level induce more bill acceptances via a slower loan growth rate. A follow-up question is how this loan-to-CB substitution affects the real economy. If a small set of large client firms (i.e., issuers) face this substitution, the impact on the real economy would be limited as only suppliers of these issuers are affected. Things would differ if an average client firm of banks have the substitution. Motivated by this rationale, the next subsection studies whether an average firm in cities connected to banks with a tighter regulation issues more bills.

B Firm-Level Evidence

This section studies whether the tightening of LDR regulations decreases bank loans, and turn issuing firms to use more trade credit in the form of commercial bills.

To establish causality, we exploit the same cross-sectional variation of the regulation tightness in different cities and at different banks firms connect to. We estimate the following equation, where the depedent variable $CbIssue_{icpt}$ is the log maturity-weighted sum of bills firm i in city c issues in year t. $LDR_{b,pre09}$ and $LDR_{c,pre09}$ are again used as instruments for the *annual* $LoanGrowth_{bt}$ and $LoanGrowth_{cpt}$:

$$CbIssue_{icpt} = \beta_0 + \beta_1 LoanGrowth_{bt} + \beta_2 LoanGrowth_{cpt} + \beta_x X_{icpt} + \epsilon_{icbpt} \tag{4}$$

where control variables of X_{icpt} include the log average maturity of bills issued, $logAvgMaturity_{icpt}$, log registered capital of issuers, $logReCap_i$, age, Age_{it}, SOE status, SOE_i, listed and pre-listed statuses, $List_i$ and $PreList_{it}$, number of suppliers, N_{it}, and the log annual GDP of city c, $logGDP_{ct}$. We include FEs of the issuer's 2-digit industry, year, and province.

In this regression, the bank-level loan growth rate, $LoanGrowth_{bt}$, is also quarterly and the city-level loan growth rate, $LoanGrowth_{cpt}$, is annual. If an issuer issues bills in more than one distinct quarters in a year, $LoanGrowth_{bt}$ would be the average across quarters. We do so since 16% of our issuers show

up once in the data, and 28% issue in only one unique quarter. Hence, given the seasonality of bank-level loan growth (see Figure A3 in appendix), the annual $LoanGrowth_{bt}$ would be inaccurate to describe the borrowing environment the specific firm faces.

Results are displayed in Table V with standard errors clustered at the firm level. Similar to results at the bank-level, we find that before 2015, a 1 p.p. decrease in loan growth rates at the issuer's connected bank is associated with a 2.023% increase of bill issuance. Meanwhile, if the loan growth rate at the city where the issuer is located decreases by 1 p.p., the bill issuance of issuer i increases by 7.63%. These statistically significant results are not there after 2015. In addition, there exists a complementarity between the bank-level loan growth rate and the amount of bills issued. Table V also shows that larger and older issuers with more suppliers located in less developed cities are more likely to issue bills.

For the simplicity of exposition, we present only the IV estimation results in the main body of the paper.[17] Our IV estimation results suggest that during 2011-2014, firms connected to banks and located in cities facing tighter regulations are more likely to have the loan-to-CB substitution.

V Real Consequences of the Substitution

Previous sections argue that banks increase their bill acceptance to meet the LDR regulation, and consequently firms in cities with more of these banks "borrow" from their suppliers in the form of commercial bills. If suppliers (i.e., receivers of bills) are deep pockets (as they usually be in the literature, e.g., Petersen and Rajan (1997) and Adelino et al. (2020)), the negative aggregate credit shock would be absorbed by these suppliers with little real economic impact.

A similar concern arises due to our lack of the transaction data with values of goods and services customers purchase from suppliers. Without observing this information and the alternative payment methods, it is unclear whether the increase of bill issuance crowds out the least liquid regular trade credit, or the most liquid cash payments. If it is the former, suppliers could benefit

[17] We also implement an OLS estimation of an equation similar to equation (3) (see Table A4).

instead of being harmed. Even in the latter case, the real impact on suppliers would be negligible if bills are as liquid as cash.

This section addresses these questions. We find that first, suppliers in our data are smaller and more financially constrained, compared to their customers. Second, using the 2011-2012 subsample and proxies of cash and regular trade payments from there, we find that the issuance of bills crowd out cash payments to suppliers, rather than the regular trade credit. Therefore, if the discounting market works less than perfectly, it would be costly for a supplier to covert their bills into cash. This mechanism detriments their balance sheet and may lower their investment, which we show as the third result in this section. We lastly show the misallocation effect.

A Comparing Suppliers vs Customers

We compare suppliers and customers in three dimensions: size, age, and a financial constraint measure, SA index (see e.g., Cooley and Quadrini, 2001; Hadlock and Pierce, 2010).[18] Table II has shown that on average customers are larger and older than receivers. In what follows, we further show that this is also the case on a vis-a-vis basis. Specifically, we calculate

$$\Delta X = X_{supplier} - X_{customer} \tag{5}$$

where X refers to size, age, or the SA index. In the 2011-2017 NRIC sample, we use the log registered capital as the size measure, while in the 2011-2012 ASIF we use the log total assets.

Figure V plots the histograms of ΔX for each measure and each sample. The red vertical line shows the mean with a gray dashed 95% confidence interval bracketing it. We find that an average supplier is 63% smaller than its matched customer in the NRIC sample and 32% smaller in the ASIF sample. These differences are statistically significant. Meanwhile, an average supplier is 1.92 years younger than its customer in the NRIC sample and 1.32 younger in the ASIF sample. As a result, the SA index of an average supplier is 0.14 larger than the customer (with an average index -3.42), suggesting that the supplier is more financially constrained than the customer. This difference in

[18]For the ownership and listing statuses, we do not find that the supplier is less likely to be a state-owned or a listed firm than its customer.

the SA index is however negligible in the ASIF sample because of a stronger selection on the supplier's side. For the same reason, we also observe that in the ASIF sample, average suppliers borrow at an interest rate of 5.2%, statistically insignificant from the 5.6% rate of customers.[19] Overall, our results lean against the idea that suppliers in our data are deep pockets and less financially constrained than their customers.

B Less Cash Payment

Given the relatively small size of suppliers, it matters for their financial situations whether the bill issuance crowds out the least liquid trade credit or the most liquid cash.

To investigate this question, using the ASIF 2011-2012 data, we define supplier j's trade credit to sales ratio in year t as

$$TCSalesRatio_{jt} = \frac{\text{Account Receivables}_{jt}}{Sales_{jt}} \tag{6}$$

and cash to sales ratio as

$$CashSalesRatio_{jt} = 1 - TCSalesRatio_{jt} - BillSalesRatio_{jt} \tag{7}$$

where $BillSalesRatio_{jt}$ is defined as the sum of maturity weighted bill values divided by sales. This calculation is based on the accounting rule that receivables exclude notes receivables, which includes commercial bill payments suppliers receive.

The following regressions investigate how $BillSalesRatio_{jt}$ affects $CashSalesRatio_{jt}$ and $TCSalesRatio_{jt}$

$$CashSalesRatio_{jt} = \beta_0 + \beta_1 BillSalesRatio_{jt} + \epsilon_{jt} \tag{8}$$
$$TCSalesRatio_{jt} = \beta_0 + \beta_1 BillSalesRatio_{jt} + \epsilon_{jt} \tag{9}$$

We also control for suppliers' industry and year FEs. We construct two samples, one is supplier-year sample and the other is customer-supplier-year sample. The latter teases out the influence from issuers' industry differences.

[19] We calculate interest rates as interest expenses divided by total liabilities. Despite its measurement error, it has been a standard proxy for financing costs of unlisted firms in China (see e.g., Bai et al., 2018).

Table VI shows the estimation results. In the first column of the supplier-year sample, we find that with 1 p.p. increase in bill sales ratio, the cash sales ratio decreases by 1.12 p.p. and the trade credit sales ratio increases by 0.12 p.p. These coefficients increase to 1.91 and 0.91 if the customer is in a different city from the supplier's, and to 2.394 and 1.394 if they are in different provinces. This result indicates that customers borrow from suppliers via not only commercial bills but also the regular trade credit, which is consistent with the loan-to-trade-credit substitution in the literature (e.g., Meltzer, 1960; Nilsen, 2002). Consequently, suppliers receive less in cash. Our results are qualitatively and quantitatively similar in the customer-supplier-year sample.

C Crowding-Out Effect on Suppliers' Investment

If suppliers are not deep pockets and they receive less cash, the negative credit shock originating from customers could have a real impact on the suppliers' investment. Murfin and Njoroge (2015) has shown this impact of trade credit lending on investment in retail and its general applicability in other industries remains untested. Meanwhile, as argued in Wilner (2000) and Cuñat (2007), trade credit lending by small suppliers could have a dynamic trade-off with the benefit of preserving the business relationship. If this is the case, less is clear whether subsequent investments would decrease because of a persistently weakened cash flow or increase by preserving customers. We hence investigate whether receiving bills, as one form of trade credit, lowers suppliers' investment, *contemporaneously* and *subsequently*.

Baseline To do so, we construct a supplier-customer-year sample in 2011 and 2012 with the detailed ASIF balance sheet information. We first estimate the bill issuance using the $LDR_{b,pre09}$, $LDR_{c,pre09}$, and other control variables including the registered capital, age, SOE statuses, industry, and province information to obtain a predicted bill issuance variable, $\hat{CBIssue}_{ijt}$ (in log terms). Note that this variable differs from that in equation (17) because it varies bilaterally, not only across issuers. We then use this $\hat{CBIssue}_{ijt}$ to estimate the following equation for the supplier j located in city c

$$InvRate_{jt} = \beta_0 + \beta_1 \hat{CBIssue}_{ijt} + \beta_2 LoanGrowth_{ct} + \beta_x X_{jt} + \epsilon_{jt} \qquad (10)$$

where $InvRate_{jt}$ is calculated as the difference of fixed capital between $t-1$ and t divided by the capital at $t-1$. $LoanGrowth_{ct}$ controls for the impact of loan supply in the city where j is located on its investment. X_{jt} includes the log sales, log receivables, log asset and leverage ratio of the supplier. It also includes a province FE and a year FE for suppliers. To look at the dynamic investment effect, We also use the forward and accumulated investment rates, $InvRate_{jt+1}$ and $AccInvRate_{jt+1}$, as dependent variables.

Table VII displays our results. In column (1), we consistently find a positive relationship between $LDR_{c,pre09}$ and $LDR_{b,pre09}$ and the bill issuance. Using the predicted bill issuance from column (1), columns (2) to (10) look at its impact on investment at t and $t+1$ and the accumulated investment rate. In columns (2) to (4) and columns (8) to (10), we only include the year of 2012 because of the missing capital information of ASIF data in 2010. Results show that the bill issuance is indeed negatively associated with a lower investment *contemporaneously*. Specifically, a one standard deviation increase in bill issuance (about 7 million CNY) decreases the supplier's investment rate by 0.09 (about 1/10 of its standard deviation). One concern of this result is that such a decrease in investment may arise from the tightened local credit supply for supplier j, instead of the bill issuance. We address this concern by including the $LoanGrowth_{ct}$ in each specification and interacting $\hat{CBIssue}_{ijt}$ with $SameCity_{ij}$ and $DiffCity_{ij}$ dummies and $SameProv_{ij}$ and $DiffProv_{ij}$ dummies. The $SameCity_{ij}$ equals 1 if the supplier j and the customer i are in the same city, similarly for $SameProv_{ij}$. And vice versa for $DiffCity_{ij}$ and $DiffProv_{ij}$. One could see that our results are robust for pairs of firms located in the same and different cities/provinces.

