The Economics of Shadow Banking: Lessons from Surrogate Intermediaries in China*

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Abstract

The shadow banking sector has grown tremendously in China in the last decade, developing in parallel with the rise of non-bank lenders in western economies. Chinese non-financial firms supply credit in the shadow banking sector, i.e., they behave as "surrogate intermediaries". Using hand-collected data on the entrusted loans made by listed firms to other firms, this paper analyzes the causes and consequences of this phenomenon. Deposit funding declines and therefore constrains loan growth differentially across banks, as banks have to comply with the 75% loan-to-deposit ratio restriction. Using the pre-determined geographic variation in the presence of constrained banks, I find that entrusted lending is more prevalent and more profitable in cities where traditional bank loans grow slower. Entrusted lenders also appear to use existing cash rather than raise external finance to make the loans. Overall, my results suggest that this segment of shadow banking fills the regulation-induced gap in bank loan supply and is unlikely to undermine financial stability.

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1 Introduction

Shadow banking, or credit intermediation outside the formal banking system, has continued to evolve since the 2007–09 Global Financial Crisis.[1] The shadow banking sector in China has been growing by more than 20% per year from 2.5 trillion Chinese yuan (400 billion US dollars) in 2007 to 25 trillion yuan (3.5 trillion dollars) in 2017, according to the Aggregate Financing to the Real Economy (AFRE) statistics by the People's Bank of China (Figure 1a).[2] A puzzling phenomenon is the rise of entrusted loans over this period. An entrusted loan is a firm-to-firm loan that is legally required to have a trustee bank to administer and service the loan, hence its name. The lending firm determines who and on what terms to lend to, and bears the credit risk of the loan.[3] These loans constitute the largest part of shadow banking in the AFRE statistics. Entrusted loans are made by non-financial firms with no access to deposits or short-term wholesale funding and arguably no expertise in credit evaluation and monitoring, yet they are sizable in the aggregate and perform a similar function to bank loans. The existence of such a phenomenon is surprising.

In this paper, I use hand-collected data from listed firms' annual reports to analyze

[1] Since the seminal work of Pozsar, Adrian, Ashcraft, and Boesky (2010), researchers and regulators have proposed different definitions for shadow banking. A commonly used definition in the literature only considers the short-term money instruments not backstopped by deposit insurance or central bank liquidity facilities (i.e., shadow money) such as commercial papers, repos, and money market funds. In this study, I adopt a broader definition proposed by the Financial Stability Board (FSB), which defines shadow banking as "credit intermediation involving entities and activities fully or partially outside the regular banking system, or non-bank credit intermediation in short" (Financial Stability Board (2014), p.4). This definition covers securitization and non-bank lenders. In the U.S. and other western economies, non-bank lenders have risen substantially in different credit markets including the mortgage market (Lux and Greene, 2015; Buchak, Matvos, Piskorski, and Seru, 2017) and peer-to-peer lending (Nash and Beardsley, 2015).

[2] This includes entrusted loans, trust loans, and undiscounted bankers' acceptances. Some instruments that are often discussed in media reports, such as wealth-management products or trust products, are "wrappers" or intermediate layers that pool funds and then invest in loans, bonds, and equities. They are excluded in the AFRE statistics that consider only the final instruments that provide capital to end-users in the real economy (domestic non-financial enterprises and households).

[3] The common form of firm-to-firm lending is trade credit—financing for the purchase of goods extended by suppliers to their customers. Entrusted loans differ from trade credit critically as they are not tied to specific transactions of goods. Section 2.2 discusses the difference between entrusted loans and trade credit in greater detail.

the rise of entrusted lending over the period from 2011 to 2016. I provide evidence that this rise was a response to a slowdown in traditional bank lending caused by regulatory enforcement of the 75% cap on banks' loan-to-deposit ratios, which created incentives for borrowers to find lenders from outside of the financial sector to fill the gap in loan supply. In addition, I find that entrusted lenders do not appear to raise external finance to make these loans. Rather, they rely on their existing cash.

The main challenge is the empirical identification of the mechanism through which the regulatory constraint creates an environment conducive to entrusted lending. The co-occurrence of the declining share of bank credit and the increasing share of entrusted loans in total financing (Figure 1b) is not sufficient to establish such a mechanism as it can be confounded by time trends, shifting loan demand, etc. Moreover, information on entrusted lenders, in particular information on how entrusted loans are funded, is necessary for assessing the financial stability implications of this phenomenon.

In order to study the mechanism as well as the financial stability implications, I use data made available by securities regulation. Listed firms are required to disclose their entrusted lending activities by the China Securities Regulatory Committee (CSRC), the securities regulator in China, as well as the stock exchanges. I collect information on these activities from annual reports for the universe of non-financial firms listed on the Shanghai and Shenzhen stock exchanges from 2011 to 2016.

Using this micro-level dataset, I find an economically large and statistically significant relationship between the city-level bank loan growth and the propensity of listed firms to engage in entrusted lending when the confounding time trends are controlled for by the inclusion of time fixed effects. The remaining major concern against a causal interpretation is that the realized bank loan growth covaries with omitted variables that affect entrusted lending. Specifically, the true demand for loans, which cannot be observed, is the omitted variable. In cities where the true demand for loans is weaker, both bank loans

and entrusted loans have a slower growth in the equilibrium. Therefore, OLS is going to underestimate the negative relationship between bank loans and entrusted loans.

To address the omitted variable concern, I explore the structural forces in the regulated banking sector that drive the bank loan growth to vary across cities. I first establish that a combination of two forces, the decline in deposit funding and the regulatory enforcement of the 75% loan-to-deposit ratio (LDR) restriction, results in substantial cross-sectional variation in the tightness of bank loan supply. Based on these observations, I construct an instrument for the endogenous city-level bank loan growth.

From 2011 to 2016, deposit funding declines for commercial banks across the board. Such a decline can affect the supply of bank loans by itself due to the unique synergy between deposit-taking and lending . The LDR regulation in China, which restricts loans to be at most 75% of deposits at each bank, imposes a further and explicit link between deposits and loans. However, this restriction is a binding constraint on making loans only for banks with a high level of initial LDR. Based on this, I classify banks as constrained banks or unconstrained banks.

This bank-level variation affects the city-level bank loan growth through the substantial geographic dispersion in the presence of constrained banks, as measured by the branch market share. I show that cities with a higher pre-determined presence of constrained banks experience a lower growth in bank loans. Such a disparity is not caused by loan demand factors proxied by macroeconomic indicators—in other words, the LDR regulation induces a gap in bank loan supply in cities where there are more constrained banks. These cities are effectively constrained cities.

Having established that the LDR regulation constrains loans differentially across banks and thus that it induces a gap of bank loan supply in cities with a higher presence of constrained banks, I investigate whether entrusted lending responds to this supply gap in a 2SLS framework. I use the inner product of the pre-determined market share of con-

strained and unconstrained banks at the city level and the loan growth of these two types of banks at the national level as the instrument for the observed bank loan growth. While 2SLS results are broadly consistent with OLS results in terms of sign and significance, they have magnitudes 4 to 5 times higher. That is, a one-standard-deviation change in the city-level bank loan growth accounts for about 30% of the overall entrusted lending propensity. This difference in magnitude reflects that the instrument using pre-determined bank presence and national growth rates purges local demand factors, and hence corrects the attenuation bias of the OLS estimate.

I also look at the profitability in the sample of entrusted lenders, measured as the realized return divided by the average balance of entrusted loans. The realized return reflects impact of the entrusted lending business on the lending firm's bottom line, and is equal to the interest income net of the commission paid to the trustee bank and loan losses if there are any. Firms make more profit from making entrusted loans in cities where bank loans grow slower in both OLS and IV specifications. This result implies that entrusted lenders supply capital to worthy borrowers who are left out by constrained banks and in doing so make a profit.

Next, I study the funding structure of entrusted loans by examining firm-level characteristics that explain listed firms' propensity to engage in entrusted lending. Larger firms and state-owned enterprises are more likely to make entrusted loans. Among three contemporaneous measures of resources—existing cash, operating profitability, and external finance—only existing cash is positively associated with the probability of entrusted lending. Since cash is fungible within a firm, the exact funding source of entrusted loans cannot be pinned down. Nonetheless, the contrasting statistical significance of existing cash and external finance indicates that entrusted lenders rely on existing cash, not external finance, to fund the loans. This finding corroborates the usual claim made by entrusted lenders in their disclosures that entrusted loans are funded with free cash. The lack of

reliance on external finance also limits the scope of plausible concerns about the financial stability consequences of this phenomenon, since under stress scenarios the lending firms can presumably absorb losses without defaulting on their external claims.

Having established that listed firms are more likely to engage in entrusted lending in constrained cities, I examine the effects of this constraint on the aggregate credit supply using the province-level AFRE flow data. I find that there is a higher flow of entrusted loans in provinces with a higher market share of constrained banks, consistent with my main results using firm-level data. Other forms of shadow banking, however, do not respond to the supply shock similarly. In particular, the dynamics of trust loans is very similar to the dynamics of bank loans, reflecting the possibility that banks pass on the constraints they face to the trust plans. Capital markets also provide more financing to provinces with a higher presence of constrained banks. Overall, the increase in entrusted loans and capital markets financing is not sufficient to fully offset the shortfall of banks' credit supply in these provinces, resulting in a decline of the flow of total financing.

Taken together, these results suggest that entrusted lending fills the regulation-induced gap of bank loan supply and may have played a role in sustaining economic growth. A central question in the economics of shadow banking is why shadow banks co-exist with banks that are specialists in fundraising, credit evaluation, and monitoring. A widely held view is that shadow banking is a mechanism for banks to evade banking regulation (a strategy called "regulatory arbitrage").[4] My results identify a different form of banking regulation circumvention: non-banks function like banks in an unregulated way. Impos-

[4]Banks' regulatory arbitrage—taking on risks and financing structures that were not subject to significant capital requirements—often involves shadow banking entities and instruments. For instance, Pozsar et al. (2010) point out that in the securitization process under the umbrella of a financial holding company, the bank subsidiary not only originates loans, but also lends to the broker-dealer subsidiaries and the bankruptcy-remote special purpose vehicles (SIV) set up by broker-dealers. Acharya, Schnabl, and Suarez (2013) find that commercial banks set up asset-backed commercial paper conduits to reduce regulatory capital requirement. Other forms of regulatory arbitrage studied in the literature include trust-preferred securities issuance (Boyson, Fahlenbrach, and Stulz, 2016) and under-reporting the risk in the trading book (Begley, Purnanandam, and Zheng, 2015), among others.

ing more stringent banking regulation can induce the growth of shadow banking which in turn justifies expanding banking regulation into the shadow banking sector. Such a migration is often viewed a threat to financial stability on the grounds that shadow banking activities are opaque and hence shady. Contrary to this popular perception, I find that entrusted lending is unlikely to undermine financial stability despite its being unregulated.

This paper relates to several strands within the literature. First, I contribute to the emerging literature on China's shadow banking. Acharya, Qian, and Yang (2016) and Hachem and Song (2017a,b) focus on banks' regulatory arbitrage in the form of wealth-management products. Zhuo Chen, He, and Liu (2017) attribute shadow banking activities to the rollover of bank loans that local governments borrowed during the 2009 four-trillion-yuan stimulus plan. Chen, Ren, and Zha (2017) focus on the nexus of monetary policy and shadow banking and find that the response by small- and medium-sized banks renders monetary policy less effective. The closest to my paper is Allen, Qian, Tu, and Yu (2015), who study the lender, borrower, and loan characteristics of entrusted loans made by listed firms using a similar dataset as my own. They find that the pricing of both loans between related and unrelated parties incorporate fundamental and informational risks, and they also predict future loan performance. My paper indicates that not only can regulation of the banking sector trigger the shadow banking expansion of banks and other financial institutions, it can also encourage non-financial firms to behave like banks.

This paper also contributes to the literature on the bank lending channel. There is now a large set of robust empirical evidence that shocks to bank funding propagate across markets and have real economic effects (see Peek and Rosengren (1997), Peek and Rosengren (2000), Paravisini (2008), Chava and Purnanandam (2011), Schnabl (2012), Chodorow-Reich (2014), and Gilje, Loutskina, and Strahan (2016)). The findings on real economic effects imply that firms facing a withdrawal of one financing source (bank credit, in this case) cannot frictionlessly switch to an alternative financing source. My contribution is to

show that there is a novel supply-side adjustment in response to shocks to bank lending: non-financial entities can fill the credit shortage left by affected banks by providing credit themselves.[5]

This finding is related to studies that challenge the traditional divide found in empirical finance between non-financial firms and financial firms. Hattori, Shin, and Takahashi (2009) show that the financial liberalization of the 1980s in Japan opened new funding sources for large manufacturing firms who consequently became *de facto* financial intermediaries. Shin and Zhao (2013) find that in recent decades, industrial firms in China, India, Indonesia, and Korea have a positive elasticity of financial assets with respect to financial liabilities, as opposed to the textbook prediction that industrial firms would have a negative elasticity. Duchin, Gilbert, Harford, and Hrdlicka (2017) find that US industrial firms invest heavily in corporate debt, equity, and MBS, and in doing so they effectively constitute an unregulated asset management industry of more than $1.5 trillion. My paper reveals that non-financial firms can respond to the regulatory forces in the banking sector and substitute for bank lending.

The paper proceeds as follows: Section 2 provides an overview of institutional details about regulation of the banking sector and entrusted loans in China; Section 3 describes the data; Section 4 lays out the empirical methodology; Section 5 presents the results; Section 6 concludes.

[5] Allen et al. (2015) interpret entrusted lending as a market solution to credit shortage based on the finding that entrusted lending increases when the interbank offer rate is higher. This measure of credit supply has only time-series variation and hence is confounded by time trends and other time-varying aggregate factors. Also, the substantial interbank market power possessed by large banks (Hachem and Song, 2017a) potentially weakens the relevance of the interbank rate for the bank credit supply to the real economy.

