

Inventory investment and the choice of financing: Does city-level financial development play a role?

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Motivation and background

China's undeveloped financial market and the choice of financing

- ▶ Using macro data for various countries worldwide, numerous papers have found a **positive relationship between** broad measures of **financial development and economic growth** (e.g. various papers by T. Beck and co-authors)
- ▶ China is considered as a **counter-example** since it has achieved **a rapid growth rate** despite **a malfunctioning financial system** (Allen et al. 2005; Guariglia, Liu and Song 2011)

Motivation (2)

- ▶ The financial system in China is mainly **bank-based**. The state-owned banks have a **preferential policy of lending** to state-owned enterprises (**SOEs**), which crowds out the access to credit for the **private sector**, and, in particular, **SMEs** (small- and medium-sized enterprises; Zhang et al. 2012)
- ▶ Informal finance such as **trade credit** (inter-firm transactions) may provide **an alternative source of funds**, and, hence, play an **important role** in China's rapid growth (Allen et al. 2019)

Motivation (3)

- The aggregate **value of trade credit** (accounts payable) for US non-financial firms is **three times that of bank loans** and **15 times that of commercial paper** (Barrot, 2015)
- Recent literature shows the presence of a **trade credit channel** in addition to a **bank lending channel** in the transmission of monetary policy [Nilson (2002); Love et al. (2007) for the US; Mateut et al. (2006); Guariglia & Mateut (2006) for the UK]
- However, most previous studies are conducted on **developed countries** with **well-functioning financial systems**

Motivation (4)

- Rajan & Zingales (1998) :
 - ▶ The **development of financial markets** can reduce the **costs of external finance** to firms
- Fisman and Love (2003) :
 - ▶ Firms in countries with **poorly developed financial markets** tend to **use more trade credit** as an alternative source of funds to bank loans
- Peterson and Rajan (1997)
 - ▶ **Firms use trade credit as a source of finance mostly because they are unable to raise funds from the traditional bank finance channel**

RESEARCH QUESTION:

Given the **capital market imperfections** characterizing China, we examine **the extent to which** the level of **regional financial development** influences firms' **choice of inventory investment financing** between trade credit and bank credit

Why Inventories? (1)

1. **Inventories** play a **vital role in the provision of products and services** at all levels of an economy, and as such have been subject to numerous investigations, from product-level, to firm-, industry-, and sector-level studies
2. Inventory investment plays a **crucial role in business cycle fluctuations**:
 - Blinder and Maccini (1991) document that inventory investment accounts for a **dramatic share of the decline in output** during **recessions**
 - Alan Blinder, a former Governor of the Federal Reserve System, famously remarked that “**the business cycle**, to a surprisingly large degree, is an **inventory cycle**”

Why Inventories? (2)

3. Inventory investment is **very sensitive** to **financial variables** and monetary policy shocks because of its **high liquidity** and **low adjustment costs** (Carpenter et al., 1994, 1998)
4. Despite the growth of the Chinese economy in recent decades, **little is known about inventories in mainland China**

Why China?

1. China has been characterized by **rapid growth** despite a **malfunctioning financial system** (Allen et al., 2005)
2. In China, **changes in inventories** are often a **leading indicator** for the overall performance of the economy (Trading Economics, 2020)
3. China's **regional financial development** is strongly **unbalanced**

Trade credit in China (1)

The literature suggests that trade credit is an **important alternative source of funds** for Chinese firms

1. **Ge & Qiu (2007)**: high usage of trade credit helps **non-SOEs** **bypass** the limited access to formal bank credit.
2. **Degryse et al. (2016)**: the use of informal finance, including trade credit, can **promote** high sales growth for small firms
3. **Allen et al. (2019)** define **trade credit** as “**constructive** informal financing” and find it \Rightarrow **good firm performance**

Contributions

Contributions (1)

1. Building on Carpenter et al. (1994, 1998) and Guariglia and Mateut (2006), who look at the role of financial variables in determining inventory investment in the US and the UK, respectively, we analyse, **for the first time**, the **role played by bank loans and trade credit in explaining Chinese firms' inventory investment**
2. Fisman & Love (2003) argue that firms in countries with less (more) developed financial markets rely more on trade credit (bank loans). We extend their **country-industry level analysis** by investigating, for the first time, the extent to which **city-level financial development** influences Chinese firms' choice of financing

Contributions (2)

3. Our study provides the first **micro-economic evidence** on the debate of the finance-growth nexus in China (e.g. Allen et al. 2005; Guariglia & Poncet, 2008; Zhang et al. 2012), focusing on **inventory investment**, which makes up **a large part of GDP growth**
4. We provide a **comprehensive** analysis on how the mix between trade credit and bank credit **differs across firms** with different characteristics such as **ownership**, **location**, and **financial conditions**