On subsequent and accumulative investments, Table VII suggests that there are no negative impacts from bill issuances. Results are robust when we interact the $\hat{CBIssue}_{ijt}$ with location dummies of $SameCity_{ij}$, $DiffCity_{ij}$, $SameProv_{ij}$, and $DiffProv_{ij}$. Therefore, the crowding-out effect of bills on suppliers' investment is short lived and restricted to a contemporaneous effect. Using the language of Jacobson and Von Schedvin (2015), bill issuance hurts the cash flow of suppliers instead of their balance sheet.

One explanation of this short-lived effect may originate from the short-term financing nature of bills. Most bills mature in one year and therefore suppliers are able to collect sales revenue in cash before maturity. This leads

to a limited dynamic effect on investment, if *the same customers do not keep issuing bills to the same suppliers in following years*. In addition, the active bill market, although frictional, also allows suppliers to discount bills earlier than maturity as we see in the data. Factors that affect the bill liquidity, such as the creditworthiness of issuers and acceptors following Gorton (2020), may therefore influence the degree how bills crowd out suppliers' investment. We investigate this as follows.

Bill Liquidity and the Crowding-Out To investigate how the bill liquidity affects investment, we estimate the following regression equation

$$InvRate_{jt} = \beta_0 + \beta_1 \hat{CBIssue}_{ijt} + \gamma_1 Liquidity_{ijt} + \gamma_2 \hat{CBIssue}_{ijt} * Liquidity_{ijt} + \beta_2 LoanGrowth_{ct} + \beta_x X_{jt} + \epsilon_{jt} \quad (11)$$

where γ_1 indicates how liquidity of the bill issued from i to j affects the supplier's investment, and γ_2 indicates whether the crowding-out effect of bill issuance attenuates or exacerbates by the bill liquidity.

We follow Gorton (2020) and use SOE_i, $Listed_i$, and $SOE_{acceptingbank}$ as the first three liquidity measures. Arguably, the bill is better received in the market if the customer i is state-owned or listed with better access to finance, or the accepting bank that endorses the bill is state-owned. We also include the total number of discounting banks that discount the customer i's bills in our 2011-2017 sample and the interest spread of the bill as the other two liquidity measures.

Table VIII suggests that γ_1 and γ_2 are significant only for the SOE_i liquidity measure. When the customer i is an SOE, the average investment rate of the supplier j decreases by -2.667 in column (1), regardless of the value of bill issuance. In addition, a one-standard deviation increase in bill issuance now *increases* or *crowds in* the supplier j's investment by 0.12 (13% of its standard deviation). Coefficients of γ_1 and γ_2 are similar in column (6) when other liquidity measures are controlled. This result is in contrast to results in column (2) to (5) using other liquidity measures. Although the listing status and the SOE status of accepting bank also alleviates the crowding-out effect, their coefficients are not significant.

D Misallocation Effect

Given the crowding-out effect of the bill issuance on suppliers' investment, we lastly show the efficiency implication of the 2011-2015 credit tightening episode. Although Table VII shows a short-lived decline in investment rate, the stock level of capital for suppliers would be permanently affected. Therefore, under Hsieh and Klenow (2009)'s framework, one would expect a lower return to capital for suppliers, absent the bill issuance. A natural question is then how the level of bill issuance influences the return-to-capital difference between suppliers and customers.

To answer the question, we first construct the return to capital measure for customer i

$$MRPK_{it} = log(\frac{Sales_{it}}{CapitalStock_{it}}) \tag{12}$$

and $MRPK_{jt}$ of the supplier j is similarly defined. Its difference between supplier j and customer i is $\Delta MRPK_{ijt} = MRPK_{jt} - MRPK_{it}$.

Comparing returns to capital in pairs, we first find that suppliers have higher capital returns than their matched customers. Figure VI shows that the return to capital of supplier is 16% higher than that of the customer in the same year of bill issuance. This difference is statistically significant with a 95% confidence interval from 0.1 to 0.22. The difference remains positive and narrows to 0.11 one year later with a 95% interval from 0.04 to 0.18. In the world of Hsieh and Klenow (2009), an efficient allocation implies the equalization of capital returns across firms and therefore, financial resources shall flow from the firm with a lower return to that of a higher one. In our data, we observe the opposite, which we name it *the misallocation effect*.

To understand whether the bill issuance widens the gap of capital returns between suppliers and customers, we then construct a "difference-in-difference" in $MPRK$ by tracking pairs of firms over time

$$\Delta^2 MRPK_{ij,t,t+1} = \Delta MRPK_{ijt+1} - \Delta MRPK_{ijt} \tag{13}$$

and run the following regression

$$\Delta^2 MRPK_{ij,t,t+1} = \beta_0 + \beta_1 CB\hat{I}ssue_{ijt} + \beta_2 \Delta MRPK_{ijt} + \beta_X X_{ijt} + \epsilon_{ijt} \tag{14}$$

where $\hat{CBIssue}_{ijt}$ is the same as those in equations (10) and (18). We are able to construct $\Delta^2 MRPK_{ij}$ for 2012 with the ASIF 2013 data.

Table IX shows the estimation results. In all three columns, we find that a higher predicted bill issuance, $\hat{CBIssue}_{ijt}$, is associated with a widened gap of capital returns ,$\Delta^2 MRPK_{ij,t,t+1}$. In column (2) and (3) when the industry, age, and state-owned statuses are controlled, the coefficient becomes significant. Specifically, using column (3) a one-standard deviation increase in bill issuance is associated with an increase of the "difference-in-difference" return gap by 0.58 (63% of its standard deviation). Put it differently, the fraction of supplier-customer pairs with $\Delta MRPK_{ijt+1} > 0$ would decrease from 50% to 15%, if there were no bill issuance. This result could be achieved by a higher capital investment for suppliers hypothetically.

VI Robustness and Discussions

Cause of the Loan-to-CB Substitution Two alternative explanations may arise with respect to the loan-to-bill substitution: the implementation of Basel III accord and the hangover effect post the 4 trillion stimulus plan.

In the first one, China released "Guidelines on Capital Management for Commercial Banks (CBRC 2012 No.1)" in June 2012, in response to the global Basel III initiative. It required systematically important banks to keep a tier 1 ratio more than 9.5% and a capital ratio more than 11.5%. For other banks, the minimums of tier 1 and capital ratios are 1% smaller. The timeline of rolling out this new requirement happened to be in our sample period, i.e., starting from January 2012 to December 2013 for systematically important banks, and to December 2016 for others.

We clarify here how bill acceptances are added into the risk weighted asset to explain why the change of capital ratio requirements is not the cause of the loan-to-CB substitution. According to guidelines, bill acceptance is essentially credit to the customer firm, which makes its risk weight the same as loan, 100%. Thus, banks cannot substitute loan for CBs to lower risk weighted assets and promote their capital ratios. To further confirm this view, we run

the IV estimation of

$$\text{CbAccepted}_{cbpt} = \beta_0 + \beta_1 LoanGrowth_{bt} + \beta_X X_{cbpt} + \epsilon_{cbpt} \tag{15}$$

and use the before-2009 core tier 1 capital ratio, $CoreRatio_{b,pre09}$, and capital ratio, $CapRatio_{b,pre09}$, as the instrument one-by-one for $LoanGrowth_{bt}$. The top panel of Table X shows that although the two ratios positively correlate with loan growth rates during 2011-2017, they have no explanatory power in accounting for the loan-to-CB substitution.

The second narrative is similar to the one articulated by Chen, He, and Liu (2020). Most the 2009 stimulus plan in China was for long-term infrastructure projects and financed by bank loans to the local government financing vehicles (LGFVs). According to Chen et al. (2020), these loans have 3 to 5 years of maturity. Thus, during the sample period, commercial banks had pressure to roll over these loans to finance the projects and crowded out loans to industrial firms.

To test the hypothesis, we use the cross-city variations in excessive loan growth rates in 2009, $bl09$, to instrument $LoanGrowth_{cpt}$, and run the following regression[20]

$$\text{CbAccepted}_{cbpt} = \beta_0 + \beta_2 LoanGrowth_{cpt} + \beta_X X_{cbpt} + \epsilon_{cbpt} \tag{16}$$

If it were the excessive loan in 2009 that induced the loan-to-CB substitution, we should expect β_2 to be negative and significant in both the *before-* and *after-* 2015 sample, i.e., regardless of the LDR regulation. Results in the bottom panel of Table X show a negative and significant β_2 in the before-2015 sample and a positive and significant β_2 in the after-2015 sample. In other words, there is indeed a loan-to-CB substitution from the hangover effect, but *via the LDR regulation channel*. When the regulation is removed, banks in cities with more stimulus loan accept more but not less bills.

Suppliers' Payables Existing literature shows that in response to more trade credit required by customers, suppliers could borrow more from their own suppliers (see e.g., Boissay and Gropp, 2013). In other words, there could be a chain of shocks that passes from one firm to the other, and so on and so

[20]Data of $bl09$ can be downloaded from the online data link of Chen et al. (2020) at Zhiguo He's website.

forth. This channel is also relevant for discussing the real consequences of bill issuances.

We thus replace $InvRate_{ijt}$ by $logPayable_{ijt}$ in the regression equation (10) and estimate the new equation. Results are in Table XI. We find that 1% increase in (predicted) bill values received by suppliers induce a 0.171% increase of payables to their own suppliers in column (1). In column (2), we interact the bill value with dummies of $SameCity$ and $DiffCity$ in addition to the loan growth rate in the city where the supplier resides. These interaction terms control for the potential effect that an increase of suppliers' payables is from a decelerated local loan growth. Our results show that the positive pass-through remains robust.

Another message from Table XI is on how the exogenous LDR regulation helps to identify the pass-through effect of chained trade credit in the data. In column (3) when we remove the bill value from the right hand side of the regression, we find a 1% increase in suppliers' receivables increases their payables to their suppliers by a smaller magnitude, 0.03%. The coefficient is significant under the 10% significance level. However, in column (1) and (2) where we utilize the exogenous shock of trade credit, this coefficient is insignificant. In other words, we identify the part of the inter-firm lendings of suppliers that is relevant in determining their payable policies.

VII Conclusion

This paper explores possible misallocation along supply chains using a transaction-level data on bank-accepted commercial bills in China. Using this propriety data that covers 140,000 commercial bill transactions, we find that banking regulation explains the rapid growth of the commercial bill market. Specially, we document that (i) firms in cities constrained in LDR regulations issue more commercial bills; (ii) banks constrained in loan-to-deposit ratios are more likely to accept commercial bills. On the firm side, usage of commercial bills is related to the relative bargaining power between customer and supplier. We find the issuance of commercial bills as a form of trade credit is larger when the issuing firm has a larger bargaining power. Finally, our results show that issuers of commercial bills have lower profitability than receivers, which suggest that trade credits in forms of commercial bills deteriorates al-

location efficiency in China. This is in sharp contrast with the case of U.S., where usage of trade credit improves allocation efficiency. We also find that due to the delayed payment, small suppliers suppress the contemporaneous and future investments.