2 Institutional Background

2.1 Regulation of the banking sector

Regulation of the banking sector in China is far more extensive and dynamic in nature than in western economies. First, the People's Bank of China (PBoC), China's central bank, sets the baseline deposit and lending rates for different maturities that vary with business cycles, and has only started to liberalize rates in recent years. Second, Chinese banks face a loan-to-deposit restriction, which mandates that lending is capped at 75% of deposits. Third, implicit lending quotas are still in place despite the removal of an explicit detailed quota system. Finally, the PBoC adjusts reserve ratios frequently to either combat inflation and sterilize the inflows of "hot money", or else to stimulate the economy.

This strict and complex form of banking regulation can induce the growth in the shadow banking system in two ways: it can motivate banks to expand their shadow banking activities to circumvent regulation, or it can encourage the non-bank entities to initiate credit intermediation. Either way, stringent banking regulation can potentially push risks into uncharted territories.

The key element of banking regulation I focus on in this paper is the loan-to-deposit ratio (LDR) regulation. This regulation was written into the law on commercial banking in 1995, but the enforcement was lax until 2008. The China Banking Regulatory Commission (CBRC) toughened the LDR regulation several times by increasing the frequency of LDR monitoring in the period from 2008 to 2011 (Hachem and Song 2017a,b): it started with monitoring end-of-year ratios. The CBRC switched to end-of-quarter ratios in late 2009 and to end-of-month ratios in late 2010. In mid-2011, the CBRC switched to average daily ratios. Subsequent years have witnessed a gradual relaxation of this constraint. The CBRC relaxed the LDR regulation in 2014 by allowing the exclusion of certain types of

loans from the numerator and also expanding the set of the permissible types of deposits in the denominator of the calculation of LDR. In late 2015, the CBRC formally dropped the LDR from its liquidity regulation, but it continued to require banks to report their ratios.

In principle, the banking regulator uses the LDR restriction as a tool for liquidity regulation under the premise that depositor funds not invested in loans are invested in liquid assets. The ability of this tool to safeguard banks' liquidity conditions is limited, as it imposes no restriction in other assets.

2.2 Entrusted Loans

An entrusted loan is the contractual arrangement governing the lending initiated by non-financial companies and involves three parties: the lender or trustor, who funds the loan; the trustee bank, who manages the administration and collection of the loan and charges a commission; and the borrower. Notably, the trustee bank plays a very limited role. It does not determine who to lend to or on what terms the loan is made, nor does it bear the credit risk of the entrusted loan. For instance, the following excerpt from Industrial & Commercial Bank of China's 2016 Annual Report is typical:

> The Group grants entrusted loans on behalf of trustors, which are recorded off-balance sheet. *The Group, as a trustee, grants such entrusted loans to borrowers under the direction of those trustors who fund these loans*. The Group has been contracted by those trustors to manage the administration and collection of these loans on their behalf. *Those trustors determine both the underwriting criteria for and the terms of all entrusted loans including their purposes, amounts, interest rates, and repayment schedules*. The Group charges a commission related to its activities in connection with entrusted loans which are recognised ratably over

the period in which the service is provided. *The risk of loss is borne by those trustors.* [Emphasis added.]

Therefore, servicing entrusted loans is a commission-only activity for a bank and is not recorded in any form on the balance sheet of the bank. Furthermore, servicing entrusted loans differs from off-balance-sheet exposure that can be converted onto the balance sheet (contingent assets) such as credit line lending.

The lending firm records the outstanding amount of entrusted loan(s) on its balance sheet. The interest income minus the commission paid to the servicing bank and any write-down losses affects its bottom line. A related form of firm-to-firm lending is trade credit where one firm effectively provides credit to another firm it does business with when the delivery of a good or service and the payment do not happen at the same time. In the common case where the good is shipped in advance of payment (i.e., an *open account transaction*), the selling firm provides credit to the buying firm.[6] The key distinction between entrusted loans and trade credit is that entrusted loans are not tied to specific transactions of goods. This means that two non-financial motives for firms to provide trade credita tool to implement price discrimination and a warranty for product quality-cannot be operative for entrusted loans. The accounting treatment is also different. While entrusted loans are typically recorded as *other current assets* or *other non-current assets* depending on the maturity, lending via trade credit is recorded as *accounts receivable*.

[6]The alternative form of trade credit is the *cash-in-advance payment* where the payment is made before the good is shipped. In this case, the buying firm provides credit to the selling firm. The literature on trade credit mostly focuses on the supplier-extended trade credit and seldom considers this alternative form. Entrusted loans differ from both forms of trade credit critically.

3 Data

3.1 Firm data

The sample consists of all firms listed on the Shanghai and Shenzhen stock exchanges from 2011 to 2016.[7] I exclude financial firms based on the CSRC's industry classification for listed firms. From their annual reports, I hand-collect the data on two aspects of entrusted lending activities mandated by the stock market information disclosure regulation.

Entrusted lending activities: In China, listed companies are required to disclose the positions of their financial investments in their annual reports, provided that the total transaction amount (expected return) exceeds 10% of their total asset (net income). Not all types of financial investments constitute shadow banking activities. Not all types of financial investments constitute shadow banking activities. Only three forms of financial investments can be arguably viewed as supplying shadow bank loans: direct lending to another firm in "entrusted loans," investments in medium-term asset management vehicles which lend out the funds in loans, and taking ownership stakes in financial institutions. I mainly focus on entrusted lending in this paper, as it is the most prevalent form and the role of the lending firm is most like that of a bank.

Income from entrusted lending: CSRC Document 2008-43 requires that listed firms disclose their non-recurring income from 21 categories, including the income from making entrusted loans. This is equal to the interest income net of any commission fee expenses or losses from any write-downs, and reflects the contribution of making entrusted loans to the bottom line of the firm. A lending firm may disclose its expected and/or realized income from making entrusted loans in a footnote on the investment details described

[7] Following the standard practice in the literature, firms that only issue B-shares are excluded (less than 1% of all public firms as of 2016). B-shares are denominated in foreign currency and issued to foreign investors.

above. I prefer the disclosure under non-recurring income to this alternative for the following two reasons. Firstly, disclosing the income under investment details is not strictly mandated and is quite scarce in the data. On the contrary, disclosing the income under non-recurring income is mandatory for all firms and has much better coverage in the data. Secondly, it is unclear whether the income disclosed under investment details takes commission expenses or write-down losses into account; hence, it is a much noisier measure of the true economic profitability than the income disclosed under non-recurring income.

I also use the accounting data from the China Securities Market and Accounting Research database (CSMAR) and the WIND Financial Terminal, two standard databases on Chinese capital markets, to scale variables appropriately and to construct firm characteristics used as control variables in the regressions. The constructions of specific variables are explained greater detail in related sections and in the appendix.

Table 1 reports the summary statistics of entrusted lending. The unit of observation is firm-year. It is an unbalance panel dataset as the number of listed firms grows. The mean and the median of total assets and the indicator of whether the firm makes entrusted loans are taken from the full sample, while the mean and the median of the ratio of entrusted loans to total assets are calculated conditionally on the indicator equal to 1. On average, about 15.7% of firms make at least one entrusted loan in a year. The size of entrusted loan assets remains small relative to total assets, reflecting that firms in the sample continue to operate primarily in non-financial industries.

3.2 Bank financial data

The data on the financial conditions of banks is available from the annual reports of banks that are listed in the stock market or have issued commercial bank bond in the bond market. I use the data compiled by the WIND Financial Terminal, which include

the income statements, the balance sheets, and the statements of cash flows, as well as banking-specific indicators such as the loan-to-deposit ratio.

As described in Section2.1, the loan-to-deposit ratio, which the banking regulation targets, does not simply equal the ratio of end-of-year loans to end-of-year deposits. Banks report their regulatory loan-to-deposit ratios in their annual reports. I cross-check the WIND data on LDR against the annual reports for a random subset of banks in order to verify that the WIND data is of good quality.

For measuring deposits and loans, I use the data from the parent-only financial statements rather than the data from the consolidated financial statements, as the LDR regulation is implemented and monitored at the individual bank level rather than at the group level.

3.3 Bank branch data

To obtain the geographic measure of banks, I use the branch information from CBRC's central registry of bank branch licenses.[8] This registry contains data on the universe of branches or offices of all banking financial institutions and reports the opening date, closing date (if closed), operation location, and affiliation of each branch.

To calculate the branch market share, I keep only the banking institutions that can legally take deposits from the public and use such deposit-taking as an important source of funding: commercial banks (large banks, the Postal Savings Bank of China, joint-stock banks, urban and rural commercial banks, rural cooperative banks, foreign banks, private banks, and village banks) and credit cooperatives (urban and rural credit cooperatives). Three types of banking institutions are excluded. The first type is the three policy banks who take few deposits and instead rely on issuing quasi-government bonds as the pri-

[8]URL: `http://xukezheng.cbrc.gov.cn/ilicence/licence/licenceQuery.jsp`. Acharya et al. (2016) and Cong and Ponticelli (2017) also use this data.

mary source of funding; they are not subject to the loan-to-deposit ratio restriction. The second excluded type is the finance companies set up by business groups. They are depository institutions, but can only take deposits from and make loans to member firms in the business groups. The third excluded type is the non-depository banking financial institutions—banking institutions that are subject to the supervision and regulation of PBoC and CBRC but that are not allowed to take deposits. This category includes asset management companies, trust companies, financial leasing companies, auto finance companies, currency brokerage firms, loan companies and mutually financial companies among farmers, consumer finance companies, etc.

3.4 Regional data

Data on bank loans, GDP, GDP per capita, and other macroeconomic indicators are published by PBoC, CBRC, National Bureau of Statistics, and downloaded from CEIC. I use city-level data in the main analysis of entrusted lending activities of listed firms, and provincial-level data in the analysis of aggregate credit supply effects.

4 Empirical Model

The central hypothesis of this paper is that entrusted lending substitutes for bank lending. It is motivated by the similar functions these two types of loans perform. In this section, I present the empirical model to test my hypothesis, as well as how I address threats to identification.

4.1 Baseline specification

The baseline specification follows Model (1):

$$y_{i,n,j,t} = \alpha + \beta \Delta LogBankLoan_{j,t} + \gamma X_{i,t} + \theta Z_{j,t} + \pi_{n,t} + \varepsilon_{i,n,j,t} \tag{1}$$

The unit of observation is firm-year. In the model, i indexes firm, n indexes industry, j indexes city, and t indexes year. The dependent variable is a measure of entrusted lending outcomes. $\Delta LogBankLoan$ is the log growth rate of bank loan in city j. Firm characteristics included in Model (1) include size (natural logarithm of total assets), a state-owned enterprise (SOE) indicator, cash balance at the beginning of the year normalized by total assets, operating cash flow normalized by total assets, and financing cash flow normalized by total assets. Furthermore, I include economic indicators $Z_{j,t}$ at the city level to control for loan demand and industry-year fixed effects $\pi_{n,t}$ to remove unobserved time-varying industry heterogeneity. Standard errors are clustered at the industry-year level.

The key variable of interest is $\Delta LogBankLoan$. The sign and the significance of its coefficient reflects the extent to which the entrusted lending by non-financial firms provides substitutes for bank loans. The major obstacle to interpreting the baseline results as causal is that realized growth of bank loans is endogenous. The bias stemming from omitted variables is the main source of problematic endogeneity. An important omitted variable is the true demand for loans, which cannot be observed. In cities where the true loan demand is weaker above and beyond the level accounted for by the proxy variables, we are going to observe a lower growth of both bank loans and entrusted loans in the equilibrium. The other common source of endogeneity concerns is the reverse causality, namely the possibility that the rise of entrusted loans causes bank loans to grow slower in my setting. This is not plausible because non-financial firms cannot conceivably compete with banks who are specialists in fund-raising, credit evaluation, and monitoring

absent of frictions. Therefore, the baseline OLS specification is going to underestimate the negative relationship between bank loans and entrusted loans.

To address the omitted variable concern, I explore the supply side factors that drive the growth of bank loans to vary across cities. In Section 4.2, I first establish that deposit funding has declined for commercial banks. Such a decline matters for the supply of bank loans. The 75% loan-to-deposit ratio regulation imposes a binding constraint on making loans for banks with a high level of initial LDR. Then in Section, I show that such a differential level of constraints in the cross-section of banks results in lower bank loans in cities with a higher presence of constrained banks, and that this disparity is not caused by loan demand factors proxied by macroeconomic indicators. In other words, the LDR regulation induces a gap of bank loan supply in cities where there are more constrained banks. Based on this fact, I set up the regression specification to examine how entrusted lending by firms responds to the supply shock caused by constraints in the banking sector. Based on these observations, I construct the instrument for the endogenous city-level bank loan growth and establish its validity in Section 4.4.

When the outcome variable is the indicator of making entrusted loans, Model (1) corresponds to the linear probability model (LPM). The alternative is to use a nonlinear binary choice model such as the probit or logit model. I use the linear probability model as it readily accommodates the inclusion of fixed effects[9] and the standard 2SLS technique for the instrumental variables analysis. I report the probit and logit results in Appendix B.

[9]The unconditional fixed-effects probit and logit models, direct analogues to the linear fixed-effects model, result in estimates inconsistent in the large sample and biased in the small sample due to the incidental parameters problem. The conditional fixed-effects models are valid when there exists a minimal sufficient statistic to allow the fixed effects to be conditioned out of the likelihood. Such a sufficient statistic is available for the logit model, but not the probit model. The conditional logit model, however, can only accommodate a limited number of fixed effects. See Chapter 17.4 of Greene (2017) for an in-depth discussion of binary choice models for panel data.

4.2 Decline in deposit funding and the supply of bank loans

Deposit funding has declined for commercial banks across the board. Figure 2a plots the ratio of deposits to total assets for large banks (solid line), medium banks (dashed line), and small banks (dotted line) separately. The decline mainly comes from the decline in core deposits (Figure 2b), as the ratio of non-core deposits to total assets has remained steady or even increased slightly (Figure 2c). Several factors contribute to this decline. Financial innovation such as wealth-management products and Yu'e Bao is the main reason of this decline. These products offer liquidity and convenience comparable to regular deposits, yet at a much higher yield.[10] The development of the stock market and the bond market also provide savors valuable investment opportunities.