Hypotheses

Hypotheses (1)

- ✓ Firms use **trade credit** as a source of finance mostly because they are **unable to** raise funds from the traditional bank finance channel (Petersen and Rajan, 1997)
- ✓ The development of financial markets can **reduce the costs of formal external finance** (Rajan & Zingales, 1998)
- ✓ In line with the country-level evidence by Fisman & Love (2003), and focusing on China, which contains very **heterogeneous regions** in terms of financial development, we hypothesize that:

H1: *Financial development has a moderating effect on the association between bank loans/trade credit and inventory investment: it strengthens (weakens) the association between bank loans (trade credit) and inventory investment*

Hypotheses (2)

- ✓ In principle, firms can choose to finance their activities using **either** formal bank credit **or** informal trade credit
- ✓ **Yet**, when they are **financially constrained**, they **might not be** able to obtain credit from formal financial institutions due to the cost premium
- ✓ Especially in regions with **poor financial development**, these firms will, therefore, need to **rely on trade credit**

Hypotheses (3)

- ✓ Financial development is particularly important for lowering informational barriers and transaction costs that hinder small firms' growth (Beck *et al.*, 2008)
- ✓ This suggests that the difficulties faced by small firms in obtaining bank loans will be lower the higher the financial development
- ✓ Our second hypothesis follows

H2: The moderating effect of financial development on the association between bank loans/trade credit and inventory investment is stronger for firms more likely to face financing constraints

Specifications

Baseline specification

- Extension of **Lovell's (1961) stock adjustment model**:

$$\Delta I_{j,t} = \alpha_0 + \beta_0 \Delta I_{j,t-1} + \beta_1 \Delta S_{j,t} + \beta_2 \Delta S_{j,t-1} + \beta_3 (I_{j,t-1} - S_{j,t-1}) + \beta_4 \text{Loans}_{j,t} + \beta_5 \text{TC}_{j,t} + V_j + V_t + V_k + V_p + V_o + e_{jt} \quad (1)$$

- subscript j indexes firms; k , industries; p , provinces; o , ownership; and t , time (where $t = 2004-2009$)
- The lagged inventory growth and sale growth are included in the regression to capture **short-run dynamics**
- The error-correction term $(I_{j,t-1} - S_{j,t-1})$ captures the **cost of inventories being far from a target level** expressed in terms of sales

The choice of financing (1)

- We next introduce the interaction of **bank credit (*Loans*)**/trade credit (*TC*) with a city-level financial development indicator (*City_FinDev*):

$$\begin{aligned} \Delta I_{j,t} &= \alpha_0 + \beta_0 \Delta I_{j,t-1} + \beta_1 \Delta S_{j,t} + \beta_2 \Delta S_{j,t-1} + \beta_3 (I_{j,t-1} - S_{j,t-1}) \\ &+ \beta_4 \text{Loans}_{j,t} + \beta_5 \text{TC}_{j,t} + \beta_6 \text{City_FinDev}_{c,t} + \beta_7 \text{Loans}_{j,t} * \text{City_FinDev}_{c,t} \\ &+ \beta_8 \text{TC}_{j,t} * \text{City_FinDev}_{j,t} + V_j + V_t + V_k + V_p + V_o + e_{jt} \end{aligned}$$

- ▶ In line with **H1**, we expect the coefficient on *Loans * City_FinDev* to be **positive**
- ▶ We also expect the coefficient on *TC * City_FinDev* to be **negative**

The choice of financing (2)

- ▶ The **rationale** is that **financial development** reduces the **costs of external finance to firms** \Rightarrow high financial development **promotes** the use of bank credit
- ▶ However, for firms in cities with a **low level of financial development**, trade credit may **provide an alternative source of funds**, suggesting that low financial development may **encourage** firms to use trade credit
- ▶ To test **H2**, we estimate our model on **sub-samples** of firms with different **ownership**, based in different **regions**, and with different degrees of **financing constraints**

Data and summary statistics

Data (1)

- Firm-level data drawn from the annual accounting reports of **industrial firms** conducted by the **National Bureau of Statistics** (NBS) of China
 - ▶ from **2004 to 2009**
 - ▶ in **manufacturing and mining sectors**
 - ▶ with **annual sales** above **5 million RMB**
 - ▶ unbalanced panel of **224,604** mostly **unlisted firms**, corresponding to **597,140** observations
 - ▶ Our firms are based in **286** **prefecture-level cities** or **municipalities**

Data (2)

- We classify firms into **state-owned**, **collective**, **private** and **foreign** based on the **share of capital paid-in** by these different agents in each year
- We merge the data with the **city- and district-level of financial development** data, which is collected from the *China City Statistical Yearbook*
- All variables are deflated using the **gross domestic product (GDP) deflator**

Descriptive statistics

Table 1

Sample means and medians (in parentheses) of key variables.