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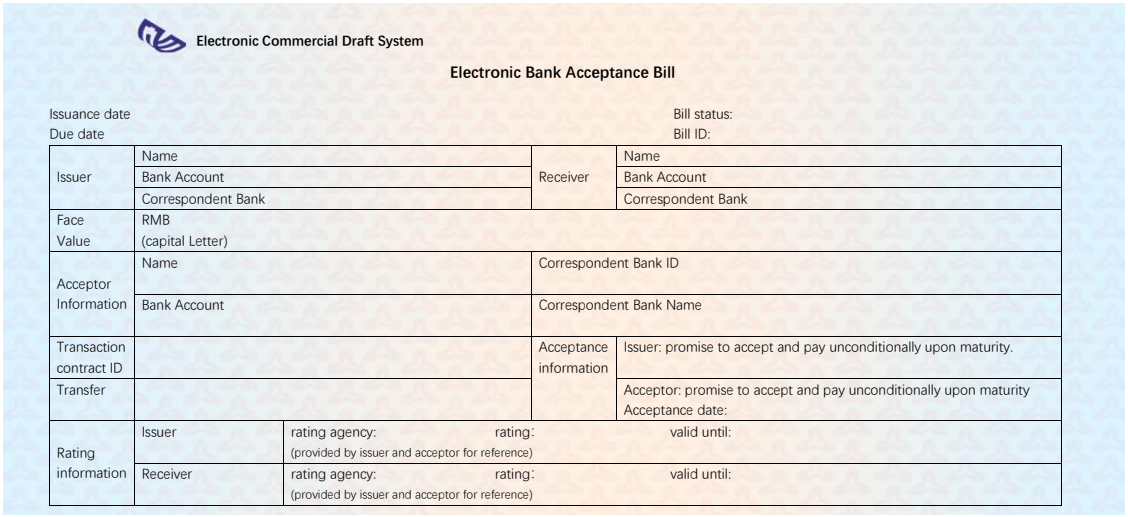
Figure I: An Electronic Commercial Bill Specimen, Translated



Electronic Commercial Draft System

Electronic Bank Acceptance Bill

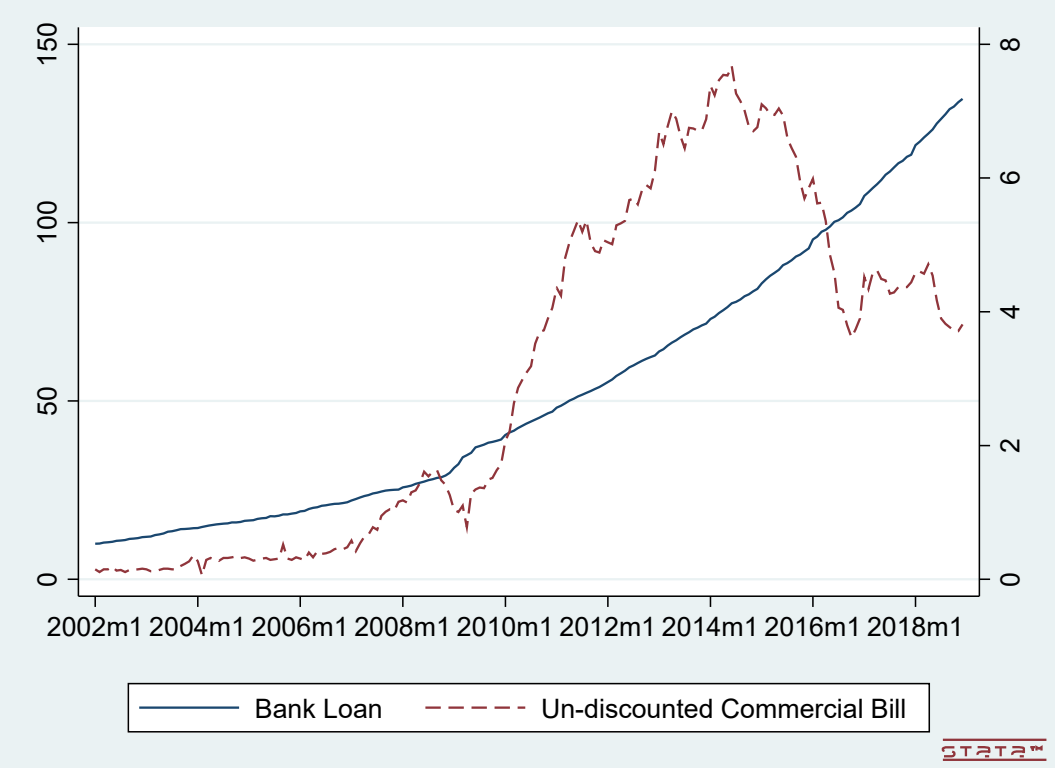
Issuance date
Due date

Bill status:
Bill ID:

Issuer	Name		Receiver	Name
	Bank Account			Bank Account
	Correspondent Bank			Correspondent Bank
Face Value	RMB (capital Letter)			
Acceptor Information	Name		Correspondent Bank ID	
	Bank Account		Correspondent Bank Name	
Transaction contract ID			Acceptance information	Issuer: promise to accept and pay unconditionally upon maturity.
Transfer				Acceptor: promise to accept and pay unconditionally upon maturity Acceptance date:
Rating information	Issuer	rating agency: rating: valid until: (provided by issuer and acceptor for reference)		
	Receiver	rating agency: rating: valid until: (provided by issuer and acceptor for reference)		

Notes: this specimen comes from the Electronic Commercial Draft System (ECDS), a centralized registry hosted by Shanghai Commercial Paper Exchange (SHCPE) of People's Bank of China.

Figure II: Sizes of Bank Loans and Un-Discounted Commercial Bills, Trillion CNY



Notes: data from the Monthly Social Financing Scale table published by the PBoC.

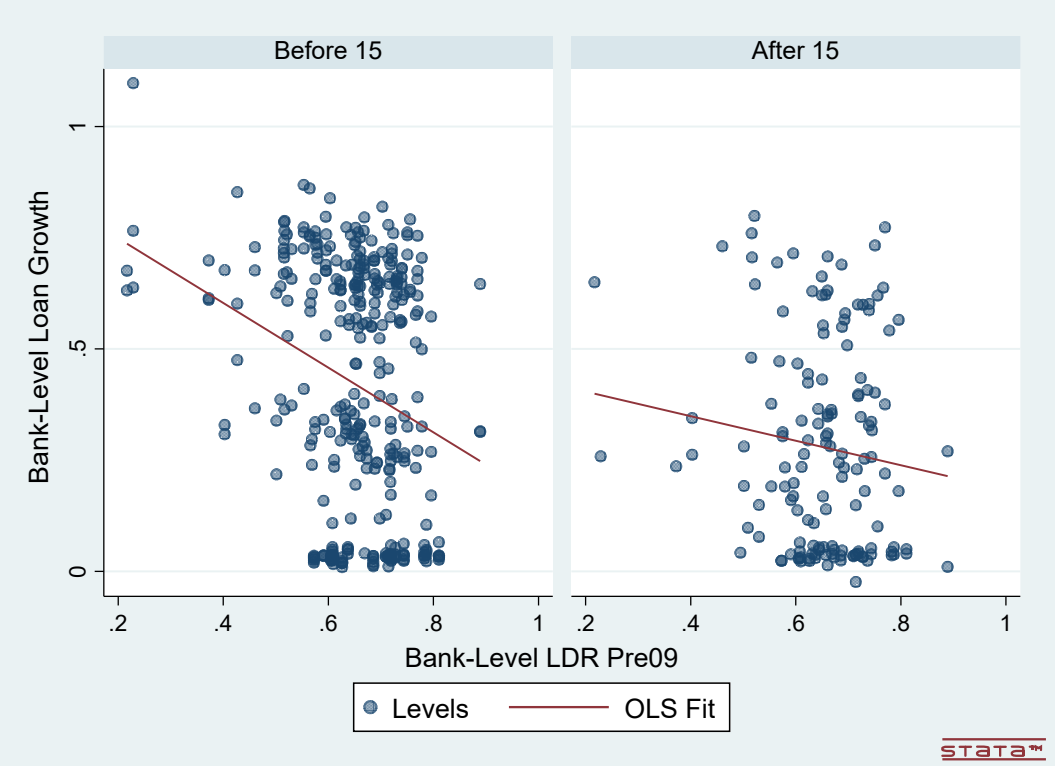


Figure III: Lower Loan Growth Rates for Banks with Higher $LDR_{b,pre09}$

Figure IV: Lower Loan Growth Rates for Banks with Higher $LDR_{c,pre09}$

Figure V: Histogram Plots of Relative Size, Age, and SA Index, Suppliers Compared to Customers