The decline in in deposit funding has a profound impact on the credit supply of banks. The banking literature has shown that deposit-taking and lending—the two core functions of banks—are closely linked to the extent that the deposits represent a unique stable source of funding that makes banks particularly suitable to invest longer-term and illiquid assets such as loans (e.g. Hanson, Shleifer, Stein, and Vishny (2015), Drechsler, Savov, and Schnabl (2017)). This is relevant for China as (a) the deposit rate is capped, (b) implicit government guarantee served as deposit insurance before such insurance is formally introduced. The LDR regulation imposes another linkage between deposit funding and lending. Even if banks find valuable lending opportunities that they are willing to fund using more expensive non-deposit liabilities, they cannot do so if they are constrained by the loan-to-deposit ratio.

I classify banks whose LDR at the end of 2010 was 70% of higher as constrained banks, and the remaining banks as unconstrained banks. I obtain similar results using 65% as

[10] Banks who take regular deposits constitute a majority of issuers of wealth-management products. Funding obtained from issuing wealth-management products, however, is distinctive from deposit funding for banks: the guaranteed portion is typically recorded on-balance-sheet as *financial liabilities at fair value through profit or loss*, and the non-guaranteed portion is recorded off-balance-sheet.

the LDR cutoff for constrained banks. These results are reported in Appendix C.

Does this characterization measure the degree of being constrained? The answer is yes. In Figure 3, I plot the average of loans normalized by the level of loans in 2010 among unconstrained banks (solid line) and unconstrained banks (dotted line). Both lines take the value of 1 in 2010 by construction and represent the average cumulative loan growth for the two groups of banks. Constrained banks make fewer loans than unconstrained banks.

In Figure 4, I separately plot the average actual loan balance and the maximum allowable loan balance (75% multiplied by deposits) for constrained and unconstrained banks separately. The space between the two lines represents the slackness of the LDR restriction. Unconstrained banks have ample slackness, while constrained banks have little slackness.

4.3 Geographic variation of constrained banks

Consistent with the timing choice for determining constrained banks, I calculate the market share of constrained banks for each city at the end of 2010. Figure 5 shows the geographic dispersion in the market share of constrained banks: the darker the color, the higher the market share.

Figure 6 establishes that the effect of the LDR constraint at the bank level demonstrated in Figure 3 and 4 matters for the bank loan supply at the city level. In this graph, I plot the average of bank loans normalized by the level of bank loans in 2010 among cities whose constrained banks' market share are below the median (solid line) and above the median (dotted line). Both lines take the value of 1 in 2010 by construction and represent the average cumulative loan growth for the two groups of cities. Cities with high constrained banks' market share experienced similar level of loan growth experienced by

cities with low constrained banks' market share until 2010, but they have substantially lower loan growth since 2010.

The assumption under which the econometrician can attribute this divergent growth in bank loans to the supply shock is that the demand for loans does not correlate with the presence of constrained banks in the cross-section of cities. I examine proxies of loan demand to validate this assumption. Figure 7 shows that cities with a higher pre-determined constrained bank presence do not have lower loan demand proxied by GDP per capita. In fact, the average normalized GDP per capita among constrained cities is slightly higher than the average among unconstrained cities. The demand for loans is higher, if anything. Therefore, the diverging growth in bank loans revealed in Figure 6 is not caused by constrained cities having a weaker demand for loans on average.

4.4 Instrumental variables approach

Because the omitted variable concern may persist due to that the economic indicators I include are not sufficient to fully control for loan demand, I construct an instrumental variable for $\Delta LogBankLoan$ by interacting pre-determined market shares of constrained and unconstrained banks at the city level with the average growths of these two types of banks at the national level:

$$Z_{j,t} = \sum_{\substack{type \in \{constrained,\\ unconstrained\}}} share_{type,2010} \Delta LogBankLoan_{type,t} \tag{2}$$

This construction can be viewed as a Bartik research design (Bartik, 1991; Goldsmith-Pinkham, Sorkin, and Swift, 2017). For other applications of the Bartik research design for studying credit markets, see Greenstone, Mas, and Nguyen (2014); Cong and Ponticelli (2017).

For this to be a valid instrument, it must meet the relevance condition and the exclusion restriction. To evaluate the instrument relevance condition, not only do I examine the first-stage F statistic as is standard in the literature, but I also report Shea (1997) partial R^2, i.e., the "squared partial correlation" between the excluded instrument *BankSupplyShock* and the endogenous regressor $\Delta LogBankLoan$. A long list of control variables, especially high-dimensional fixed effects, can lead to a high first-stage R^2 and a F statistic above the rule-of-thumb value of 10 when the excluded instrument is weak (Jiang, 2017). The partial R^2 purges the explanatory power of the control variables that are included in both the first- and second-stage equations, and provides a sharper picture of what fraction of the sample constitutes "compliers" and hence contributes to the identification.

The exclusion restriction is harder to establish because the locations of bank branches are not random. The fact that proxies for loan demand do not exhibit differential trends in constrained cities vs unconstrained cities lends some credence to the exclusion restriction. I also directly control for these proxies of loan demand in the regression. In addition, I fix the shares at the pre-determined level in the construction of the instrument to avoid endogeneity originated from that shares update as a function of the growth rates.

5 Results

5.1 Probability of making entrusted loans

Table 2 reports the OLS estimates of the extensive margin of entrusted lending. The dependent variable is an indicator variable that equals 1 if the firm makes one or more entrusted loans in year t and 0 otherwise. They are linear probability models.

Table 3 reports the first-stage results from a 2SLS model using the supply shock instrument defined in (2). The coefficient on the supply shock instrument is positive and

statistically significant with or without the inclusion of additional controls.

Table 4 reports the second-stage results from the 2SLS model as well as the reduced-form results.

Regardless of which specification is used, bank loan supply tightness in a city is negatively associated with the probability that a listed firm located in the given city engages in entrusted lending. In interpreting the coefficient and assessing its economic significance, I focus on the IV estimates. A decline of one percentage point in the growth rate of traditional bank loans is associated with an increase of 1.338 percent points in the probability of making entrusted loans. The economic significance is that a decrease of one standard deviation in the growth rate of traditional bank loans, which corresponds with 3.5 percentage points, leads to an increase of 4.7 percentage points in the probability that the listed firm will make entrusted loans, which accounts for 30% of the unconditional probability of 15.7 percentage points. The magnitude difference between the OLS estimate and the 2SLS estimate reflects that the instrument using pre-determined bank presence and national growth rates purges local demand factors, and hence corrects the attenuation bias of the OLS estimate.

The coefficients of various firm characteristics are also interesting to look at. Larger firms and state-owned enterprises are more likely to make entrusted loans. The next three variables (all expressed as a percentage of total assets) represent three different sources of funding for making entrusted loans: available existing cash at the beginning of this year, net cash flow generated from operating activities, and net cash flow generated from financing activities. The coefficient of the existing cash variable is statistically and economically significant: a one percentage point increase in the constrained banks' market share is associated with an increase of 0.05 percentage points in the probability of making entrusted loans. A one-standard-deviation increase in existing cash (16 percentage points) leads to a 0.8 percentage points increase in the probability of making entrusted

loans, which accounts for 5.1% of the unconditional probability of 15.7 percentage points. The coefficient of the operating cash flow variable is negative and insignificant. There is no evidence that entrusted lenders rely on cash generated from their profitable operating activities. The coefficient of the net financing variable is positive but, again, insignificant. When the net financing is split into the internal part and the external part, only the internal financing cash flow variable is significantly positive. To the extent that entrusted lenders raise financing to make loans, they obtain the funding from within the business groups rather than from banks or securities markets.

5.2 Profitability of making entrusted loans

Table 5 presents the OLS estimates of the determinants of the profitability from making entrusted loans. The dependent variable is the return on assets (ROA) measure for entrusted lending, defined as the realized income over the average balance of entrusted loans. The firm-year observations that do not make any entrusted loans are excluded for this analysis.

Table 6 reports the first-stage results from a 2SLS model using the supply shock instrument defined in (2). This table presents the relevance of the instrument in the intensive margin. Table 7 reports the second-stage results from the 2SLS model as well as the reduced-form results.

Both the OLS and IV results show that entrusted lenders make more profits in cities with tighter bank loan supply. This is consistent with the notion that entrusted lenders supply capital to worthy borrowers who are left out by constrained banks and in doing so make a profit.

5.3 Aggregate effects on credit supply

So far, I have established that the decline of deposit funding creates a gap of bank loan supply through the loan-to-deposit ratio regulation, and consequently listed firms are more likely to make entrusted loans in cities where there are fewer traditional bank loans. Several questions arise: is there any effect on the aggregate credit supply? Do other forms of shadow banking respond to the supply shock as well? In this section, I explore these aspects using the province-level Aggregate Financing to the Real Economy (AFRE) flow data.

The data report the net flow of financing provided to the real economy (i.e., non-financial enterprises and households) in each province annually from 2013 to 2016. Total financing consists of three components: bank credit, defined as the sum of bank loans denominated in RMB and foreign currencies; shadow bank credit, defined as the sum of entrusted loans, trust loans, and undiscounted banker's acceptances; and capital markets, defined as the sum of financing raised in the bond market and the stock market. Analogously to my procedure in Model (1) for the analysis of entrusted lending outcomes at the firm level Model, I estimate the following specification:

$$FinancingFlow_{j,t} = \alpha + \beta \cdot ConstrainedShare_{2010} + \theta Z_{j,t} + \pi_t + \varepsilon_{j,t} \tag{3}$$

The unit of observation is province-year. The dependent variable is a normalized financing flow. The key variable of interest is the market share of constrained banks at the end of 2010. Provincial control variables and time fixed effects are included in the regressions. Standard errors are clustered at the province level.

Table 8 shows the results. Panel A shows the effect on total financing flow as well as its three components: bank credit, shadow bank credit, and capital markets; Panel B breaks down shadow bank credit and capital markets into their individual components. Firstly,

a higher market share of constrained banks is associated with a lower flow of bank loans, a fact which reconfirms the relevance of bank constraints for cities in Figure 6. Secondly, the impact of the presence of constrained banks is more mixed for shadow bank credit, due to entrusted loans and trust loans being affected in opposite directions. A higher market share of constrained banks is associated with a higher flow of entrusted loans, corroborating my earlier result using firm-level data. On the contrary, a higher market share of constrained banks is associated with a lower flow of trust loans. Given that trust vehicles rely heavily on the banking sector for funding, this result suggests that the banks pass on the constraints they face to trusts and hence impact the credit supplied by trusts. Finally, a higher market share of constrained banks is associated with a higher flow of financing provided by capital markets. Overall, the increase in entrusted loans and financing provided by capital markets is not sufficient to fully offset the shrinkage in the credit supply by banks in provinces with a higher presence of constrained banks, which results in a decline in the flow of total financing.

6 Conclusion

In this paper, I focus on firm-to-firm (entrusted) loans—the largest component of China's shadow banking sector which has increased fivefold from 2007 to 2017—and study how the regulation in the formal banking sector explains its rise. To do so, I compile data consisting of entrusted loans made by the universe of listed non-financial firms from their mandatory disclosures for the period of 2011-16. During this period, deposit funding declines substantially for commercial banks as regular deposits face increasing competition from innovative vehicles such as Yu'e Bao and short-term wealth management products. This decline directly affects bank lending as banks have to comply with the 75% loan-to-deposit ratio (LDR) restriction. Banks with a higher level of initial LDR become more constrained from making loans. This bank-level variation is relevant for different cities

because there is substantial geographic variation in the presence of constrained banks. Cities with more pre-determined presence of constrained banks have a lower loan growth and hence are constrained cities. I find that firms are more likely to be entrusted lenders and make more profits from doing so in the constrained cities. I also study the funding structure of entrusted loans which is important to evaluate the financial stability implications. Although the exact funding source of entrusted loans cannot be pinned down perfectly due to that cash is fungible within the firm, I find that entrusted lenders appear to rely on existing cash rather than external finance to make the loans. This lack of reliance on external finance arguably limits the scope of financial stability consequences.

My results provide a plausible explanation for why non-financial firms supply credit despite that they are inferior to banks in fund-raising, credit evaluation and monitoring: they enjoy one key advantage of being not regulated. This is related to the shadow banking activities *by* banks' regulatory arbitrage strategy, since both phenomena circumvent the banking regulation. The circumvention often causes doubt on whether the migration of risks into uncharted territories sows the seed for the next crisis. My results suggest that entrusted lenders in China are filling the regulation-induced gap of bank loan supply. They are unlikely to undermine financial stability; quite the contrary, they may play an important role in sustaining economic growth during China's transition from a bank-financed economy to a market economy. I look forward to investigating further the dynamics and welfare implications of entrusted loans and the broader shadow banking sector.