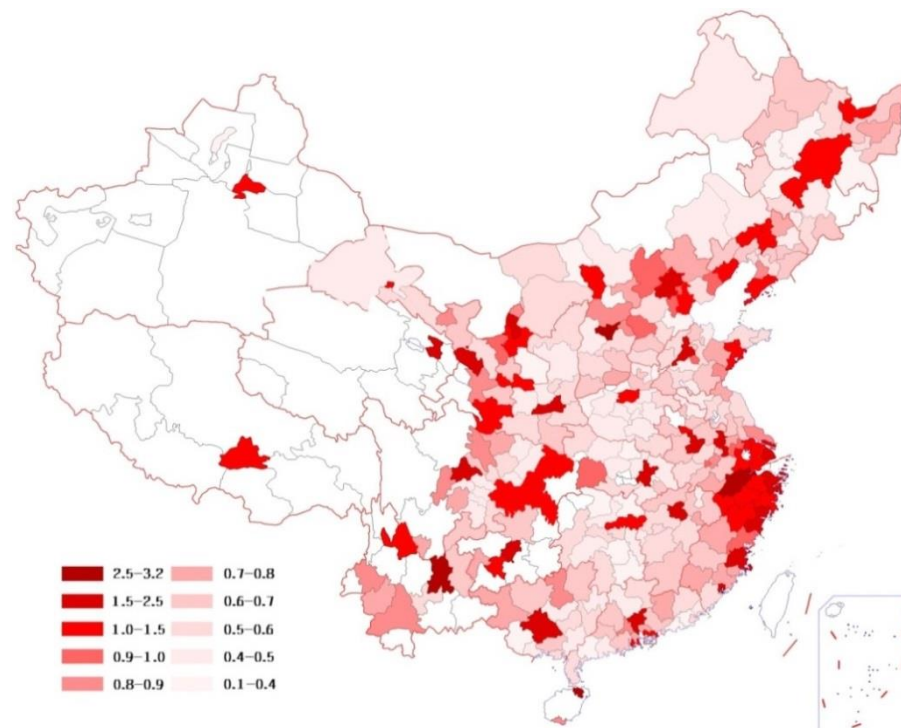
	(1) All	(2) State-owned	(3) Collective	(4) Private	(5) Foreign
ΔI	0.031 (0.025)	-0.049 (-0.023)	-0.010 (-0.009)	0.044 (0.033)	-0.005 (0.009)
TC	0.153 (0.099)	0.127 (0.079)	0.157 (0.102)	0.147 (0.093)	0.185 (0.130)
$Loans$	0.374 (0.363)	0.421 (0.412)	0.380 (0.366)	0.395 (0.392)	0.259 (0.210)
Observations	579,250	13,576	31,728	443,669	89,474

Descriptive statistics

- We observe that firms experienced **positive inventory growth** overall
 - **Private** firms are the major contributor to this growth
 - **Other firms** show **negative inventory investment**
- **SOEs** exhibit the **highest bank loans to assets ratio** (0.421) and the **lowest trade credit to assets ratio** (0.127)
- **Foreign firms** show the **lowest bank loans to assets ratio** (0.259) and the **highest trade credit to assets ratio** (0.185)

Financial Development in China

Maps of the **level of financial development** across **different cities** in 2009.



2009

City_FinDev: the ratio of **total loans** in the city's financial system to the city's gross regional product (**GRP**).

Main empirical results

- The Table that follows presents the estimates of our **baseline** model
- Estimation is carried out using a **fixed-effects** estimator

Empirical Results: Baseline Model (1)