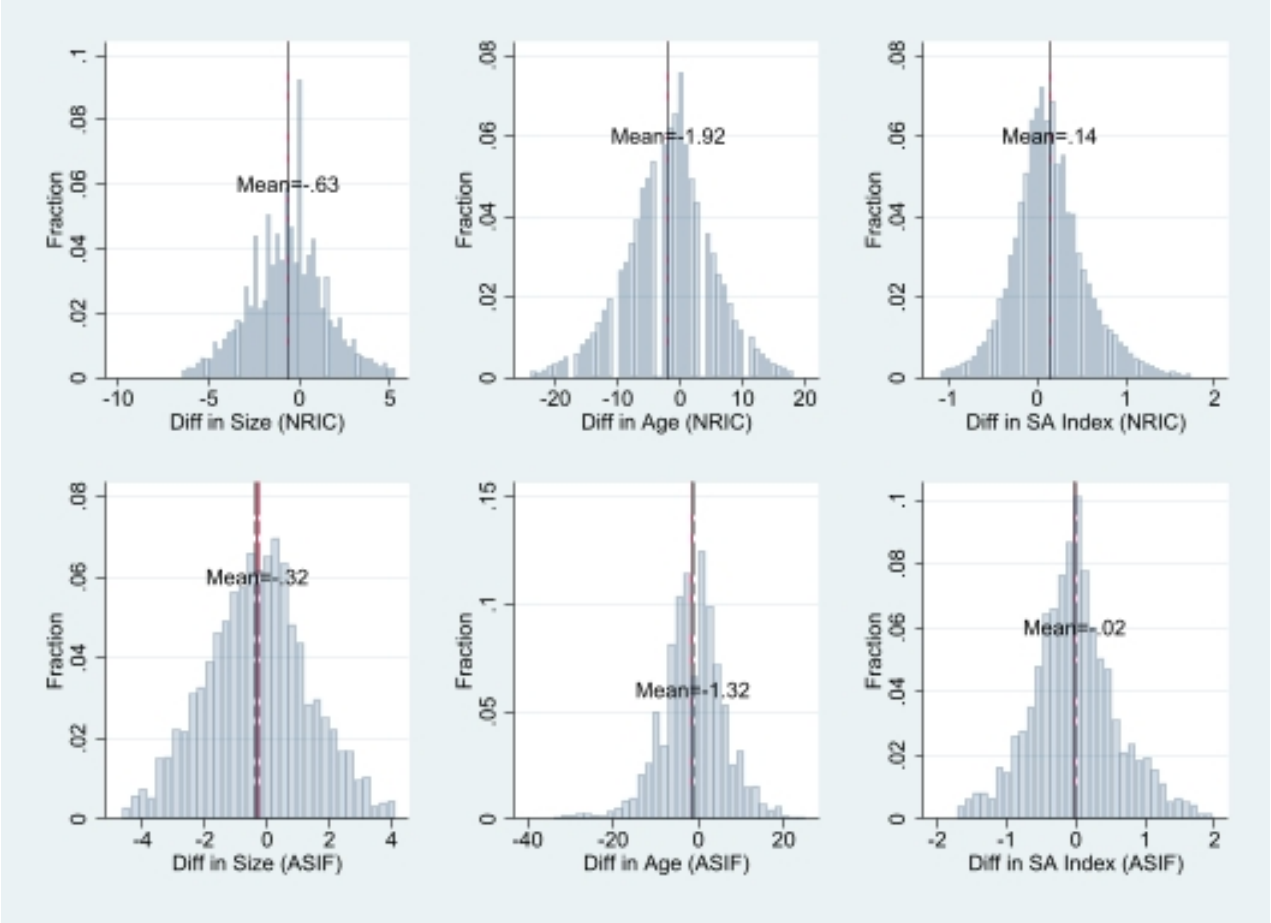


Figure VI: Differences in Returns to Capital in the Year of and One Year after the Bill Issuance, Suppliers compared to Customers

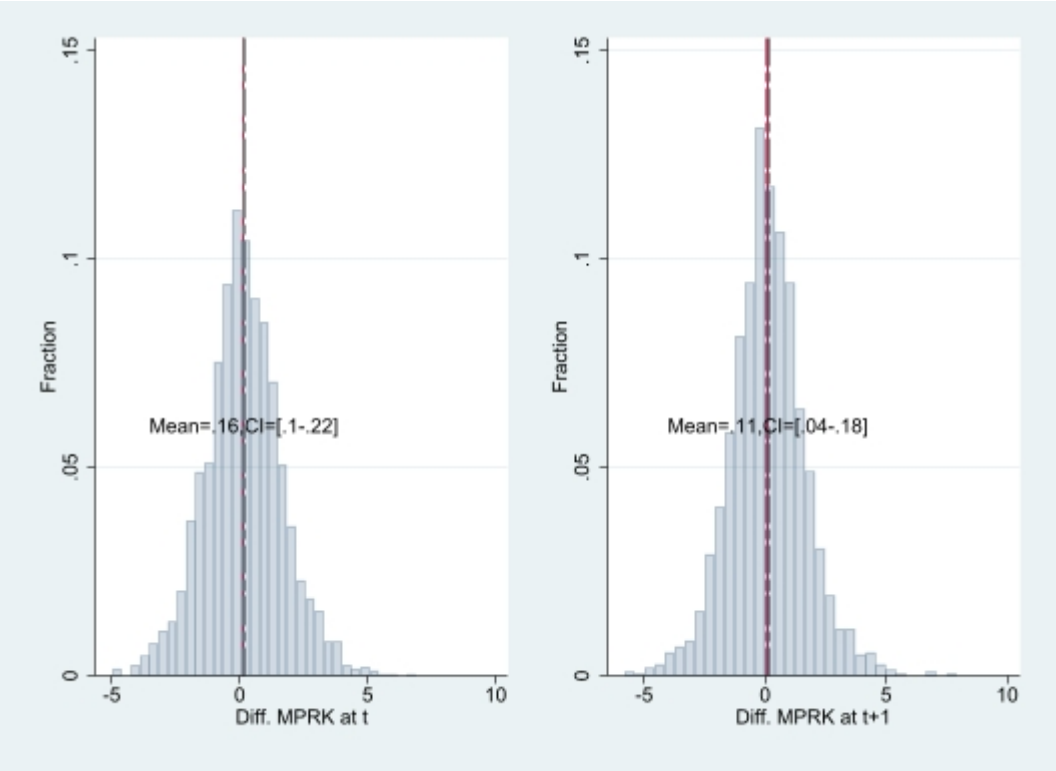


Table I: Summary Statistics for Bills

This table describes the transaction-level characteristics of commercial bills in our proprietary data. Panel A describes transaction characteristics averaged over years from 2011 to 2017. Column 2 to 9 report the number of observations, mean, standard deviation, minimum, maximum, 25% quantile, median, and 75% quantile of bill characteristics, respectively. Panel B describes averages of bill value, maturity, duration, discount rate, and number during each transaction, unique numbers of bill issuers, receivers, accepting bank branches and accepting bank headquarters by year. See appendix for variable definitions.

Panel A. Transaction-level Summary Statistics

Variable	Count	Mean	SD	Min	Max	P25	Median	P75
Order Value(Million ¥)	142787	19.00	23.12	0.10	180	5	10	20
Maturity(Days)	143449	192.86	42.63	120	366	182	183	184
Duration(Days)	142824	187.88	43.24	83	366	180	182	183
Discount Rate(%)	142065	4.94	1.31	1.90	8.70	3.90	5.06	5.54
Number of Bills	143555	1.91	1.80	1	13	1	1	2

Panel B. Yearly Distribution of Transaction Characteristics

Year	Bill Value (Million ¥)	Maturity (Days)	Duration (Days)	Discount Rate (%)	# of Bills	# of Issuers	# of Receivers	# of Accept. Branches	# of Accept. Banks
2011	13.94	182.85	180.19	6.15	1	11372	11596	1096	46
2012	20.56	182.37	181.56	5.59	2.16	12913	13011	1471	117
2014	20.78	188.65	184.05	5.20	2.20	10600	10633	1905	235
2015	17.47	198.85	189.25	3.99	1.94	12784	13401	2133	280
2016	22.21	207.33	200.31	3.32	2.18	9805	10082	1877	281
2017	22.55	247.34	233.64	4.99	2.38	2650	2731	1131	201
2011-2017	19.00	192.86	187.88	4.94	1.91	44233	47357	2981	306

Table II: Summary Statistics for Bill Issuers, Receivers and Acceptance Banks

This table describes the characteristics of accepting banks and bill issuers and receivers. Bank-level data is from the Wind database. Firm-level data is from the National Registry of Industry and Commerce (NRIC) and the Annual Survey of Industrial Firms (ASIF). The sample period is from 2011 to 2017. Variables are either at the firm-year-level or at the bank-year-level. See appendix for variable definitions.

Panel A. Year-level Characteristics of Accepting Banks								
Variables	Count	Mean	SD	Min	Max	P25	Median	P75
Asset(Billion ¥)	1795	360.92	1341.35	3.67	15363.21	21.58	54.56	149.33
Leverage Ratio	1314	0.08	0.02	0.04	0.17	0.06	0.07	0.09
Non-interest Income Ratio	1604	0.21	0.18	0.01	0.84	0.08	0.16	0.30
Profit Growth Rate	1623	0.21	0.45	-0.82	3.91	0.02	0.14	0.33
LDR	1739	0.65	0.11	0.31	0.91	0.58	0.67	0.72
Tier1 Ratio	1236	0.12	0.03	0.07	0.24	0.10	0.11	0.13
Capital Ratio	1662	0.14	0.03	0.09	0.38	0.12	0.13	0.15

Panel B. Year-level Characteristics of Issuers

Variable for Issuers	Count	Mean	SD	Min	Max	P25	Median	P75
SOE	57711	0.01	0.08	0	1	0	0	0
Listed	57711	0.03	0.16	0	1	0	0	0
Pre-listed	57711	0.01	0.10	0	1	0	0	0
Number of Suppliers	57711	1.34	0.90	1	37	1	1	1
Age	54253	9.21	5.62	1.00	30.00	5.00	8.00	13.00
Registered Capital(Million ¥)	53928	134.09	333.99	0.30	3085.06	10.00	30.00	100.00
Asset(Million ¥)	5460	860.89	1860.55	10.44	19451.65	112.71	288.93	738.59
ROA	4127	0.08	0.12	-0.10	0.80	0.01	0.04	0.10
Leverage Ratio	5222	0.63	0.23	0.03	0.99	0.47	0.66	0.81
Asset Turnover	5414	1.63	1.75	0.12	13.94	0.61	1.06	1.91
Output to Asset Ratio	5346	1.66	1.74	0.11	13.36	0.63	1.10	1.97
Payable to Asset Ratio	4728	0.09	0.11	0.00	0.67	0.01	0.05	0.13
Cash Flow to CAsset Ratio	3725	0.28	0.66	-1.01	6.26	-0.00	0.12	0.36
Cash Flow to Sale Ratio	3716	0.09	0.23	-0.98	1.15	0.00	0.07	0.17
Investment to Capital Ratio	4062	0.95	2.59	-1.91	25.43	0.01	0.16	0.83
Investment Asset Ratio	3890	0.08	0.20	-0.77	0.82	0.00	0.02	0.13

Panel C. Year-level Characteristics of Receivers

Varaible for Receivers	Count	Mean	SD	Min	Max	P25	Median	P75
SOE	61458	0.01	0.09	0	1	0	0	0
Listed	61458	0.02	0.12	0	1	0	0	0
Pre-listed	61458	0.00	0.07	0	1	0	0	0
Number of Customuers	61458	1.30	1.12	1	57	1	1	1
Age	57081	7.72	5.35	1.00	30.00	3.00	7.00	11.00
Registered Capital(Million ¥)	56114	96.55	288.49	0.28	3080.00	5.00	18.00	50.09
Asset(Million ¥)	4142	1058.58	2328.66	10.36	19451.65	84.32	256.31	819.97
ROA	3141	0.09	0.14	-0.10	0.80	0.01	0.04	0.11
Leverage Ratio	4009	0.62	0.24	0.03	0.99	0.46	0.65	0.81
Asset Turnover	4186	2.08	2.12	0.12	13.83	0.76	1.35	2.49
Output to Asset Ratio	4132	2.07	2.07	0.10	13.57	0.77	1.37	2.51
Receivable to Asset Ratio	3975	0.13	0.13	0.00	0.66	0.03	0.08	0.19
Cash Flow to CAsset Ratio	2756	0.31	0.73	-1.01	6.13	-0.01	0.12	0.41
Cash Flow to Sale Ratio	2765	0.08	0.22	-0.98	1.15	-0.01	0.06	0.15
Investment to Capital Ratio	2979	0.95	2.67	-1.89	26.09	0.00	0.15	0.76
Investment Asset Ratio	2856	0.08	0.20	-0.78	0.82	0.00	0.03	0.14

Table III: More Bill Acceptances at Banks and Cities with Slower Loan Growth Rates, OLS Estimation, Bank-Level