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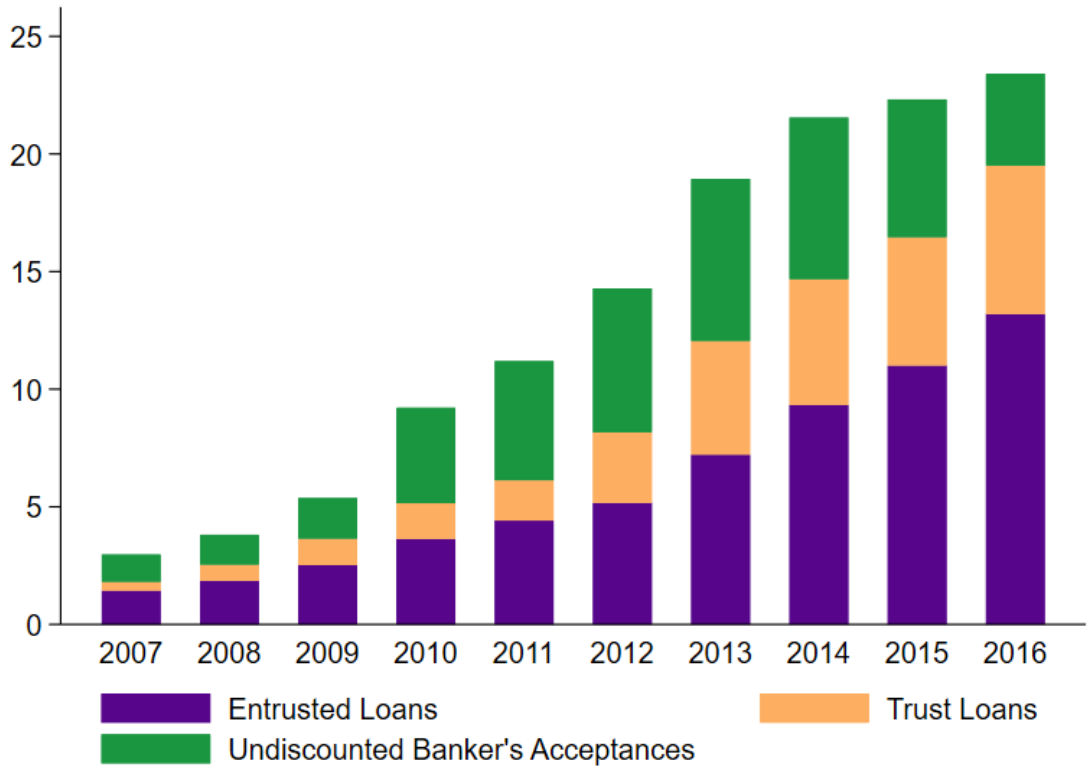
Figure 1: **Rapid Growth of Shadow Banking in China**

This graph demonstrates the rapid growth of shadow banking in China. The Aggregate Financing to the Real Economy (AFRE) statistics published by People's Bank of China (PBoC) reports the various sources of financing provided to the real economy (domestic non-financial enterprises and households). Three sources constitute the shadow banking sector: entrusted loans, trust loans, and undiscounted banker's acceptances. The data source is the national outstanding volume (stock) of the AFRE statistics.

(a) Shadow Banking in the AFRE statistics (trillion Chinese Yuan)



(b) Bank loans and Entrusted Loans as a Percentage of Total Financing (%)

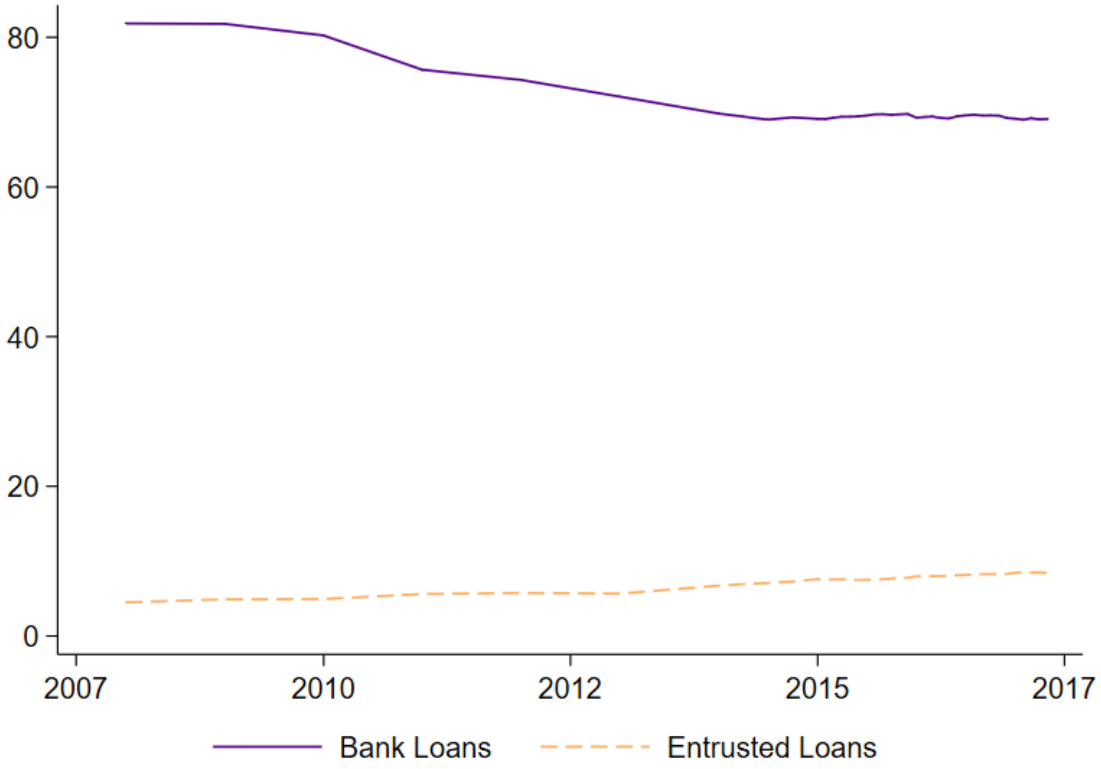
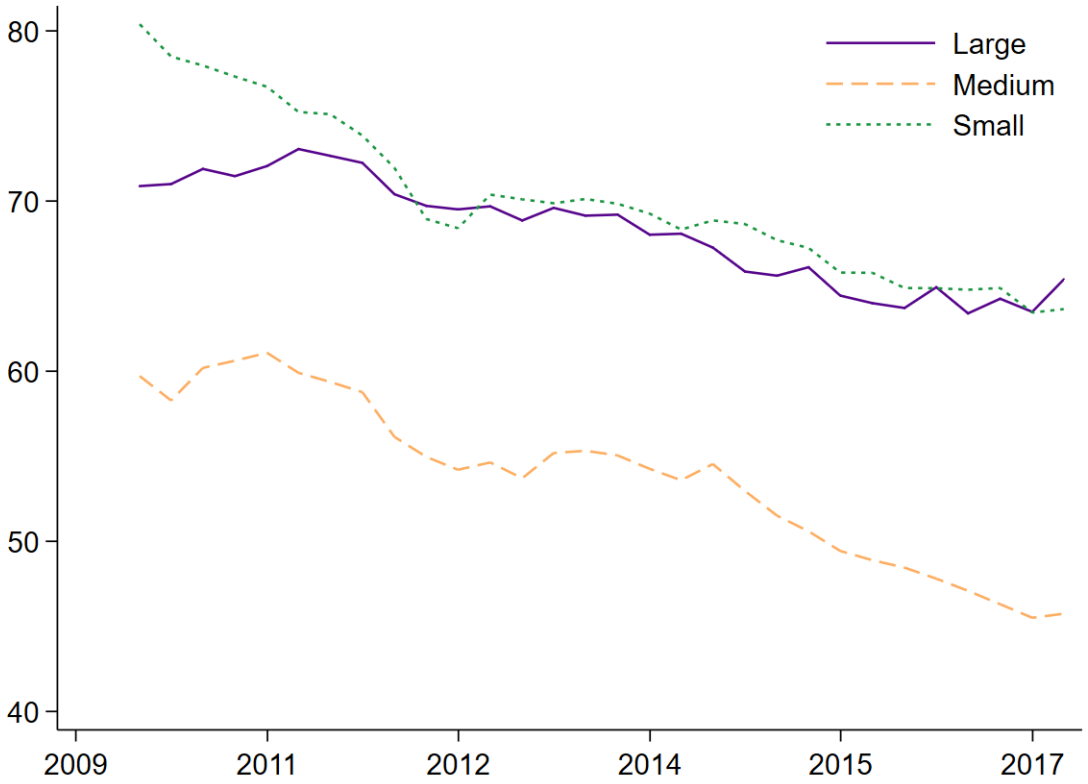


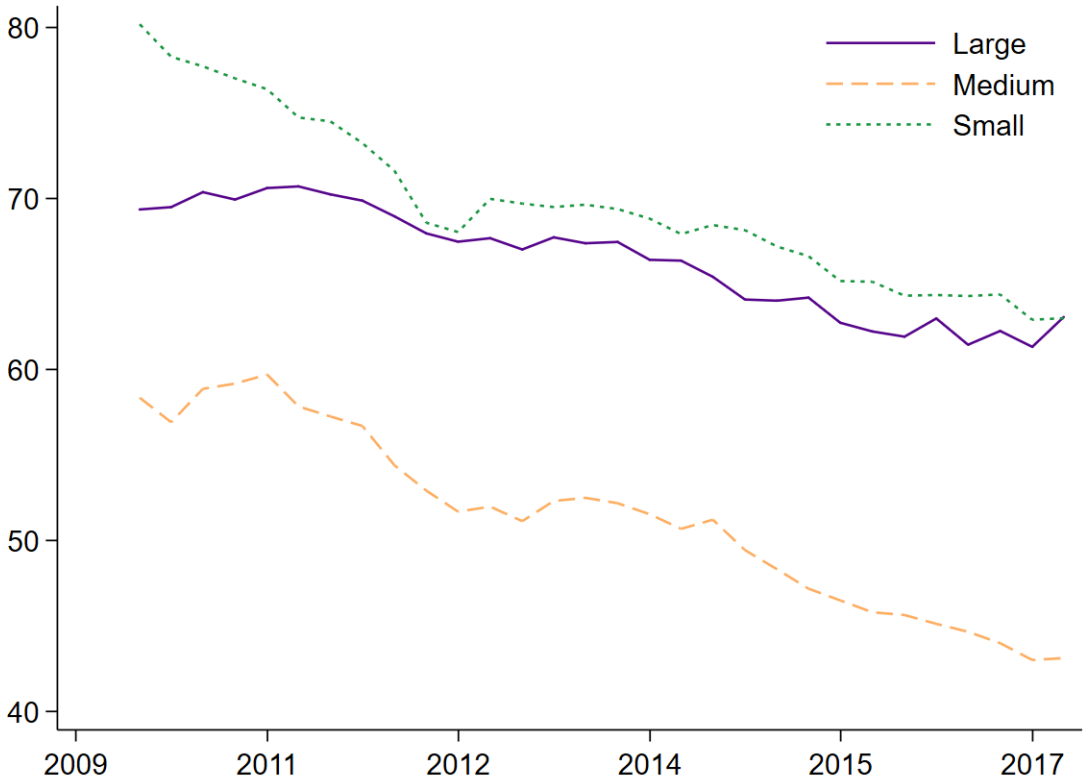
Figure 2: **Decline in Deposit Funding for Commercial Banks**

This figure shows that deposit funding declines from 2011 to 2016 for commercial banks. The data source is People's Bank of China (PBoC)'s consolidated balance sheet of domestic banks by type. The data is quarterly and starts from the fourth quarter of 2009. Large, median, and small banks refer to banks with total assets greater than 2 trillion RMB, between 300 billion and 2 trillion RMB, and less than 300 billion RMB at the end of 2008, respectively. Deposits refer to the deposits by domestic non-financial enterprises and households and exclude borrowing from the central bank or other financial institutions. Core deposits are deposits included in the broad money, including demand deposits, time deposits, and saving deposits. Non-core deposits are deposits excluded from the broad money, including transferrable deposits and other deposits.

(a) Deposits / Total Assets (%)



(b) Core Deposits / Total Assets (%)



(c) Non-Core Deposits / Total Assets (%)

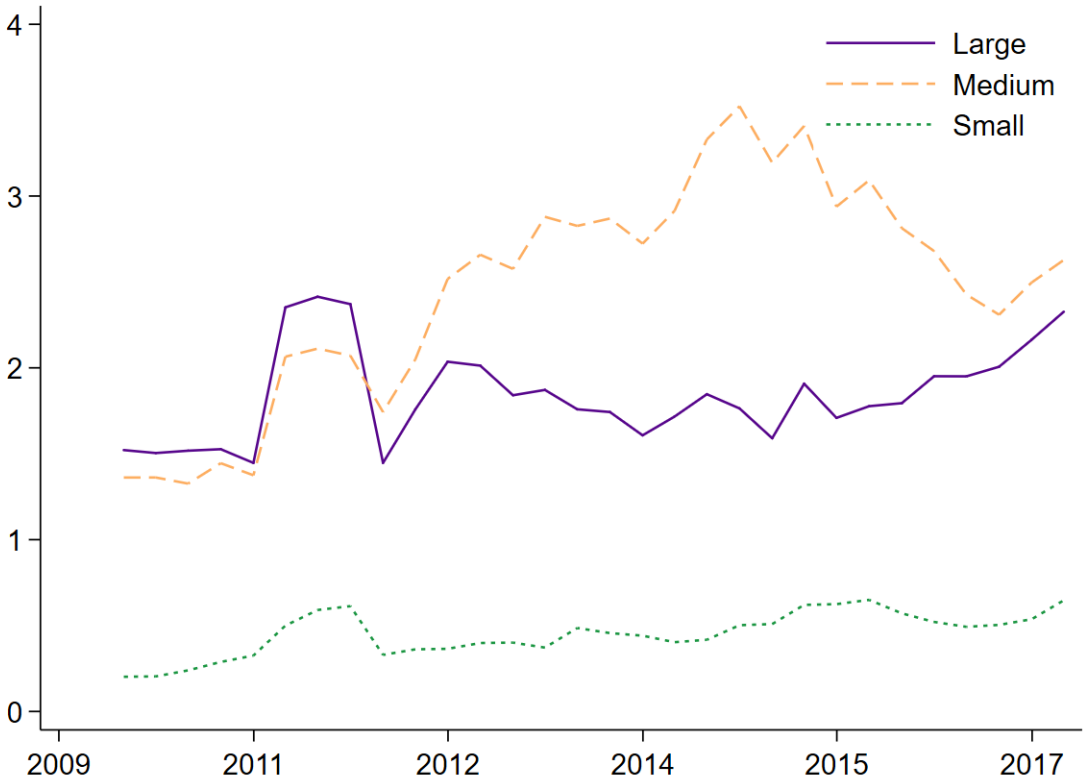


Figure 3: **Banks with Initially High Loan-to-Deposit Ratio Are Constrained**

This figure contrasts the average cumulative loan growth of constrained banks with that of unconstrained banks. Constrained banks are those with a loan-to-deposit ratio (LDR) greater than 70% at the end of 2010. The remaining banks are unconstrained banks. First, I normalize loans by the level of loans in 2010 for each bank, and then I calculate the average within each group.