Dependent Variable: $\Delta I_{j,t}$	(1)	(2)	(3)	(4)
$\Delta I_{j,t-1}$	0.0122*** (0.0017)	0.0139*** (0.0018)	0.0139*** (0.0018)	0.0140*** (0.0018)
$\Delta S_{j,t}$	0.456*** (0.0031)	0.458*** (0.0032)	0.458*** (0.0032)	0.458*** (0.0032)
$\Delta S_{j,t-1}$	-0.272*** (0.0033)	-0.275*** (0.0034)	-0.275*** (0.0034)	-0.275*** (0.0034)
$I_{j,t-1} - S_{j,t-1}$	-0.967*** (0.0023)	-0.973*** (0.0024)	-0.973*** (0.0024)	-0.973*** (0.0024)
$Loans_{j,t}$	0.519*** (0.0101)	0.401*** (0.0191)	0.511*** (0.0105)	0.446*** (0.0205)
$TC_{j,t}$	0.587*** (0.0139)	0.585*** (0.0143)	0.777*** (0.0270)	0.739*** (0.0289)
$Loans_{j,t} * City_FinDev_{c,t}$		0.119*** (0.0169)		0.0697*** (0.0187)
$TC * City_FinDev_{c,t}$			-0.200*** (0.0235)	-0.159*** (0.0260)
$City_FinDev_{c,t}$		0.230*** (0.0118)	0.304*** (0.0106)	0.272*** (0.0136)

Empirical Results: Baseline Model (2)

- The coefficients associated with **bank loans** and **trade credit** in column 1 are both **positive**
- The **coefficient on the interaction between bank loans and financial development is positive** and significant:
 - **Bank lending is more** widely used for firms in **financially developed cities**
 - The reason could be that financial development reduces the costs of using formal external finance

Empirical Results: Baseline Model (3)

- The coefficient on the **interaction term between trade credit and financial development is negative** and significant:
 - Firms in **less financially developed cities** are **more likely to use trade credit** to fund their inventory investment
- These findings **support** our **H1**

Robustness tests

- We check whether our main results are robust to using different indicators of financial development, i.e.:
 - *City_FinDev2*: ratio of total deposits to the city's GRP
 - *City_FinDev3*: ratio of total household savings to the city's GRP

- *City_FinDev4*: ratio of **total loans** in the city's **main district** to the gross regional product (GRP) of the city's main district
- *City_FinDev5*: **composite index of financial development** calculated by aggregating *City_FinDev*, *City_FinDev2* and *City_FinDev3* (Amidžic *et al.*, 2014)

- Our **main results** are **robust** to using different indicators of financial development
- We next check whether our **results are robust** to taking into account the **possible endogeneity** of our financial variables

- To this end, we first use a **fixed-effects IV** approach with:
 - the **proportion of people aged 64+**: instrument for city-level financial development seen as **regional supply of finance** (Becker, 2007; Butler and Cornaggia, 2011)
- We next use a **system GMM** estimator (Blundell and Bond, 1998)
- We **instrument** financial variables and their interactions using their own **lags**

Other Robustness Tests

- Our main **results are robust** to using and IV approach, as well as to using **system-GMM** in estimation

Other robustness tests:

- **Massive entry of new firms**
 - ▶ we re-estimate our models based on **a balanced** sample
- We include *Liquidity* in our baseline model to control for **the role of internal finance.**
- We stop the sample in **2006**

Accounting for financing constraints

- Ownership
- Regions
- Size and political connections

Different Ownership (1)

Table 6

Inventory investment models: Distinguishing firm-years on the basis of ownership

Dependent Variable: $\Delta I_{j,t}$	(1) State-owned	(2) Collective	(3) Private	(4) Foreign
$Loans_{j,t}$	0.612*** (0.1230)	0.697*** (0.0934)	0.414*** (0.0236)	0.522*** (0.0582)
$TC_{j,t}$	0.951*** (0.2000)	0.712*** (0.1280)	0.668*** (0.0339)	1.122*** (0.0706)
$Loans_{j,t} * City_FinDev_{c,t}$	0.0056 (0.1070)	-0.182** (0.0848)	0.0846*** (0.0220)	0.0626 (0.0497)
$TC * City_FinDev_{c,t}$	-0.0475 (0.1700)	-0.130 (0.1120)	-0.167*** (0.0310)	-0.242*** (0.0609)
Observations	11,720	30,384	420,215	86,559
Margin $City_FinDev$	0.027	-0.004	0.326***	0.202***

Different Ownership (2)

- **Interaction effects** of financial development with both trade credit and bank loans: **only significant for private firms** \Rightarrow support for H2
- For **state-owned** firms, the interaction terms are **not significant**
- For **foreign firms**: **interaction between financial development and trade credit** has a significantly **negative** coefficient, whilst the interaction with bank loans is no longer significant

Different Ownership (3)

- Our results are robust to using **different ownership classifications**
 - ▶ We use the ownership classification made on the basis of ownership shares **immediately before the sample period begins**
 - ▶ We also define a firm's ownership based on the **average shares of capital paid-in** by our four types of investors during the sample period