This table implements the following OLS regression:

$$\begin{aligned}\text{CbAccepted}_{cbpt} = \beta_0 + \beta_1 LoanGrowth_{bt} * Pre15 + \gamma_1 LoanGrowth_{bt} * Post15 \\ + \beta_2 LoanGrowth_{cpt} * Pre15 + \gamma_2 LoanGrowth_{cpt} * Post15 + \beta_X X_{cbpt} + \epsilon_{cbpt}\end{aligned}$$

here c, b, p and t represent for city, bank, province, and year-quarter. The sample includes all city-level branches that accept bills from 2011 to 2017. The dependent variable CbAccepted_{cbpt} is the maturity-adjusted sum of bill values bank b in city c accepted during year-quarter t. Variables other than $LogCityGDP$ and $LoanGrowth_{cpt}$ (annual) are at the quarterly frequency. $Pre15$ equals 1 if t is before the 3rd quarter of 2015 and otherwise. Vice versa for $Post15$. Column (1)'s sample includes all observations. The sample of columns (2) ((3)) includes branches that accept bills both before and after the LDR removal (every year). The sample of columns (4) ((5)) includes branches of which headquarter banks accept bills both before and after the LDR removal (every year). Standard errors are in parentheses and clustered by bank branches. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

	(1)	(2)	(3)	(4)	(5)
Bank Loan Growth Rate × pre15	−0.504**	−0.057	−0.225	−0.073	0.207
	(0.216)	(0.203)	(0.444)	(0.198)	(0.237)
City Loan Growth Rate × pre15	−1.543***	−0.913*	−3.251***	−1.631***	−1.717***
	(0.477)	(0.506)	(0.767)	(0.473)	(0.482)
Bank Loan Growth Rate × post15	−0.050	0.317	−2.050	0.371	0.315
	(0.333)	(0.339)	(1.778)	(0.312)	(0.422)
City Loan Growth Rate × post15	0.366	1.163**	1.201**	0.286	0.329
	(0.467)	(0.472)	(0.610)	(0.461)	(0.469)
Log Average Maturity	2.425***	2.227***	2.071***	2.422***	2.407***
	(0.102)	(0.108)	(0.172)	(0.100)	(0.102)
Bank Non-Performing Loan Ratio	0.227***	−0.010	0.080	0.029	0.027
	(0.072)	(0.079)	(0.135)	(0.077)	(0.083)
State Owned	0.168	−0.804***		−4.020***	−4.035***
	(0.237)	(0.161)		(0.397)	(0.406)
Joint Equity	0.379**	−0.995***	−0.931***	−2.024***	−2.023***
	(0.168)	(0.139)	(0.142)	(0.336)	(0.343)
Log Bank Asset	−0.170***	0.013	0.010	0.049	0.017
	(0.054)	(0.197)	(0.305)	(0.189)	(0.202)
Log City GDP	0.516***	−0.903***	−0.430	0.528***	0.540***
	(0.037)	(0.263)	(0.416)	(0.035)	(0.036)
Constant	−5.071***	4.582	2.160	−6.742*	−6.173
	(1.135)	(4.422)	(7.091)	(3.683)	(3.914)
Year-Quarter FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Province FE	*Yes*	*No*	*No*	*Yes*	*Yes*
Bank FE	*No*	*No*	*No*	*Yes*	*Yes*
Branch FE	*No*	*Yes*	*Yes*	*No*	*No*
Observations	16625	15143	7278	16620	15937
Adjusted R^2	0.266	0.186	0.244	0.295	0.297

Table IV: More Bill Acceptances at Banks and Cities with Slower Loan Growth Rates, IV Estimation, Bank-Level

This table uses $LDR_{b,pre09}$ and $LDR_{c,pre09}$ to instrument $LoanGrowth_{bt}$ and $LoanGrowth_{cpt}$ and estimates the following regression

$$\text{CbAccepted}_{cbpt} = \beta_0 + \beta_1 LoanGrowth_{cpt} + \beta_2 LoanGrowth_{bt} + \beta_X X_{cbpt} + \epsilon_{cbpt}$$

We split the data into two samples: before and after 2015. Standard errors are in parentheses and clustered by bank branches. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

	Before 2015			After 2015		
	1st Stage		2nd Stage	1st Stage		2nd Stage
	(1) Bank Loan Growth Rate	(2) City Loan Growth Rate	(3) Log Maturity-Adjusted Bill Value	(4) Bank Loan Growth Rate	(5) City Loan Growth Rate	(6) Log Maturity-Adjusted Bill Value
$LDR_{b,pre09}$	−0.397***			−0.235***		
	(0.042)			(0.055)		
$LDR_{c,pre09}$		−0.053***			−0.029	
Bank Loan Growth Rate			−4.405*			5.386
			(2.370)			(14.433)
City Loan Growth Rate			−45.692***			−70.965
			(14.467)			(60.093)
Log Average Maturity	0.010	−0.008	2.362***	−0.001	−0.009**	1.751***
	(0.009)	(0.005)	(0.291)	(0.006)	(0.004)	(0.595)
Bank NPL	0.031***	−0.001	0.454***	0.024***	−0.000	0.022
	(0.005)	(0.003)	(0.164)	(0.005)	(0.003)	(0.413)
State Owned	0.004	−0.000	−0.076	0.077***	−0.003	−0.369
	(0.026)	(0.005)	(0.337)	(0.022)	(0.008)	(1.338)
Joint Equity	−0.054***	0.001	−0.016	0.018	−0.000	0.340
	(0.021)	(0.003)	(0.339)	(0.019)	(0.006)	(0.447)
Log Bank Asset	−0.097***	0.001	−0.444*	−0.092***	−0.000	0.291
	(0.005)	(0.001)	(0.233)	(0.005)	(0.002)	(1.275)
Log City GDP	−0.004**	−0.012***	−0.153	−0.005**	0.007***	0.721**
	(0.002)	(0.002)	(0.255)	(0.002)	(0.002)	(0.305)
Constant	2.262***	0.321***	12.608*	2.018***	0.118***	−7.078
	(0.109)	(0.036)	(6.868)	(0.110)	(0.041)	(21.386)
Year-Quarter FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Province FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Observations	11106	10957	10940	5759	5673	5651
Adjusted R^2	0.643	0.249	.	0.557	0.143	.

Standard errors in parentheses, clustered at the city-branch-level
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table V: More Bill Issuances for Firms Connected with Banks & in Cities with Slower Loan Growth Rates, IV Estimation, Firm-Level

This table uses $LDR_{b,pre09}$ and $LDR_{c,pre09}$ to instrument $LoanGrowth_{bt}$ and $LoanGrowth_{cpt}$ and estimates the following regression

$$CbIssue_{icpt} = \beta_0 + \beta_1 LoanGrowth_{bt} + \beta_2 LoanGrowth_{cpt} + \beta_x X_{icpt} + \epsilon_{icbpt} \quad (17)$$

here c, i, p and t represent for city, issuer, province, and year. The sample includes issuers that issue bills from 2011 to 2017. We split the data into two subsamples: before and after (including) 2015. The dependent variable CbIssue_{icpt} is the maturity-adjusted sum of bill values issuer i in city c issued during year t. Variables other than $LoanGrowth_{bt}$ (quarterly) are at the annual frequency. Standard errors are in parentheses and clustered by issuers. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

	Before 2015			After 2015		
	1st Stage		2nd Stage	1st Stage		2nd Stage
	(1) Bank Loan Growth Rate	(2) City Loan Growth Rate	(3) Log Maturity-Adjusted Bill Value	(4) Bank Loan Growth Rate	(5) City Loan Growth Rate	(6) Log Maturity-Adjusted Bill Value
$LDR_{b,pre09}$	−0.346***			−0.413***		
	(0.066)			(0.023)		
$LDR_{c,pre09}$		−0.102***			0.022***	
		(0.005)			(0.008)	
Bank Loan Growth Rate			−1.209***			1.662**
			(0.272)			(0.654)
City Loan Growth Rate			−7.195***			6.391
			(1.539)			(18.531)
Log Average Maturity	−0.024**	−0.002	1.879***	0.017***	0.000	2.570***
	(0.012)	(0.002)	(0.105)	(0.005)	(0.001)	(0.071)
Log Issuer's Registered Capital	−0.003***	0.000***	0.267***	−0.003***	0.001***	0.198***
	(0.001)	(0.000)	(0.007)	(0.001)	(0.000)	(0.019)
Log Issuer's Age	−0.007***	−0.002***	0.109***	−0.008***	−0.001***	−0.004
	(0.001)	(0.000)	(0.013)	(0.002)	(0.000)	(0.033)
State-Owned Issuer	0.017	−0.000	0.098	0.009	0.002	−0.464*
	(0.013)	(0.004)	(0.121)	(0.013)	(0.003)	(0.265)
Pre-listed Issuer	−0.001	−0.000	−0.090	−0.012	0.001	0.133
	(0.010)	(0.003)	(0.125)	(0.008)	(0.003)	(0.171)
Listed Issuer	0.004	−0.002	−0.728***	−0.004	−0.001	−0.757***
	(0.007)	(0.002)	(0.086)	(0.006)	(0.002)	(0.098)
No. of Suppliers	−0.002***	0.000	0.548***	0.003*	−0.000	0.524***
	(0.001)	(0.000)	(0.017)	(0.001)	(0.000)	(0.045)
Log City GDP	0.006***	−0.006***	−0.125***	0.001	−0.000	−0.092
	(0.002)	(0.001)	(0.031)	(0.002)	(0.001)	(0.071)
Constant	0.427***	0.221***	−4.366***	0.325***	0.101***	−8.824***
	(0.075)	(0.014)	(0.736)	(0.043)	(0.011)	(1.339)
Year FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Province FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Issuer Industry FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Observations	28285	32381	28231	13402	22389	13306
Adjusted R^2	0.106	0.386	0.304	0.103	0.191	0.231

Table VI: Bill Payments to Suppliers Crowds Out Cash Payments

This table runs the following regressions

$$CashSalesRatio_{jt} = \beta_0 + \beta_1 BillSalesRatio_{jt} + \epsilon_{jt}$$
$$TCSalesRatio_{jt} = \beta_0 + \beta_1 BillSalesRatio_{jt} + \epsilon_{jt}$$

where $CashSalesRatio_{jt}$ and $TCSalesRatio_{jt}$ are fractions of sales of supplier j that are collected by cash and account receivables, respectively. $BillSalesRatio_{jt}$ is the fraction collected by bills. The sample includes all suppliers in the ASIF 2011-2012 and are in two forms: supplier themselves and pairs of customer-supplier matched. The subsmaple of *Diff. City* means that supplier j and customer i therein are in different cities and the subsample of *Diff. Prov* means that they are in different provinces. Standard errors are in parentheses and clustered by suppliers in the supplier-year sample, and by customer-supplier pairs in the customer-supplier-year sample. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