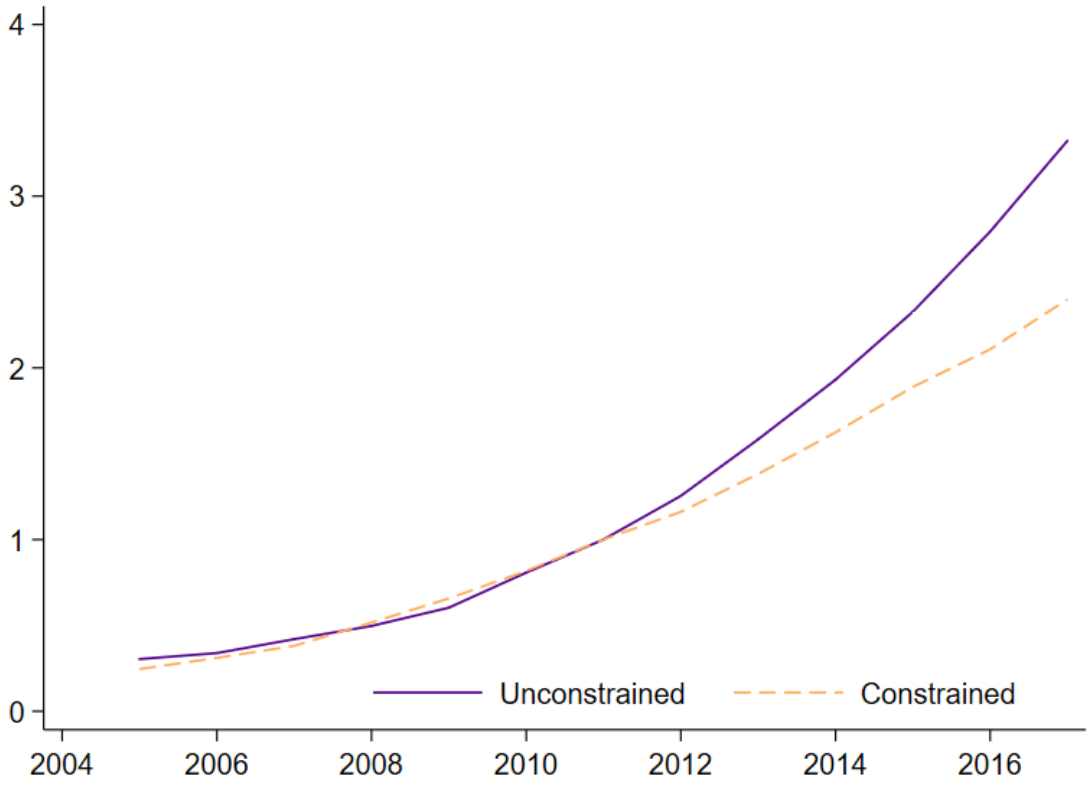


Figure 4: **Slackness of the 75% Loan-to-Deposit Ratio (LDR) Restriction**

This figure shows the slackness of the 75% Loan-to-Deposit Ratio (LDR) Restriction for constrained banks and unconstrained banks. Constrained banks are those with a loan-to-deposit ratio (LDR) greater than 70% at the end of 2010. The remaining banks are unconstrained banks. First, I normalize both loans and maximum allowable loans (defined as 75% multiplied by deposits) by the level of loans in 2010 for each bank, and then I calculate the average within each group.

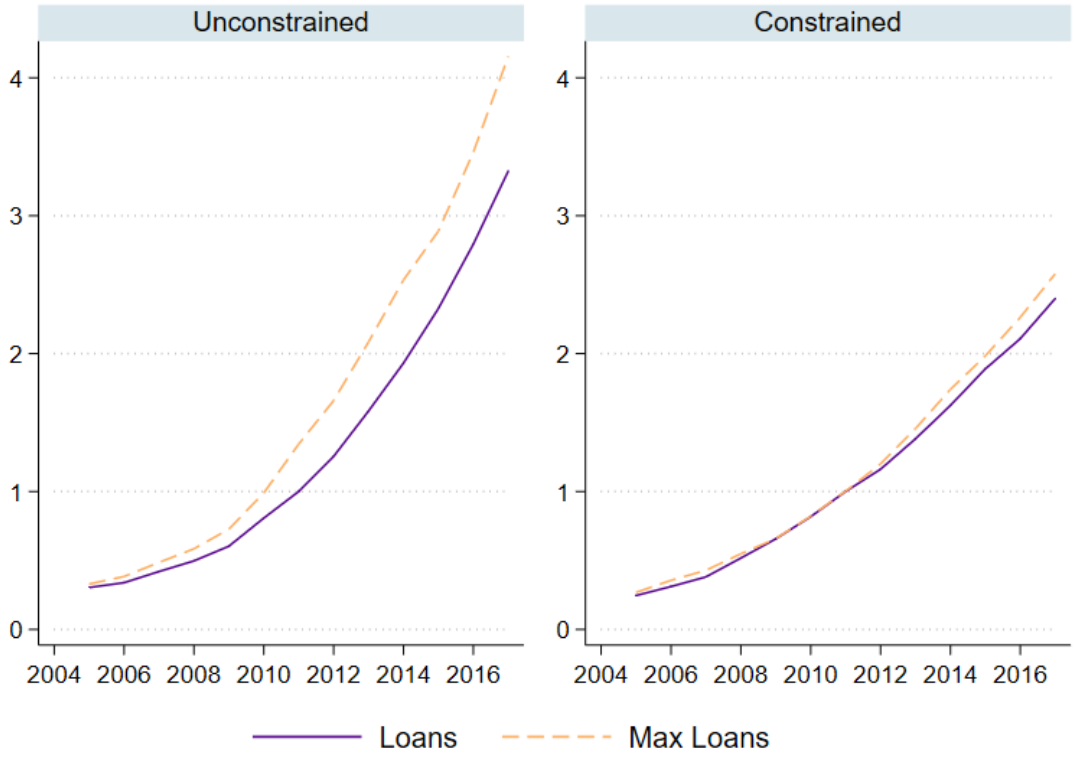


Figure 5: **Geographic Distribution of Market Share of Constrained Banks**

This graph shows the geographic distribution of the branch market share of constrained banks, defined as banks with a loan-to-deposit ratio (LDR) greater than 70% at the end of 2010. The data source is CBRC's central registry of bank branch licenses.

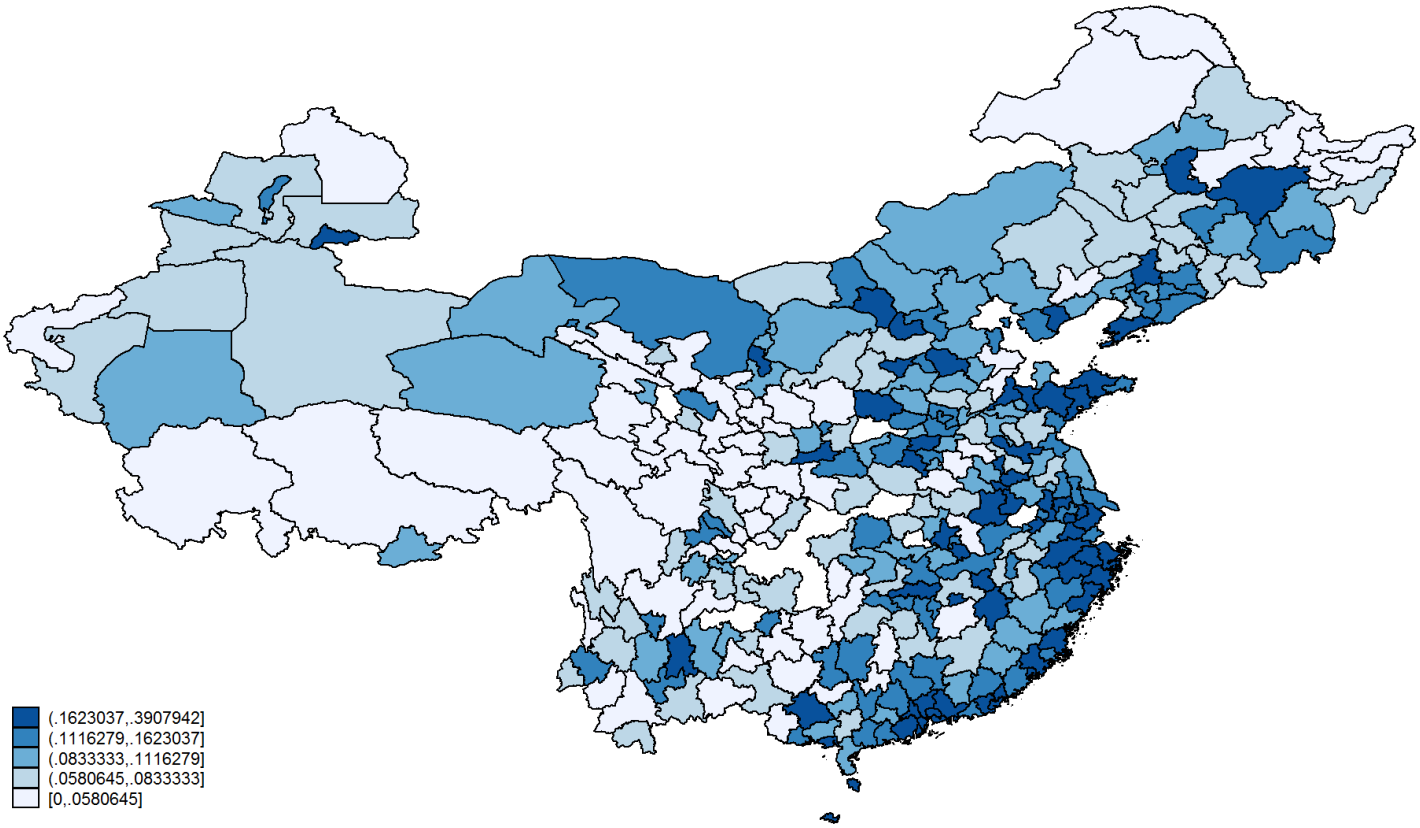


Figure 6: **Constrained Cities Have Slower Loan Growth**

This figure contrasts the average cumulative loan growth of constrained cities with that of unconstrained cities. Constrained (unconstrained) cities are those with an above-median (below-median) market share of constrained banks, defined as those banks with a loan-to-deposit ratio (LDR) greater than 70% at the end of 2010. First, I normalize bank loans by the level of bank loans in 2010 for each city, and then I calculate the average within each group.

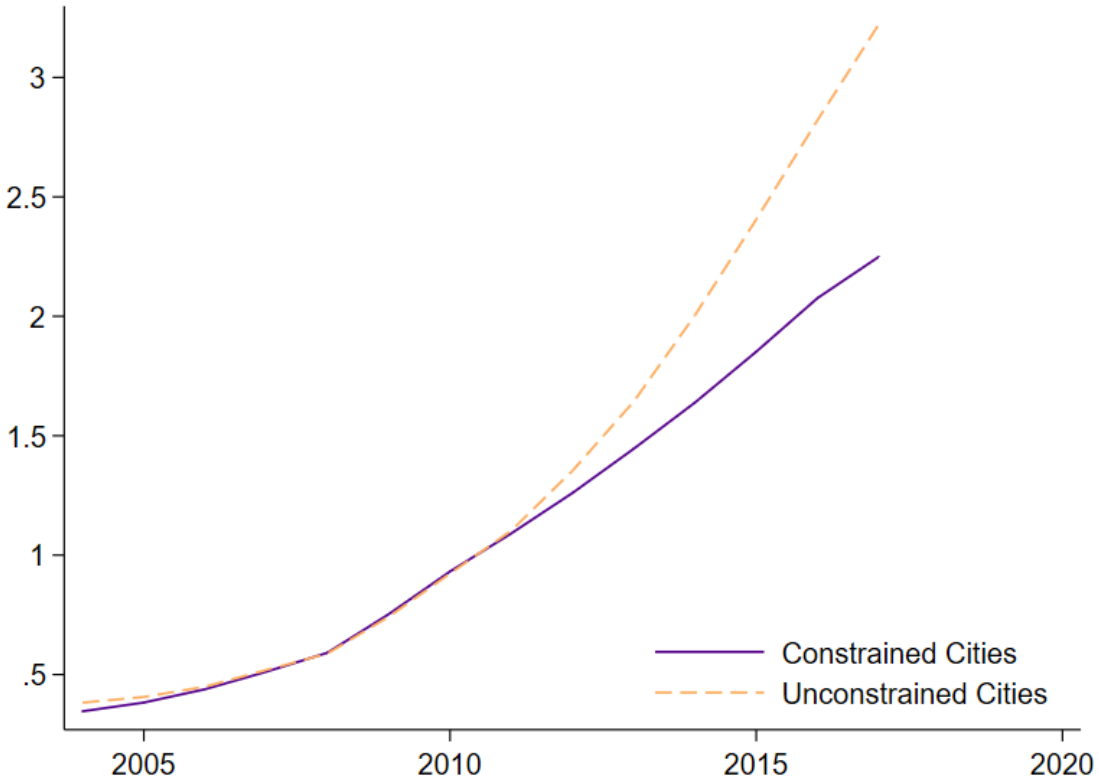


Figure 7: **Constrained Cities Don't Have Weaker Loan Demand**

This figure compares the loan demand, proxied by GDP per capita, of constrained cities with that of unconstrained cities. Constrained (unconstrained) cities are those with an above-median (below-median) market share of constrained banks, defined as those banks with a loan-to-deposit ratio (LDR) greater than 70% at the end of 2010. First, I normalize GDP per capita by the level of GDP per capita in 2010 for each city, and then I calculate the average within each group.