Different Regions (1)

Table 8

Inventory investment models: Distinguishing firm-years on the basis of location

Dependent Variable: $\Delta I_{j,t}$	(1) Coastal	(2) Interior
$Loans_{j,t}$	0.398*** (0.0246)	0.531*** (0.0412)
$TC_{j,t}$	0.648*** (0.0341)	0.892*** (0.0601)
$Loans_{j,t} * City_FinDev_{c,t}$	0.0879*** (0.0214)	0.00227 (0.0462)
<i>Diff-test (t-value)</i>	13.67***	
$TC_{j,t} * City_FinDev_{c,t}$	-0.0959*** (0.0294)	-0.219*** (0.0649)
<i>Diff-test (t-value)</i>	17.82***	
Observations	432,320	117,282
Margin $City_FinDev$	0.286***	0.097***

Different Regions (2)

- Financial development affects both the use of bank loans and trade credit in financing inventory investment only for firms located in **coastal regions**
- For these firms, the **use of bank loans is enhanced**, and the **use of trade credit discouraged** in cities characterized by more financial development ⇒ **support for H2**
- Our findings can be explained considering that firms operating in the most fast-growing coastal regions face **high competition** for a limited amount of funds

- We next estimate our models differentiating firms on the basis of the degree of **financing constraints** that they face
- We measure FC based on firms' **size** and **political affiliation**

Size and Political Affiliation (2)

Table 7

Inventory investment models: Distinguishing firm-years on the basis of financial constraints

Dependent Variable: $\Delta I_{j,t}$	(1) Low_FC (Large)	(2) High_FC (Small)	(3) Low_FC (With PA)	(4) High_FC (Without PA)
$Loans_{j,t}$	0.391*** (0.0302)	0.390*** (0.0313)	0.514*** (0.0482)	0.376*** (0.0258)
$TC_{j,t}$	0.712*** (0.0458)	0.702*** (0.0412)	0.700*** (0.0697)	0.710*** (0.0362)
$Loans_{j,t} * City_FinDev_{c,t}$	0.0997*** (0.0265)	0.103*** (0.0291)	-0.0214 (0.0457)	0.120*** (0.0234)
<i>Diff-test (t-value)</i>	-1.08		-35.01***	
$TC * City_FinDev_{c,t}$	-0.0841** (0.0404)	-0.126*** (0.0372)	-0.000147 (0.0641)	-0.183*** (0.0324)
<i>Diff-test (t-value)</i>	7.55***		19.46***	
Observations	269,415	280,187	98,856	398,009
Margin $City_FinDev$	0.226***	0.306***	0.083***	0.327***

- The **coefficients associated with the interaction terms are all significant for financially constrained (FC) firms** regardless of how financial constraints are measured
- The **magnitude** of the coefficients on the interaction terms are **higher for (FC) firms** compared to their financially healthier counterparts
- **Support for H2**

Conclusions and policy implications

Conclusions (1)

- Given the **capital market imperfections** characterizing the Chinese market, we investigate the **role of different sources of finance on firms' inventory investment**
- We find that both **bank lending and trade credit** play a **significant role in financing inventory investment**
- We also observe that in **cities with relatively high (low) financial development**, firms rely more on bank loans (trade credit) to finance their inventory investment

Conclusions (2)

- Finally, we show that the **moderating effect** played by financial development on the association between bank loans/trade credit and inventory investment is **more pronounced for private, small, politically unaffiliated firms, as well as firms based in coastal regions**
- These results are **robust** to the use of a variety of **controls, alternative variables, and different estimation techniques**

Policy Implications (1)

- Our findings provide a portrait of **the choice of financing** used by **different types** of Chinese firms
- Our results also provide fresh **micro-economic evidence** on the **relationship** between financial development and economic growth in China
- The importance of informal finance (i.e. **trade credit**) for **private** firms, firms from **coastal regions**, and **financially constrained** firms suggests that under-developed and inefficient financial markets might be an **obstacle** to the fast growth of these firms

Policy Implications (2)

- Given that private firms, firms located in **coastal regions**, and **SMEs** constitute the **engine of growth** of the Chinese economy, policy makers should think about **creating a more supportive legal and regulatory system** to promote more formal sources of funds to these firms
- A more **effective financial system** would lead to a **better allocation of resources**, which would in turn benefit the economy
- **Positive steps** in this direction have already been taken. Recent **reforms** to the financial system \Rightarrow significant **\uparrow in the flow of loans to the private sector** in recent years (Lardy, 2014; Borst and Lardy, 2015)

Thanks for your attention!
Comments are welcome!