	DepVar: Cash sales ratio					
	Supplier-Year Sample			Customer-Supplier-Year Sample		
	All	Diff. City	Diff. Prov	All	Diff. City	Diff. Prov
Bill sales ratio	-1.123***	-1.906***	-2.394***	-1.192***	-2.451***	-3.440***
	(-56.43)	(-5.08)	(-5.73)	(-21.49)	(-3.96)	(-4.08)
Constant	0.889***	0.913***	0.935***	0.950***	0.904***	0.894***
	(31.30)	(35.96)	(40.87)	(27.60)	(12.31)	(29.92)
Supplier Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Customer Industry FE	-	-	-	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	4045	1696	1039	5820	2795	1863
Adjusted R^2.	0.477	0.111	0.181	0.357	0.192	0.202

	DepVar: TC sales ratio					
	Receiver-Year Sample			Issuer-Receiver-Year Sample		
	All	Diff. City	Diff. Prov	All	Diff. City	Diff. Prov
Bill sales ratio	0.123***	0.906*	1.394***	0.192***	1.451*	2.440**
	(6.16)	(2.41)	(3.34)	(3.47)	(2.35)	(2.90)
Constant	0.111***	0.0869***	0.0649**	0.0504	0.0959	0.106***
	(3.92)	(3.42)	(2.83)	(1.47)	(1.31)	(3.56)
Receiver Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Issuer Industry FE	-	-	-	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	4045	1696	1039	5820	2795	1863
adjusted R sq.	0.049	0.060	0.107	0.078	0.148	0.146

Table VII: Crowding-Out Effect of Bill Issuance on Suppliers' Investment

This table runs the following regression

$$InvRate_{jt} = \beta_0 + \beta_1 \hat{CBIssue}_{ijt} + \beta_2 LoanGrowth_{ct} + \beta_x X_{jt} + \epsilon_{jt}$$

We also use the next period investment rate $InvRate_{jt+1}$ as the dependent variable. $\hat{CBIssue}_{ijt}$ is the predicted bill issuance using $LoanGrowth_{bt}$ and $LoanGrowth_{cpt}$, and other customer and supplier controls. Standard errors are in parentheses and clustered by pairs of suppliers. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. Var:	$BillIssuance_t$	$InvRate_t$	$InvRate_t$	$InvRate_t$	$InvRate_{t+1}$	$InvRate_{t+1}$	$InvRate_{t+1}$
City-Level LDR	0.508***						
	(0.081)						
Bank-Level LDR	0.527***						
	(0.085)						
Predicted Bill Issuance		-0.142**			0.035		
		(0.068)			(0.034)		
Predicted Bill Issuance × Same City			-0.144**			0.034	
			(0.068)			(0.034)	
Predicted Bill Issuance × Diff City			-0.135**			0.028	
			(0.067)			(0.034)	
Predicted Bill Issuance × Same Prov				-0.152**			0.030
				(0.068)			(0.034)
Predicted Bill Issuance × Diff Prov				-0.168**			0.024
				(0.069)			(0.035)
Age	0.001**	-0.008***	-0.008***	-0.008***	-0.006***	-0.006***	-0.006***
	(0.001)	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
SOE	0.215**	-0.050	-0.053	-0.046	0.012	0.008	0.012
	(0.086)	(0.159)	(0.155)	(0.158)	(0.113)	(0.114)	(0.113)
Customer's Registered Capital	0.251***						
	(0.006)						
Supplier's Registered Capital	0.096***						
	(0.004)						
Supplier's City Loan Growth		0.585	0.581	0.589	0.410	0.417	0.408
		(1.119)	(1.119)	(1.116)	(0.389)	(0.389)	(0.389)
Supplier's Sales		-0.153***	-0.156***	-0.147***	0.032	0.034*	0.034*
		(0.053)	(0.052)	(0.053)	(0.020)	(0.020)	(0.020)
Supplier's Receivable		0.025	0.025	0.025	-0.008	-0.008	-0.008
		(0.022)	(0.022)	(0.022)	(0.009)	(0.009)	(0.009)
Supplier's Asset		0.121**	0.121**	0.122**	-0.053**	-0.052**	-0.052**
		(0.048)	(0.048)	(0.048)	(0.021)	(0.021)	(0.021)
Supplier's Leverage		-0.243***	-0.239***	-0.248***	0.008	0.008	0.007
		(0.078)	(0.079)	(0.078)	(0.021)	(0.021)	(0.021)
Constant	2.846***	1.187**	1.214**	1.218**	-0.051	-0.060	-0.033
	(0.207)	(0.478)	(0.481)	(0.481)	(0.236)	(0.236)	(0.238)
Receiver Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Receiver Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No	Yes	Yes	Yes
Observations	28139	2634	2634	2634	4507	4507	4507

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table VIII: Bill Liquidity and the Crowding-Out Effect on Suppliers' Investment

This tables runs the following regression equation

$$InvRate_{jt} = \beta_0 + \beta_1 \hat{CBIssue}_{ijt} + \gamma_1 Liquidity_{ijt} + \gamma_2 \hat{CBIssue}_{ijt} * Liquidity_{ijt} + \beta_2 LoanGrowth_{ct} + \beta_x X_{jt} + \epsilon_{jt} \quad (18)$$

$\hat{CBIssue}_{ijt}$ is the predicted bill issuance using $LoanGrowth_{bt}$ and $LoanGrowth_{cpt}$, and other customer and supplier controls. $Liquidity_{ijt}$ includes measures of SOE Issuer, Listed Issuer, SOE Accepting Bank, No. of Discounting Banks and Spread. Standard errors are in parentheses and clustered by pairs of suppliers. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Predicted Bill Issuance	-0.143**	-0.146**	-0.170**	-0.123	-0.241**	-0.262**
	(0.068)	(0.070)	(0.080)	(0.079)	(0.094)	(0.126)
SOE Issuer	-2.667**					-2.752**
	(1.083)					(1.095)
Predicted Bill Issuance × SOE Issuer	0.335**					0.349**
	(0.151)					(0.152)
Listed Issuer		-0.301				-0.480
		(1.655)				(1.698)
Predicted Bill Issuance × Listed Issuer		0.046				0.068
		(0.208)				(0.215)
SOE Accepting Bank			-0.684			-0.719
			(0.801)			(0.808)
Predicted Bill Issuance × SOE Accepting Bank			0.106			0.111
			(0.112)			(0.113)
No. of Discounting Banks				0.031		0.025
				(0.093)		(0.098)
Predicted Bill Issuance × No. of Discounting Banks				-0.005		-0.004
				(0.012)		(0.013)
Spread					-0.799	-0.796
					(0.550)	(0.561)
Predicted Bill Issuance × Spread					0.107	0.107
					(0.078)	(0.079)
Constant	1.286***	1.295***	1.475***	1.150**	2.008***	2.158**
	(0.483)	(0.490)	(0.543)	(0.566)	(0.659)	(0.864)
Receiver Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2669	2669	2669	2669	2669	2669

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table IX: Misallocation Effect of Bill Issuance

This table runs the following regression

$$\Delta^2 MRPK_{ij,t,t+1} = \beta_0 + \beta_1 \hat{CBIssue}_{ijt} + \beta_2 \Delta MRPK_{ijt} + \beta_X X_{ijt} + \epsilon_{ijt}$$

where the dependent variable, $\Delta^2 MRPK_{ij,t,t+1}$, is the change of the relative return capital of supplier j compared to customer i, $\Delta MRPK_{ijt}$. Return to capital $MRPK$ is defined as the log sales divided by capital. $\hat{CBIssue}_{ijt}$ is the predicted bill issuance level using $LDR_{b,pre09}$, $LDR_{c,pre09}$, and supplier and customer size, age, ownership, and industry information as explanatory variables. Standard errors are in parentheses and clustered by pairs of suppliers and customers. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Dep. Var	$\Delta^2 MRPK_{ij,t,t+1}$		
	(1)	(2)	(3)
$\Delta MRPK_{ijt}$	-0.104***	-0.123***	-0.124***
	(0.014)	(0.015)	(0.015)
Predicted Bill Issuance	0.036	0.084**	0.097**
	(0.026)	(0.037)	(0.040)
Constant	-0.263	-0.601**	-0.693**
	(0.187)	(0.264)	(0.281)
Customer, Supplier Industry FE	No	Yes	Yes
Customer, Supplier Age and SOE Statuses	No	No	Yes
Year FE	Yes	Yes	Yes
Observations	1815	1812	1782
Adjusted R^2	0.042	0.056	0.071

Table X: Alternative Stories of Loan-to-CB Substitution: Basel III and the Hanover Effect of the Stimulus Plan

This table tests two alternative stories of the loan-to-CB substitution. In the top panel of Basel III, column (1) and column (3) are the 1st and 2nd stages of the IV estimation running the following regression

$$\text{CbAccepted}_{cbpt} = \beta_0 + \beta_1 LoanGrowth_{bt} + \beta_X X_{cbpt} + \epsilon_{cbpt}$$

using the average bank-capital core capital ratio before 2009, $CoreRatio_{b,pre09}$, as the instrument. Column (2) and (4) are similar but using the average capital ratio before 2009, $CapRatio_{b,pre09}$, as the instrument. In the bottom panel of Hangover, we run the IV estimation of the following regression

$$\text{CbAccepted}_{cbpt} = \beta_0 + \beta_2 LoanGrowth_{cpt} + \beta_X X_{cbpt} + \epsilon_{cbpt}$$

using the $bl09$ as the instrument for $LoanGrowth_{cpt}$. Column (1) and column (3) are the 1st and 2nd stage results for the before-2015 sample. Column (2) and (4) are results for the after-2015 sample. Standard errors are in parentheses and clustered by bank branches. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

	Basel III			
	(1) Bank Loan Growth Rate	(2) Bank Loan Growth Rate	(3) Log Maturity Adjusted Bill (2011-2017)	(4) Log Maturity Adjusted Bill (2011-2017)
$CoreRatio_{b,pre09}$	0.482***			
	(0.112)			
$CapRatio_{b,pre09}$		0.239**		
		(0.118)		
Bank Loan Growth Rate			−3.096	−8.309
			(1.960)	(5.845)
Bank and City Controls as in Table IV	*Yes*	*Yes*	*Yes*	*Yes*
Year-Quarter FE	*Yes*	*Yes*	*Yes*	*Yes*
Observations	10179	5255	10179	5255
Adjusted R^2	0.237	0.151	0.045	0.026
	Hangover			
	(1) City Loan Growth Rate (Before 2015)	(2) City Loan Growth Rate (After 2015)	(3) Log Maturity Adjusted Bill (Before 2015)	(4) Log Maturity Adjusted Bill (After 2015)
$bl09$	−0.042***	0.042***		
	(0.009)	(0.010)		
City Loan Growth Rate			−21.658**	18.706**
			(8.901)	(8.729)
Bank and City Controls as in Table IV	*Yes*	*Yes*	*Yes*	*Yes*
Year-Quarter FE	*Yes*	*Yes*	*Yes*	*Yes*
Observations	16689	16764	16689	16764
Adjusted R^2	0.601	0.595	0.255	0.143