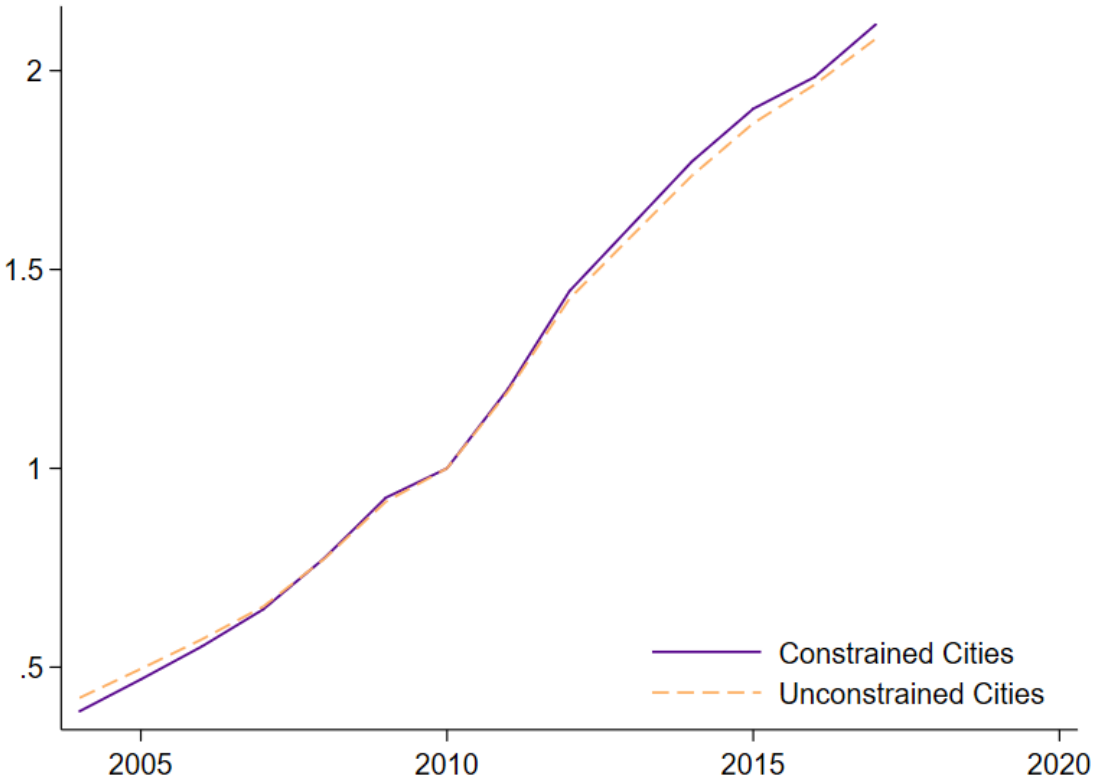


Table 1: **Summary Statistics of Entrusted Lending by Listed Firms**

This table provides summary statistics on the entrusted lending activities by listed firms. The sample includes the universe of non-financial listed firms from 2011 to 2016. The unit of observation is firm-year. $\mathbb{1}$(EL) is an indicator variable that equals 1 if the firm makes one or more entrusted loans in a year and 0 otherwise. Conditional on $\mathbb{1}$(EL) being equal to 1, EL/Assets (%) is the average balance of entrusted loan assets as a fraction of total assets.

Year	Obs	Statistics	Ttl Assets (M)	$\mathbb{1}$(EL)	EL/Assets (%)
2011-16	15,395	Mean	13000	0.1568	2.912
		Median	2960	0	1.083
By year					
2011	2,268	Mean	10000	0.1531	2.9334
		Median	2270	0	0.7252
2012	2,428	Mean	10900	0.1904	2.9873
		Median	2460	0	1.4616
2013	2,425	Mean	12300	0.2050	3.6611
		Median	2800	0	1.3552
2014	2,547	Mean	13300	0.1551	2.7171
		Median	3090	0	0.5921
2015	2,758	Mean	14400	0.1276	2.0932
		Median	3410	0	0.7577
2016	2,969	Mean	15900	0.1213	2.0334
		Median	3870	0	0.6053

Table 2: **Firms Are More Likely to Become Entrusted Lenders in Constrained Cities (OLS)**

This table reports the OLS estimates of the determinants of entrusted lending probability. The sample includes the universe of non-financial listed firms from 2011 to 2016. The unit of observation is firm-year. The industry-year fixed effects are included in all specifications. Standard errors in parentheses are clustered at the industry-year level. ***, ** and * represent 1%, 5% and 10% significance, respectively. The within R^2 is within the industry-year group.

	$\mathbb{1}$(EL)		
	(1)	(2)	(3)
Main effects:			
Δ Log Bank Loan	-0.352***	-0.291***	-0.291***
	(0.116)	(0.093)	(0.093)
Firm Characteristics:			
Size		0.059***	0.059***
		(0.004)	(0.004)
State-owned Enterprise		0.055***	0.054***
		(0.009)	(0.009)
Existing Cash		0.050***	0.051***
		(0.016)	(0.016)
Operating Cash Flow		-0.026	-0.024
		(0.025)	(0.025)
Net Financing		0.018	
		(0.013)	
Net Affiliated Financing			0.145**
			(0.072)
Net Unaffiliated Financing			0.016
			(0.013)
Province Controls	No	Yes	Yes
Within R^2	0.00112	0.0542	0.0544
Observations	14718	14718	14718

Table 3: **First Stage (Extensive Margin): Instrument is Strong**

This table presents the first-stage regression of the instrumental variables analysis of the determinants of entrusted lending probability. The sample includes the universe of non-financial listed firms from 2011 to 2016. The unit of observation is firm-year. The supply shock instrument follows (2), where banks with a loan-to-deposit ratio (LDR) greater than 70% at the end of 2010 are constrained banks; other banks are unconstrained banks. The composition is measured by the market share based on numbers of branches at the end of 2010. The industry-year fixed effects are included in all specifications. Standard errors in parentheses are clustered at the industry-year level. ***, ** and * represent 1%, 5% and 10% significance, respectively. The within R^2 is within the industry-year group. Two measures of instrument relevance—the first-stage F statistic and the Shea (1997) partial R^2 (i.e., the "squared partial correlation" between the excluded instrument *BankSupplyShock* and the endogenous regressor $\Delta LogBankLoan$)—are presented as well.

	Δ Log Bank Loan		
	(1)	(2)	(3)
Main effects:			
Bank Supply Shock	6.962***	4.741***	4.745***
	(0.763)	(0.743)	(0.745)
Firm Characteristics:			
Size		-0.001***	-0.001***
		(0.000)	(0.000)
State-owned Enterprise		0.001	0.001
		(0.001)	(0.001)
Existing Cash		0.002	0.002
		(0.002)	(0.002)
Operating Cash Flow		-0.001	-0.001
		(0.003)	(0.003)
Net Financing		0.001	
		(0.001)	
Net Affiliated Financing			-0.008
			(0.006)
Net Unaffiliated Financing			0.000
			(0.001)
Province Controls	No	Yes	Yes
F statistic	83.23	40.68	40.62
Partial R^2	0.286	0.138	0.138
Within R^2	0.286	0.378	0.378
Observations	14718	14718	14718

Table 4: **Firms Are More Likely to Become Entrusted Lenders in Constrained Cities (IV)**

This table presents the instrumental variables analysis and the corresponding reduced-form results of the determinants of entrusted lending probability. The sample includes the universe of non-financial listed firms from 2011 to 2016. The unit of observation is firm-year. The supply shock instrument follows (2), where banks with a loan-to-deposit ratio (LDR) greater than 70% at the end of 2010 are constrained banks; other banks are unconstrained banks. The composition is measured by the market share based on numbers of branches at the end of 2010. The industry-year fixed effects are included in all specifications. Standard errors in parentheses are clustered at the industry-year level. ***, ** and * represent 1%, 5% and 10% significance, respectively. The within R^2 is within the industry-year group. For the IV results, two measures of instrument relevance—the first-stage F statistic and the Shea (1997) partial R^2 (i.e., the "squared partial correlation" between the excluded instrument *BankSupplyShock* and the endogenous regressor $\Delta LogBankLoan$)—are presented as well.

	$\mathbb{1}$(EL)					
	IV (2SLS)			Reduced Form		
	(1)	(2)	(3)	(4)	(5)	(6)
Main effects:						
Δ Log Bank Loan	-0.722***	-1.338***	-1.353***			
	(0.193)	(0.198)	(0.198)			
Bank Supply Shock				-5.028***	-6.344***	-6.419***
				(1.347)	(1.128)	(1.132)
Firm Characteristics:						
Size		0.058***	0.058***		0.059***	0.059***
		(0.004)	(0.004)		(0.004)	(0.004)
State-owned Enterprise		0.059***	0.059***		0.057***	0.057***
		(0.010)	(0.010)		(0.010)	(0.010)
Existing Cash		0.051***	0.052***		0.049***	0.049***
		(0.016)	(0.016)		(0.016)	(0.016)
Operating Cash Flow		-0.030	-0.028		-0.029	-0.027
		(0.025)	(0.024)		(0.024)	(0.024)
Net Financing		0.019			0.019	
		(0.013)			(0.013)	
Net Affiliated Financing			0.149**			0.160**
			(0.071)			(0.071)
Net Unaffiliated Financing			0.017			0.017
			(0.013)			(0.013)
Province Controls	No	Yes	Yes	No	Yes	Yes
First-stage F statistic	83.23	40.68	40.62			
Partial R^2	0.286	0.138	0.138			
Within R^2	-0.000114	0.0471	0.0470	0.00134	0.0553	0.0554
Observations	14718	14718	14718	14718	14718	14718

Table 5: **Entrusted Lenders in Constrained Cities Make More Profits (OLS)**

This table presents the OLS estimates of the determinants of the profitability of entrusted lending. The sample includes the non-financial listed firms who are entrusted lenders from 2011 to 2016. The unit of observation is firm-year. The industry-year fixed effects are included in all specifications. Standard errors in parentheses are clustered at the industry-year level. ***, ** and * represent 1%, 5% and 10% significance, respectively. The within R^2 is within the industry-year group.

	Return on EL (%)		
	(1)	(2)	(3)
Main effects:			
Δ Log Bank Loan	-0.516**	-0.908***	-0.903***
	(0.219)	(0.260)	(0.258)
Firm Characteristics:			
Size		-0.064***	-0.064***
		(0.022)	(0.022)
State-owned Enterprise		-0.033	-0.034
		(0.022)	(0.022)
Existing Cash		0.149	0.151
		(0.215)	(0.215)
Operating Cash Flow		0.474	0.474
		(0.391)	(0.388)
Net Financing		0.070	
		(0.121)	
Net Affiliated Financing			0.257
			(0.574)
Net Unaffiliated Financing			0.069
			(0.128)
Province Controls	No	Yes	Yes
Within R^2	0.00111	0.0402	0.0404
Observations	2339	2339	2339

Table 6: **First Stage (Intensive Margin): Instrument is Strong**

This table presents results of the determinants of the profitability of entrusted lending. The sample includes the non-financial listed firms who are entrusted lenders from 2011 to 2016. The unit of observation is firm-year. The supply shock instrument follows (2), where banks with a loan-to-deposit ratio (LDR) greater than 70% at the end of 2010 are constrained banks; other banks are unconstrained banks. The composition is measured by the market share based on numbers of branches at the end of 2010. The industry-year fixed effects are included in all specifications. Standard errors in parentheses are clustered at the industry-year level. ***, ** and * represent 1%, 5% and 10% significance, respectively. The within R^2 is within the industry-year group. Two measures of instrument relevance—the first-stage F statistic and the Shea (1997) partial R^2 (i.e., the "squared partial correlation" between the excluded instrument *BankSupplyShock* and the endogenous regressor Δ*LogBankLoan*)—are presented as well.

	Δ Log Bank Loan		
	(1)	(2)	(3)
Main effects:			
Bank Supply Shock	7.115***	4.629***	4.615***
	(0.855)	(0.685)	(0.686)
Firm Characteristics:			
Size		-0.000	-0.000
		(0.000)	(0.000)
State-owned Enterprise		-0.000	0.000
		(0.001)	(0.001)
Existing Cash		0.002	0.002
		(0.003)	(0.003)
Operating Cash Flow		0.030**	0.030**
		(0.014)	(0.014)
Net Financing		0.009	
		(0.006)	
Net Affiliated Financing			-0.017
			(0.014)
Net Unaffiliated Financing			0.010
			(0.006)
Province Controls	No	Yes	Yes
F statistic	69.23	45.63	45.27
Partial R^2	0.302	0.137	0.136
Within R^2	0.302	0.412	0.413
Observations	2339	2339	2339

Table 7: **Entrusted Lenders in Constrained Cities Make More Profits (IV)**

This table presents the instrumental variables analysis and the corresponding reduced-form results of the profitability of entrusted lending. The sample includes the non-financial listed firms who are entrusted lenders from 2011 to 2016. The unit of observation is firm-year. The supply shock instrument follows (2), where banks with a loan-to-deposit ratio (LDR) greater than 70% at the end of 2010 are constrained banks; other banks are unconstrained banks. The composition is measured by the market share based on numbers of branches at the end of 2010. The industry-year fixed effects are included in all specifications. Standard errors in parentheses are clustered at the industry-year level. ***, ** and * represent 1%, 5% and 10% significance, respectively. The within R^2 is within the industry-year group. For the IV results, two measures of instrument relevance—the first-stage F statistic and the Shea (1997) partial R^2 (i.e., the "squared partial correlation" between the excluded instrument *BankSupplyShock* and the endogenous regressor $\Delta LogBankLoan$)—are presented as well.

	Return on EL (%)					
	IV (2SLS)			Reduced Form		
	(1)	(2)	(3)	(4)	(5)	(6)
Main effects:						
Δ Log Bank Loan	-0.728	-1.730*	-1.730*			
	(0.610)	(0.991)	(1.006)			
Bank Supply Shock				-5.176	-8.008*	-7.984*
				(4.462)	(4.607)	(4.667)
Firm Characteristics:						
Size		-0.065***	-0.065***		-0.064***	-0.064***
		(0.021)	(0.021)		(0.022)	(0.022)
State-owned Enterprise		-0.031	-0.031		-0.030	-0.031
		(0.022)	(0.022)		(0.023)	(0.023)
Existing Cash		0.151	0.153		0.148	0.151
		(0.210)	(0.211)		(0.214)	(0.215)
Operating Cash Flow		0.500	0.500		0.449	0.448
		(0.368)	(0.364)		(0.388)	(0.385)
Net Financing		0.079			0.064	
		(0.119)			(0.121)	
Net Affiliated Financing			0.243			0.272
			(0.573)			(0.580)
Net Unaffiliated Financing			0.079			0.063
			(0.125)			(0.127)
Province Controls	No	Yes	Yes	No	Yes	Yes
First-stage F statistic	69.23	45.63	45.27			
Partial R^2	0.302	0.137	0.136			
Within R^2	0.000924	0.0383	0.0384	0.000665	0.0390	0.0392
Observations	2339	2339	2339	2339	2339	2339

Table 8: **LDR Constraint Has Aggregate Effects on Credit Supply**

This table presents estimates of the impact of LDR constraints on the financing of real economic activities. The unit of observation is province-year. The sample period is from 2013 to 2016, the period when the provincial-level Aggregate Financing to the Real Economy (AFRE) flow data is available. *Constrained* is the province-level market share of constrained banks, defined as banks with a loan-to-deposit ratio (LDR) greater than 70%, at the end of 2010. Standard errors in parentheses are clustered at the province level. ***, ** and * represent 1%, 5% and 10% significance, respectively.