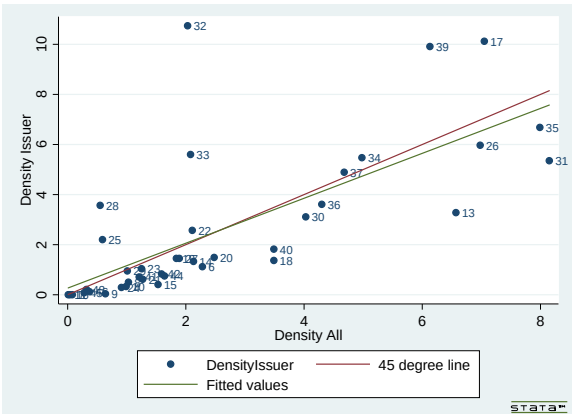
Table XI: Suppliers Increase their Payables in Response to the Trade Credit Lending of Bills

This table studies whether receiving more bills, $\widehat{CBIssue}_{ijt}$, predict suppliers' behavior in passing the trade credit shock to their own suppliers. The regression specification is the same as that in Table VII with the dependent variable replaced by the log account payables of the suppliers. Standard errors are in parentheses and clustered by pairs of customers and suppliers. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

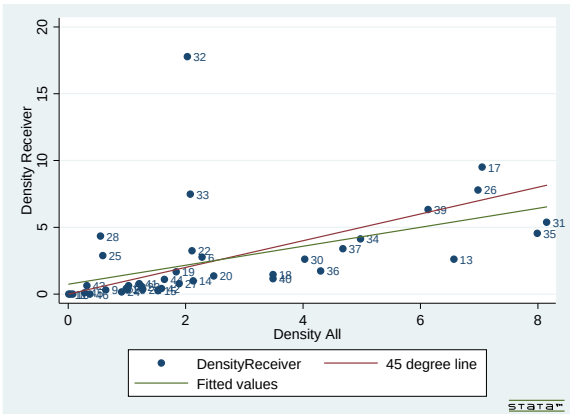
	(1)	(2)	(3)
Predicted Bill Issuance	0.163***		
	(0.050)		
Predicted Bill Issuance × Same City		0.161***	
		(0.050)	
Predicted Bill Issuance × Diff. City		0.186***	
		(0.051)	
Supplier's City Loan Growth	-0.094	-0.136	-0.610
	(0.517)	(0.516)	(0.492)
Supplier's Log Account Receivable	0.019	0.020	0.029*
	(0.017)	(0.017)	(0.016)
Constant	-3.833***	-3.772***	-3.082***
	(0.404)	(0.406)	(0.288)
Observations	4177	4177	4788
Adjusted R^2	0.701	0.702	0.704

Appendix

Figure A1: Comparing Industry Compositions in the Bill Data vs the ASIF Data



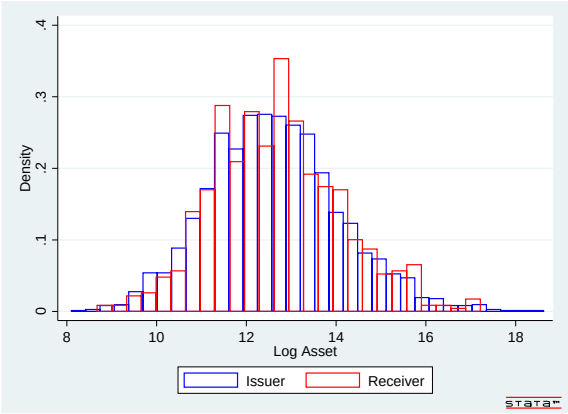
Issuer



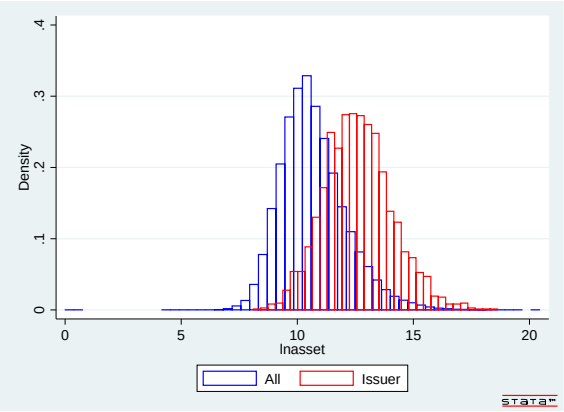
Receiver

Notes: markers are 2-digit CIC codes. The horizontal axis is the density of firms for each industry in the ASIF 2011-2012 data, while the vertical axis is the density of firms in the bill data.

Figure A2: Comparing Sizes in the Bill Data vs the ASIF Data



Issuer vs Receiver



Issuer vs ASIF

Notes: total asset information is from the ASIF 2011-2012 data.

Figure A3: Evidence of the City-Level LDR Regulation, Shanghai

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存贷比如期达标

根据《中国银行业监督管理委员会关于<中华人民共和国外资银行管理条例实施细则公布后有关问题的公告>》（银监发〔2006〕82号）的要求，在沪外资法人银行应当于2011年12月31日前符合《中华人民共和国商业银行法》第三十九条第（二）项“贷款余额与存款余额的比例不得超过75%”的规定。据统计，截至2011年末，在沪外资法人银行整体存贷比水平已降至70%以下，同时，所有在沪外资法人银行在2011年12月31日前均实现存贷比达标。监管达标的同时，在沪外资法人银行整体经营状况得到大幅提升，资产规模超千亿的银行增至5家，并具备较强的综合化经营能力，同时，盈利水平较2010年也有大幅增长。

为督促在沪所有外资法人银行存贷比如期达标，上海银监局采取了综合性监管手段，强化在沪外资法人银行流动性风险管理，督促合理安排存贷款结构，确保存贷比按期达标。在上海银监局指导下，在沪外资法人银行于2011年初制定了存贷比达标计划，并结合市场流动性状况合理预估存贷款变化趋势。达标压力较大的几家银行，也从存款吸收和贷款控制两个方面进一步拟定有效措施，实现了达标目标。同时，上海银监局督促银行落实以月度日均存贷比为基础的内部监测和考核机制，注重达标长效机制建设，通过调整资产负债结构、分币种管理、到期日管理、客户集中度管理等多种手段促进科学的存贷比管理。

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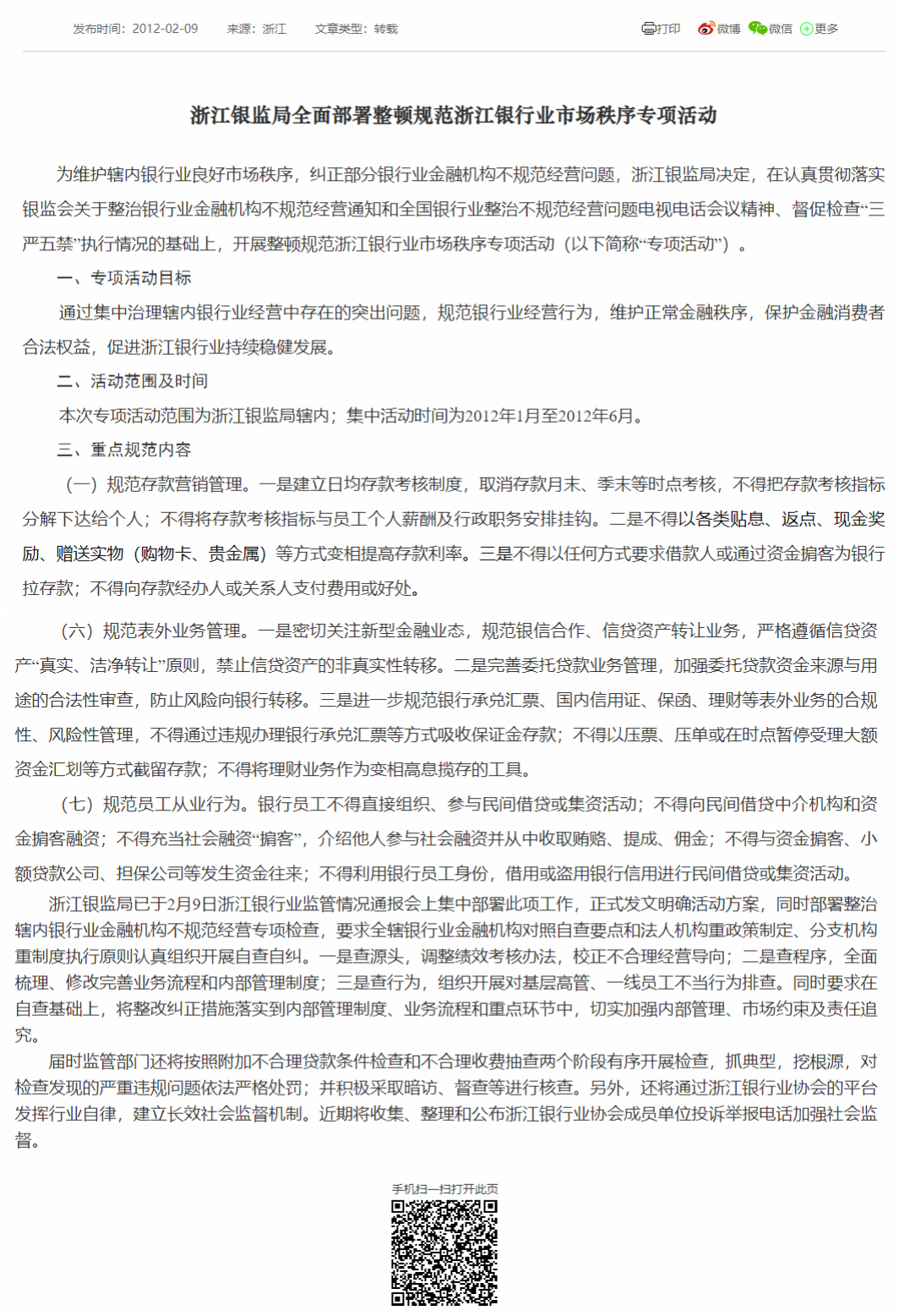
Notes: the screenshot is from the China Banking Regulation Commission website. The QR code in the bottom center can be scanned for linking to the webpage.

Figure A4: Evidence of the City-Level LDR Regulation, Xi'an

Notes: the screenshot is from the China Banking Regulation Commission website. The QR code in the bottom center can be scanned for linking to the webpage.

Figure A5: Evidence of the Loan-to-CB Substitution, Zhejiang



发布时间：2012-02-09　来源：浙江　文章类型：转载　打印　微博　微信　更多

浙江银监局全面部署整顿规范浙江银行业市场秩序专项活动

为维护辖内银行业良好市场秩序，纠正部分银行业金融机构不规范经营问题，浙江银监局决定，在认真贯彻落实银监会关于整治银行业金融机构不规范经营通知和全国银行业整治不规范经营问题电视电话会议精神、督促检查"三严五禁"执行情况的基础上，开展整顿规范浙江银行业市场秩序专项活动（以下简称"专项活动"）。

一、专项活动目标

通过集中治理辖内银行业经营中存在的突出问题，规范银行业经营行为，维护正常金融秩序，保护金融消费者合法权益，促进浙江银行业持续稳健发展。

二、活动范围及时间

本次专项活动范围为浙江银监局辖内；集中活动时间为2012年1月至2012年6月。

三、重点规范内容

（一）规范存款营销管理。一是建立日均存款考核制度，取消存款月末、季末等时点考核，不得把存款考核指标分解下达给个人；不得将存款考核指标与员工个人薪酬及行政职务安排挂钩。二是不得以各类贴息、返点、现金奖励、赠送实物（购物卡、贵金属）等方式变相提高存款利率。三是不得以任何方式要求借款人或通过资金掮客为银行拉存款；不得向存款经办人或关系人支付费用或好处。

（六）规范表外业务管理。一是密切关注新型金融业态，规范银信合作、信贷资产转让业务，严格遵循信贷资产"真实、洁净转让"原则，禁止信贷资产的非真实性转移。二是完善委托贷款业务管理，加强委托贷款资金来源与用途的合法性审查，防止风险向银行转移。三是进一步规范银行承兑汇票、国内信用证、保函、理财等表外业务的合规性、风险性管理，不得通过违规办理银行承兑汇票等方式吸收保证金存款；不得以压票、压单或在时点暂停受理大额资金汇划等方式截留存款；不得将理财业务作为变相高息揽存的工具。

（七）规范员工从业行为。银行员工不得直接组织、参与民间借贷或集资活动；不得向民间借贷中介机构和资金掮客融资；不得充当社会融资"掮客"，介绍他人参与社会融资并从中收取贿赂、提成、佣金；不得与资金掮客、小额贷款公司、担保公司等发生资金往来；不得利用银行员工身份，借用或盗用银行信用进行民间借贷或集资活动。

浙江银监局已于2月9日浙江银行业监管情况通报会上集中部署此项工作，正式发文明确活动方案，同时部署整治辖内银行业金融机构不规范经营专项检查，要求全辖银行业金融机构对照自查要点和法人机构重政策制定、分支机构重制度执行原则认真组织开展自查自纠。一是查源头，调整绩效考核办法，校正不合理经营导向；二是查程序，全面梳理、修改完善业务流程和内部管理制度；三是查行为，组织开展对基层高管、一线员工不当行为排查。同时要求在自查基础上，将整改纠正措施落实到内部管理制度、业务流程和重点环节中，切实加强内部管理、市场约束及责任追究。

届时监管部门还将按照附加不合理贷款条件检查和不合理收费抽查两个阶段有序开展检查，抓典型，挖根源，对检查发现的严重违规问题依法严格处罚；并积极采取暗访、督查等进行核查。另外，还将通过浙江银行业协会的平台发挥行业自律，建立长效社会监督机制。近期将收集、整理和公布浙江银行业协会成员单位投诉举报电话加强社会监督。

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Notes: the screenshot is from the China Banking Regulation Commission website. We crop the first and last thirds of the article and combine them together for shortening the length. See the full article via scanning the QR code in the bottom center.

Figure A6: Evidence of the Loan-to-CB Substitution, Zhejiang

发布时间：2015-07-17

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海南银监局认真落实“禁止以借款人非自愿申请的承兑汇票代替贷款发放”监管要求

银监会在今年一季度经济形势分析会上明确要求，禁止以借款人非自愿申请的承兑汇票代替贷款发放。海南银监局迅速落实，多措并举，有效防范了银行以承兑汇票代替贷款发放情况的发生。一是传达监管要求。通过监管会议要求辖内银行业加强对银行承兑汇票的管理和审查，严格按照有关规定和企业真实需求开展业务。二是考核导向。推动辖内银行业加大中间业务合规收费管理力度，不得对银行承兑汇票业务指标进行单独绩效考核，从源头遏制违规问题发生。三是非现场监管。按月监测银行承兑汇票的变化，对出现的异常情况及时了解核查；四是现场抽查。在“两个加强、两个遏制”的专项检查中，对部分银行的承兑汇票业务进行抽查，发现情况严肃处理。

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Table A1: Data Sources and Variable Definitions

Variable	Definition
Proprietary Commercial Bill Dataset	
Transaction-level Variables	
Order Value	The reported amount of individual bill transaction
Maturity	The time length between the issuing date and the due date
Adjusted Order Value	$\frac{\text{maturity}}{365} \times$ order value
Duration	The time length between the transaction date and the due date
Discount Rate	The percentage cost when the bill is discounted
Number of Bills	The number of bills transacted during one transaction
Number of Suppliers	The number of receivers the issuer has during certain year
Number of Customers	The number of issuers the receiver has during certain year
National Registry of Industry and Commerce(NRIC)	
Firm-level Variables	
Relative Registered Capital	$\ln(\frac{\text{registered capital of issuer}}{\text{registered capital of receiver}})$
SOE	A dummy which takes one if the firm is state owned enterprise
Pre-listed	A dummy which takes one if the firm has received X round$(A, B, ...)$ investment, angel investment or come to Pre-IPO stage, but has not been listed
Listed	A dummy which takes one if the firm is listed
Annual Survey of Industrial Firms (ASIF)	
Asset	Total asset of the firm
Age	The time length between sample year and the year firm started its business
ROA	$\frac{\text{total profit-income tax payable}}{\text{total assets}}$
Asset Turnover	Main business revenue/total asset
Leverage Ratio	Total liabilities/total assets
Investment to Capital Ratio	$\frac{\text{Total fixed assets}_t - \text{total fixed assets}_{t-1}}{\text{net total fixed assets}_{t-1}}$
Wind Database	
Macroeconomics Variables	
Loan Growth Rate	$\frac{\text{city loan balance in year } t}{\text{city loan balance in year } t-1}$
$\text{LDR}_{city,t}$	City yearly averaged headquarter bank LDR level that is calculated as $\sum_{b=1}^{B_{city}}(LDR_{b,t} \times \text{share}_{b,city,t})$
$\text{share}_{b,city,t}$	$\frac{\text{number of branches of bank b in city of year t}}{\text{number of branches of all banks in city of year t}}$
$B_{city,t}$	The number of distinct banks in city of year t.
Bank-level Variables	
Asset	Total asset of the bank
Registered Capital	Registered capital of the bank
Non-interest Income Ratio	Bank's non-interest income/operating income
LDR	Amount of outstanding loans/deposit balance
LDR_{pre09}	$\frac{1}{3}(LDR_{2006} + LDR_{2007} + LDR_{2008})$, which is the averaged LDR ratio from 2006 to 2008 for headquarter of bank branch b
Tier 1 Ratio	$\frac{\text{Tier 1capital}}{\text{total risk weighted assets}}$
Capital Ratio	$\frac{\text{Core capital}}{\text{total risk weighted assets}}$
	China National Bureau of Statistics
GDP	Gross domestic product of certain province

Table A2: Volumes of Acceptance and Discounting, Our Data versus Aggregates, Billion CNY

Aggregate acceptance data are the sum of acceptance values disclosed by 25 publicly listed banks, including all state-owned and joint equity ones. Aggregate discounting data is from the table of Sources & Uses of Funds of Financial Institutions from PBoC.

Year	Our Data	Aggregate	Coverage
	Acceptance		
2011	394	4640	8.49%
2012	767	5657	13.56%
2014	608	6153	9.88%
2015	603	5994	10.06%
2016	643	5376	11.96%
2017	201	4573	4.40%
2011-2017	3216	32393	9.93%
	Discounting		
2011	395	1512	26.09%
2012	767	2043	37.54%
2014	605	2917	20.74%
2015	605	4576	13.22%
2016	643	5471	11.75%
2017	202	3887	5.20%
2011-2017	3217	20407	15.76%

Table A3: Seasonality of Bank-Level Loan Growth Rates

This table uses the quarterly bank-loan growth rates from the Wind Database and runs the following regression by year

$$LoanGrowth_{bt} = \beta_0 + \beta_1 2ndQuarter_t + \beta_2 3rdQuarter_t + \beta_3 4thQuarter_t + \epsilon_{bt}$$

Standard errors are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

	2011	2012	2013	2014	2015	2016	2017
2nd Quarter	-0.008	-0.010	-0.021***	-0.011	-0.017	0.006	0.006
	(0.013)	(0.006)	(0.004)	(0.014)	(0.014)	(0.007)	(0.007)
3rd Quarter	-0.008	-0.016**	-0.020***	-0.025*	-0.016	0.004	-0.008
	(0.013)	(0.006)	(0.005)	(0.015)	(0.014)	(0.007)	(0.007)
4th Quarter	-0.014	-0.014**	-0.029***	-0.008	-0.025*	-0.003	-0.004
	(0.013)	(0.006)	(0.004)	(0.014)	(0.013)	(0.007)	(0.007)
Constant	0.054***	0.052***	0.055***	0.052***	0.053***	0.032***	0.032***
	(0.011)	(0.005)	(0.004)	(0.012)	(0.012)	(0.005)	(0.006)
N	105	141	124	166	413	649	768
Bank FE	YES	YES	YES	YES	YES	YES	YES
adj. R^2	-0.086	0.343	0.403	-0.041	0.050	-0.014	-0.095

Table A4: Bill Issuances for Firms Connected with Banks & in Cities with Different Loan Growth Rates, OLS Estimation, Firm-Level

This table implements the following OLS regression:

$$CbIssue_{icpt} = \beta_0 + beta_1 LoanGrowth_{bt} * Pre15 + \gamma_1 LoanGrowth_{bt} * Post15 + \beta_2 LoanGrowth_{cpt} * Pre15 + \gamma_2 LoanGrowth_{cpt} * Post15 + \beta_x X_{icpt} + \epsilon_{icbpt}$$

here c, i, p and t represent for city, issuer, province, and year. The sample includes issuers that issue bills from 2011 to 2017. The dependent variable CbIssue$_{icpt}$ is the maturity-adjusted sum of bill values issuer i in city c issued during year t. Variables other than $LoanGrowth_{bt}$ (quarterly) are at the annual frequency. $Pre15$ equals 1 if t is smaller than 2015 and otherwise. Column (1) includes all observations. Column (2) includes firms that bills both before and after 2015. Vice versa for $Post15$. Standard errors are in parentheses and clustered by issuers. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

	(1)	(2)
Bank-Level Loan Growth Rate × Pre15	0.141***	−0.179
	(0.050)	(0.126)
City-Level Loan Growth Rate × Pre15	−0.373*	−0.519
	(0.214)	(0.524)
Bank-Level Loan Growth Rate × Post15	0.657***	0.316*
	(0.137)	(0.187)
City-Level Loan Growth Rate × Post15	1.478***	0.541
	(0.367)	(0.438)
Log Average Maturity	2.512***	1.492***
	(0.057)	(0.092)
Log Issuer's Registered Capital	0.236***	
	(0.007)	
Log Issuer's Age	0.095***	0.244**
	(0.013)	(0.108)
State-Owned Issuer	−0.118	
	(0.130)	
Pre-Listed Issuer	−0.017	
	(0.120)	
Listed Issuer	−0.829***	
	(0.073)	
No. of Suppliers	0.541***	0.389***
	(0.021)	(0.031)
Log City GDP	−0.028*	−0.234
	(0.016)	(0.273)
Constant	−8.836***	0.485
	(0.369)	(2.300)
Year FE	*Yes*	*Yes*
Province FE	*Yes*	*No*
Issuer Industry FE	*Yes*	*No*
Issuer FE	*No*	*Yes*
Observations	42695	11955
Adjusted R^2	0.272	0.193

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$