Panel A: Total Financing and Its Three Main Components

	Dep Var: AFRE components / GDP			
	Total Financing	Bank Credit	Shadow Bank Credit	Capital Markets
Constrained	-0.523*	-0.724***	-0.064	0.282***
	(0.303)	(0.184)	(0.124)	(0.088)
Province Controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
R^2	0.166	0.235	0.266	0.0933
Observations	124	124	124	124

Panel B: Breakdown of Shadow Bank Credit and Capital Markets

	Dep Var: AFRE components / GDP				
	Shadow Bank Credit			Capital Markets	
	Entrusted Loans	Trust Loans	Bankers' Acceptances	Bond Market	Stock Market
Constrained	0.157***	-0.218**	-0.003	0.232***	0.050**
	(0.053)	(0.105)	(0.044)	(0.076)	(0.023)
Province Controls	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
R^2	0.105	0.128	0.348	0.0909	0.163
Observations	124	124	124	124	124

Appendices

A Variable Construction

This appendix provides more details on how firm-level variables are constructed.

State-owned enterprise: an indicator variable that equals 1 if a controlling shareholder exists and it is a state entity – State-owned Assets Supervision and Administration Commission (SASAC) or its local branch, the State Council, Huijin, a cabinet-level unit under the State Council, or branches of a local government – and 0 otherwise. The data on controlling shareholders come from WIND.

The following cash and cash flow variables are scaled with total assets.

Existing cash: beginning-of-the-year balance of cash and cash equivalents.

Operating cash flow: net cash flow from operating activities.

Net financing: net cash flow from financing activities scaled by total assets.

Net affiliated financing: net within-group capital transfer from the disclosure of related party transactions obtained from WIND.

Net unaffiliated financing: Net financing minus Net affiliated financing scaled by total assets.

B Probit and Logit Results

This appendix reports the probit and logit results of the determinants of entrusted lending probability. I include the industry-year fixed effects as in the linear probability model. I use the unconditional fixed-effects specification for both probit and logit, as the conditional fixed-effects specification does not exist for probit. One important caveat is that the fixed-effects estimates are biased, as discussed in Footnote 9 in the text.

Table B.1: **Firms Are More Likely to Become Entrusted Lenders in Constrained Cities (Probit and Logit)** (Compare with Table 2)

This table presents the probit and logit results of the determinants of entrusted lending probability. The sample includes the universe of non-financial listed firms from 2011 to 2016. The unit of observation is firm-year. The industry-year fixed effects are included in all specifications. Standard errors in parentheses are clustered at the industry-year level. ***, ** and * represent 1%, 5% and 10% significance, respectively. To facilitate comparison with the OLS results, I report marginal effects instead of coefficient estimates in this table.

	𝟙(EL)					
	Probit			Logit		
	(1)	(2)	(3)	(4)	(5)	(6)
Main effects:						
Δ Log Bank Loan	-0.327***	-0.272***	-0.271***	-0.351***	-0.295***	-0.295***
	(0.117)	(0.105)	(0.105)	(0.126)	(0.110)	(0.110)
Firm Characteristics:						
Size		0.053***	0.053***		0.052***	0.051***
		(0.004)	(0.004)		(0.003)	(0.003)
State-owned Enterprise		0.050***	0.050***		0.050***	0.050***
		(0.010)	(0.010)		(0.010)	(0.010)
Existing Cash		0.046***	0.046***		0.046***	0.047***
		(0.016)	(0.016)		(0.017)	(0.018)
Operating Cash Flow		-0.032	-0.031		-0.038	-0.037
		(0.026)	(0.026)		(0.026)	(0.026)
Net Financing		0.007			0.001	
		(0.020)			(0.022)	
Net Affiliated Financing			0.085			0.095
			(0.074)			(0.075)
Net Unaffiliated Financing			0.005			-0.000
			(0.019)			(0.021)
Province Controls	No	Yes	Yes	No	Yes	Yes
Pseudo R^2	0.0382	0.0945	0.0945	0.0383	0.0938	0.0939
Observations	15361	14709	14709	15361	14709	14709

C Results Using 65% as LDR Cutoff

This appendix reports the results using 65% as the LDR cutoff for constrained banks. I show that:

- The alternative constraint explains the differential loan growth rate in the cross-section of banks and in the cross-section of cities, analogous to the analysis in Section 4.
- The supply shock instrument constructed under this alternative LDR cutoff remains strong in both the extensive margin and the intensive margin. The IV results using this alternative supply shock instrument are similar to my main results.
- The results of the aggregate effects on credit supply are similar.

Figure C.1: **Banks with Initially High Loan-to-Deposit Ratio Are Constrained** (Compare with Figure 3)

This figure contrasts the average cumulative loan growth of constrained banks with that of unconstrained banks. Constrained banks are those with a loan-to-deposit ratio (LDR) greater than 65% at the end of 2010. The remaining banks are unconstrained banks. First, I normalize loans by the level of loans in 2010 for each bank, and then I calculate the average within each group.

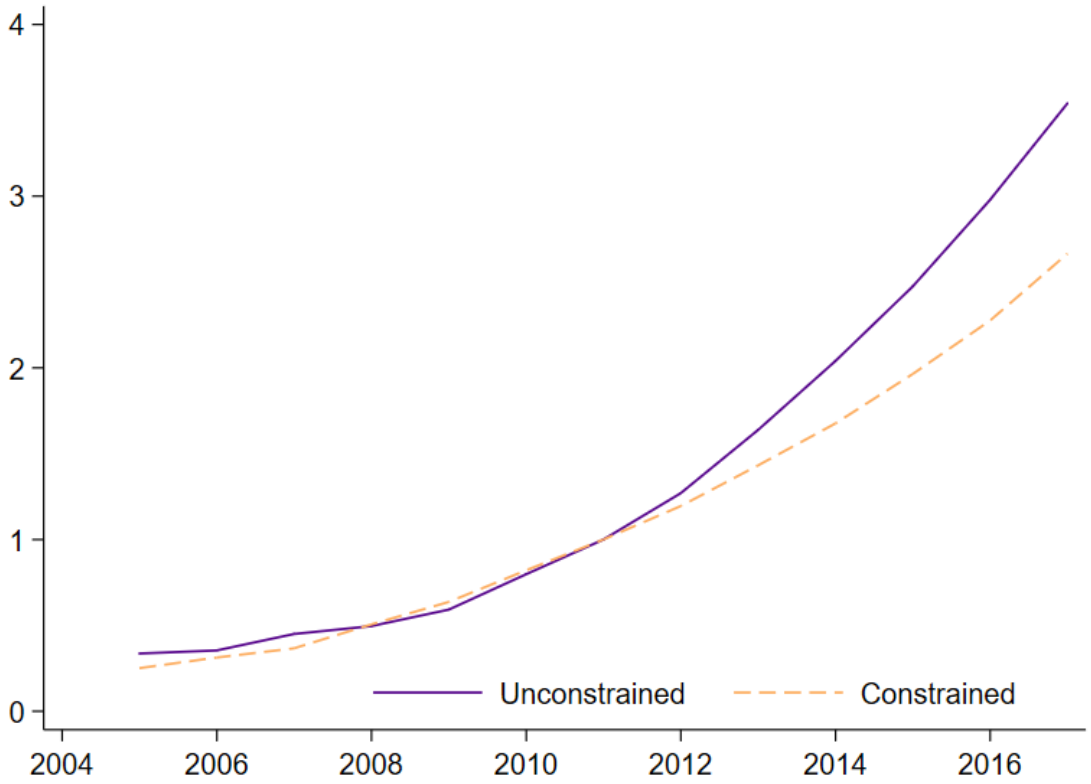


Figure C.2: **Slackness of the 75% Loan-to-Deposit Ratio (LDR) Restriction** (Compare with Figure 4)

This figure shows the slackness of the 75% Loan-to-Deposit Ratio (LDR) Restriction for constrained banks and unconstrained banks. Constrained banks are those with a loan-to-deposit ratio (LDR) greater than 65% at the end of 2010. The remaining banks are unconstrained banks. First, I normalize both loans and maximum allowable loans (defined as 75% multiplied by deposits) by the level of loans in 2010 for each bank, and then I calculate the average within each group.

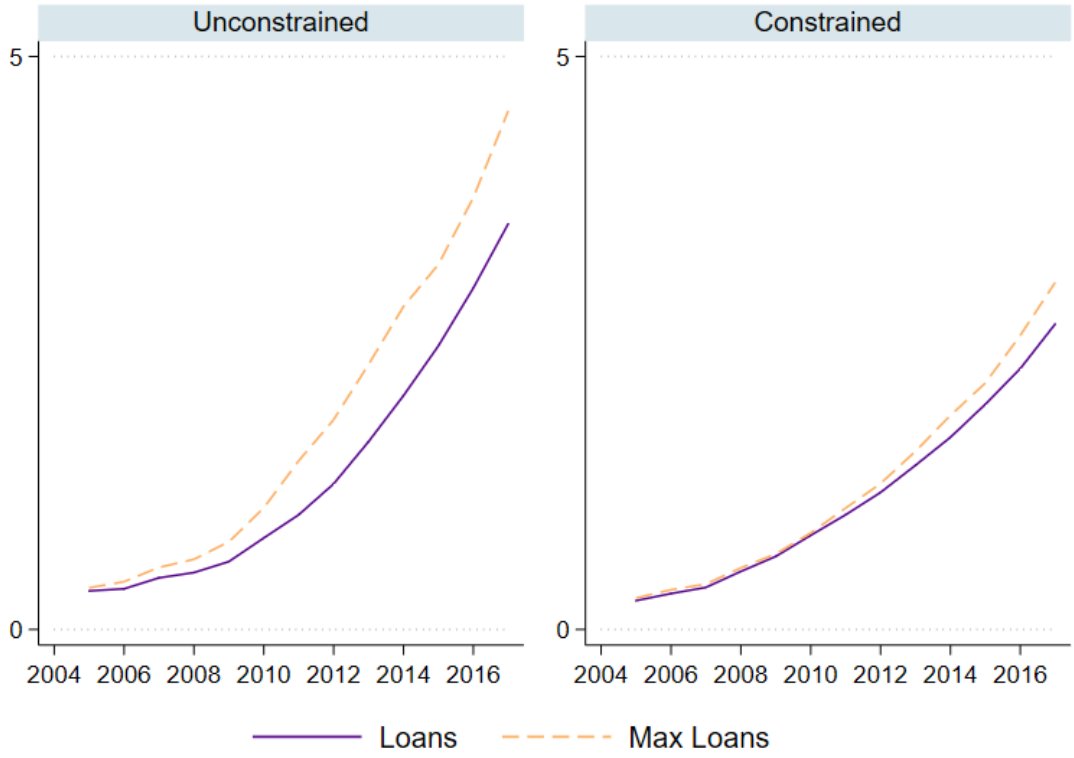


Figure C.3: **Constrained Cities Have Slower Loan Growth** (Compare with Figure 6)

This figure contrasts the average cumulative loan growth of constrained cities with that of unconstrained cities. Constrained (unconstrained) cities are those with an above-median (below-median) market share of constrained banks, defined as those banks with a loan-to-deposit ratio (LDR) greater than 65% at the end of 2010. First, I normalize bank loans by the level of bank loans in 2010 for each city, and then I calculate the average within each group.

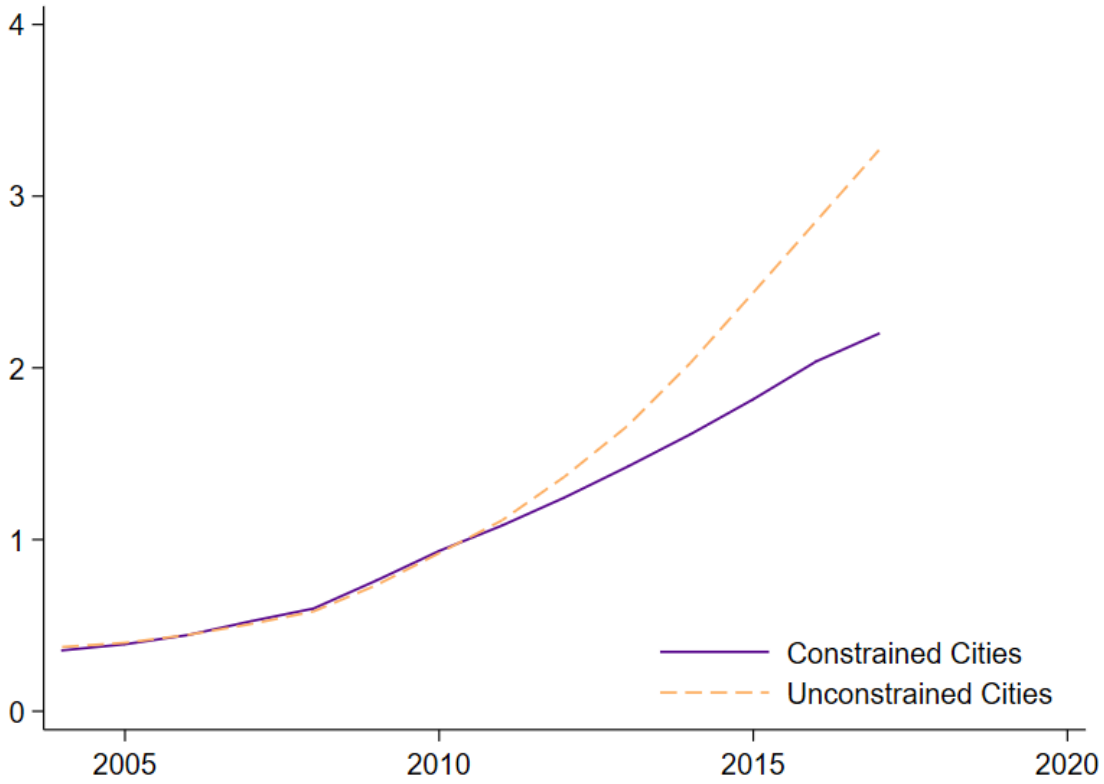


Figure C.4: **Constrained Cities Don't Have Weaker Loan Demand** (Compare with Figure 7)

This figure compares the loan demand, proxied by GDP per capita, of constrained cities with that of unconstrained cities. Constrained (unconstrained) cities are those with an above-median (below-median) market share of constrained banks, defined as those banks with a loan-to-deposit ratio (LDR) greater than 65% at the end of 2010. First, I normalize GDP per capita by the level of GDP per capita in 2010 for each city, and then I calculate the average within each group.

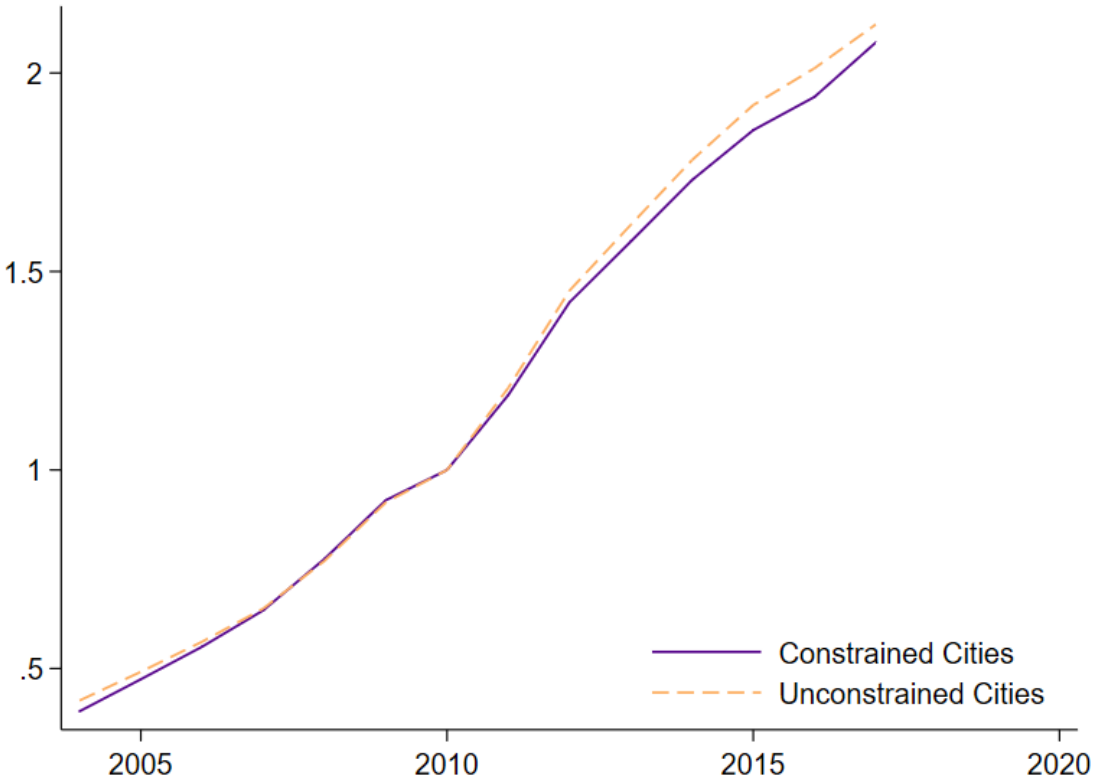


Table C.1: **First Stage (Extensive Margin): Instrument is Strong** (Compare with Table 3)

This table presents the first-stage regression of the instrumental variables analysis of the determinants of entrusted lending probability. The sample includes the universe of non-financial listed firms from 2011 to 2016. The unit of observation is firm-year. The supply shock instrument follows (2), where banks with a loan-to-deposit ratio (LDR) greater than 65% at the end of 2010 are constrained banks; other banks are unconstrained banks. The composition is measured by the market share based on numbers of branches at the end of 2010. The industry-year fixed effects are included in all specifications. Standard errors in parentheses are clustered at the industry-year level. ***, ** and * represent 1%, 5% and 10% significance, respectively. The within R^2 is within the industry-year group. Two measures of instrument relevance—the first-stage F statistic and the Shea (1997) partial R^2 (i.e., the "squared partial correlation" between the excluded instrument *BankSupplyShock* and the endogenous regressor $\Delta LogBankLoan$)—are presented as well.

	Δ Log Bank Loan		
	(1)	(2)	(3)
Main effects:			
Bank Supply Shock	4.522***	3.236***	3.239***
	(0.448)	(0.504)	(0.505)
Firm Characteristics:			
Size		-0.001***	-0.001***
		(0.000)	(0.000)
State-owned Enterprise		0.001	0.001
		(0.001)	(0.001)
Existing Cash		-0.000	-0.000
		(0.002)	(0.002)
Operating Cash Flow		0.000	0.000
		(0.004)	(0.004)
Net Financing		-0.000	
		(0.001)	
Net Affiliated Financing			-0.008
			(0.005)
Net Unaffiliated Financing			-0.000
			(0.001)
Province Controls	No	Yes	Yes
F statistic	102.0	41.19	41.20
Partial R^2	0.327	0.167	0.167
Within R^2	0.327	0.399	0.399
Observations	14718	14718	14718

Table C.2: **Firms Are More Likely to Become Entrusted Lenders in Constrained Cities (IV)** (Compare with Table 4)

This table presents the instrumental variables analysis and the corresponding reduced-form results of the determinants of entrusted lending probability. The sample includes the universe of non-financial listed firms from 2011 to 2016. The unit of observation is firm-year. The supply shock instrument follows (2), where banks with a loan-to-deposit ratio (LDR) greater than 65% at the end of 2010 are constrained banks; other banks are unconstrained banks. The composition is measured by the market share based on numbers of branches at the end of 2010. The industry-year fixed effects are included in all specifications. Standard errors in parentheses are clustered at the industry-year level. ***, ** and * represent 1%, 5% and 10% significance, respectively. The within R^2 is within the industry-year group. For the IV results, two measures of instrument relevance—the first-stage F statistic and the Shea (1997) partial R^2 (i.e., the "squared partial correlation" between the excluded instrument *BankSupplyShock* and the endogenous regressor $\Delta LogBankLoan$)—are presented as well.

	$\mathbb{1}$(EL)					
	IV (2SLS)			Reduced Form		
	(1)	(2)	(3)	(4)	(5)	(6)
Main effects:						
Δ Log Bank Loan	-0.638***	-1.205***	-1.217***			
	(0.199)	(0.191)	(0.191)			
Bank Supply Shock				-2.887***	-3.901***	-3.940***
				(0.991)	(0.774)	(0.781)
Firm Characteristics:						
Size		0.058***	0.058***		0.059***	0.059***
		(0.004)	(0.004)		(0.004)	(0.004)
State-owned Enterprise		0.058***	0.058***		0.057***	0.057***
		(0.010)	(0.010)		(0.009)	(0.009)
Existing Cash		0.051***	0.051***		0.051***	0.052***
		(0.016)	(0.016)		(0.015)	(0.016)
Operating Cash Flow		-0.029	-0.028		-0.030	-0.028
		(0.025)	(0.024)		(0.024)	(0.024)
Net Financing		0.019			0.019	
		(0.013)			(0.013)	
Net Affiliated Financing			0.149**			0.159**
			(0.071)			(0.071)
Net Unaffiliated Financing			0.017			0.017
			(0.013)			(0.013)
Province Controls	No	Yes	Yes	No	Yes	Yes
First-stage F statistic	102.0	41.19	41.20			
Partial R^2	0.327	0.167	0.167			
Within R^2	0.000380	0.0488	0.0488	0.00120	0.0552	0.0554
Observations	14718	14718	14718	14718	14718	14718

Table C.3: **First Stage (Intensive Margin): Instrument is Strong** (Compare with Table 6)

This table presents results of the determinants of the profitability of entrusted lending. The sample includes the non-financial listed firms who are entrusted lenders from 2011 to 2016. The unit of observation is firm-year. The supply shock instrument follows (2), where banks with a loan-to-deposit ratio (LDR) greater than 65% at the end of 2010 are constrained banks; other banks are unconstrained banks. The composition is measured by the market share based on numbers of branches at the end of 2010. The industry-year fixed effects are included in all specifications. Standard errors in parentheses are clustered at the industry-year level. ***, ** and * represent 1%, 5% and 10% significance, respectively. The within R^2 is within the industry-year group. Two measures of instrument relevance—the first-stage F statistic and the Shea (1997) partial R^2 (i.e., the "squared partial correlation" between the excluded instrument *BankSupplyShock* and the endogenous regressor Δ*LogBankLoan*)—are presented as well.

	Δ Log Bank Loan		
	(1)	(2)	(3)
Main effects:			
Bank Supply Shock	4.389***	3.072***	3.061***
	(0.394)	(0.382)	(0.383)
Firm Characteristics:			
Size		-0.001*	-0.001*
		(0.000)	(0.000)
State-owned Enterprise		-0.001	-0.001
		(0.001)	(0.001)
Existing Cash		0.001	0.000
		(0.003)	(0.003)
Operating Cash Flow		0.030**	0.030**
		(0.013)	(0.013)
Net Financing		0.007	
		(0.006)	
Net Affiliated Financing			-0.013
			(0.013)
Net Unaffiliated Financing			0.008
			(0.006)
Province Controls	No	Yes	Yes
F statistic	124.3	64.81	63.97
Partial R^2	0.350	0.180	0.178
Within R^2	0.350	0.441	0.442
Observations	2339	2339	2339

Table C.4: **Entrusted Lenders in Constrained Cities Make More Profits (IV)** (Compare with Table 7)

This table presents the instrumental variables analysis and the corresponding reduced-form results of the profitability of entrusted lending. The sample includes the non-financial listed firms who are entrusted lenders from 2011 to 2016. The unit of observation is firm-year. The supply shock instrument follows (2), where banks with a loan-to-deposit ratio (LDR) greater than 65% at the end of 2010 are constrained banks; other banks are unconstrained banks. The composition is measured by the market share based on numbers of branches at the end of 2010. The industry-year fixed effects are included in all specifications. Standard errors in parentheses are clustered at the industry-year level. ***, ** and * represent 1%, 5% and 10% significance, respectively. The within R^2 is within the industry-year group. For the IV results, two measures of instrument relevance—the first-stage F statistic and the Shea (1997) partial R^2 (i.e., the "squared partial correlation" between the excluded instrument *BankSupplyShock* and the endogenous regressor $\Delta LogBankLoan$)—are presented as well.

	Return on EL (%)					
	IV (2SLS)			Reduced Form		
	(1)	(2)	(3)	(4)	(5)	(6)
Main effects:						
Δ Log Bank Loan	-1.359**	-2.370**	-2.371**			
	(0.626)	(1.076)	(1.102)			
Bank Supply Shock				-5.965**	-7.283**	-7.257**
				(2.889)	(3.436)	(3.497)
Firm Characteristics:						
Size		-0.065***	-0.065***		-0.063***	-0.063***
		(0.021)	(0.021)		(0.022)	(0.022)
State-owned Enterprise		-0.029	-0.029		-0.027	-0.028
		(0.023)	(0.022)		(0.024)	(0.024)
Existing Cash		0.153	0.155		0.152	0.154
		(0.210)	(0.210)		(0.214)	(0.214)
Operating Cash Flow		0.520	0.520		0.449	0.448
		(0.364)	(0.360)		(0.389)	(0.386)
Net Financing		0.087			0.070	
		(0.123)			(0.122)	
Net Affiliated Financing			0.231			0.262
			(0.567)			(0.577)
Net Unaffiliated Financing			0.087			0.069
			(0.130)			(0.129)
Province Controls	No	Yes	Yes	No	Yes	Yes
First-stage F statistic	124.3	64.81	63.97			
Partial R^2	0.350	0.180	0.178			
Within R^2	-0.00184	0.0342	0.0343	0.00269	0.0407	0.0409
Observations	2339	2339	2339	2339	2339	2339

Table C.5: **LDR Constraint Has Aggregate Effects on Credit Supply** (Compare with Table 8)

This table presents estimates of the impact of LDR constraints on the financing of real economic activities. The unit of observation is province-year. The sample period is from 2013 to 2016, the period when the provincial-level Aggregate Financing to the Real Economy (AFRE) flow data is available. *Constrained* is the province-level market share of constrained banks, defined as banks with a loan-to-deposit ratio (LDR) greater than 65%, at the end of 2010. Standard errors in parentheses are clustered at the province level. ***, ** and * represent 1%, 5% and 10% significance, respectively.

Panel A: Total Financing and Its Three Main Components

	Dep Var: AFRE components / GDP			
	Total Financing	Bank Credit	Shadow Bank Credit	Capital Markets
Constrained	-0.266	-0.362***	-0.004	0.109**
	(0.174)	(0.107)	(0.071)	(0.052)
Province Controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
R^2	0.162	0.211	0.264	0.0508
Observations	124	124	124	124

Panel B: Breakdown of Shadow Bank Credit and Capital Markets

	Dep Var: AFRE components / GDP				
	Shadow Bank Credit			Capital Markets	
	Entrusted Loans	Trust Loans	Bankers' Acceptances	Bond Market	Stock Market
Constrained	0.076**	-0.080	-0.000	0.087*	0.021
	(0.031)	(0.061)	(0.025)	(0.045)	(0.014)
Province Controls	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
R^2	0.0868	0.110	0.348	0.0505	0.149
Observations	124	124	124	124	124