Local Crowding-Out in China

JF,2020,6(12)

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2021. 5.26

Summary

结论

local public debt

- crowded out the investment of private firms
- state-owned firms' investment **unaffected**

local public debt → tightening → funding constraints of private firms

方法

- exploits **variation** in the location of firms within their respective cities
- exploits **firm-level variation** in firms' funding needs due to technological differences between industries
- tests whether local government debt affects the **sensitivity** of firms' investment to internally generated funds

创新

- identify **a local crowding-out channel** by the geographical segmentation and interest rate ceilings
- the effects of the Chinese fiscal stimulus in the wake of the global financial crisis
- improves our understanding of local government debt in China

Abstract

- In China, between 2006 and 2013, local public debt crowded out the investment of private firms by tightening their funding constraints while leaving state-owned firms' investment unaffected.
- We establish this result using a purpose-built data set for Chinese local public debt.
- Private firms invest less in cities with more public debt, with the reduction in investment larger for firms located farther from banks in other cities or more dependent on external funding.
- Moreover, in cities where public debt is high, private firms' investment is more sensitive to internal cash flow.

1.Backgroud

- In China, local government debt almost quadrupled from 5.8% to 22% of GDP over the 2006 to 2013 period.
- -fiscal stimulus program carried out after 2008, worth US$590 billion(四万亿)
- - much-reduced reliance on central government debt and transfers to local governments.
- The increase in local public debt crowded out private investment.(导致后果)
- by inducing banks to tighten credit supply to local firms
- led to a reallocation of capital from private firms to the local public sector
- public debt issuance reducing not only firm investment, but also its efficient allocation

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geographical segmentation

- The Chinese credit market provides an ideal setting to test local crowding-out hypothesis because of its geographical segmentation.

☐ In an integrated, nationwide market, there would be no reason to expect local government debt to affect local investment.

- Its issuance would trigger an increase in local interest rates, drawing capital from the rest of the country, the greater stock of local public debt would be held by investors throughout the country (crowd out at national level)

☐ If the credit market is geographically segmented, the imbalance and its impact on investment would be localized.

- In China, debt issuance by local governments ends up being absorbed by local banks and, owing to interest rate ceilings, does not trigger an increase in local interest rates and thus a local savings response.

Crowding-out hypothesis

- Not all borrowers are expected to be affected equally. If banks maximize profits,

☐ **-tighten credit more to riskier borrowers**

- less collateral to pledge
- higher monitoring costs

☐ **-allocate credit preferentially to politically connected borrowers**

- State-owned firms

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Three approaches of Crowd out for causal and mechanism

- exploits variation in the location of firms within their respective cities.
- exploits firm-level variation in firms' funding needs due to technological differences between industries.
- tests whether local government debt affects the sensitivity of firms' investment to internally generated funds(FC indicator)

Contribution

- This paper is related to the vast literature on the effect of government debt on investment and growth.

- - a negative correlation between public debt and growth(Reinhart and Rogoff ,2011)
- - establishing causality has been more difficult
- - international comparisons are plagued by problems of reverse causality, omitted variables, and limited degrees of freedom

- Our paper: the geographical segmentation and interest rate ceilings of China's credit market

- - enable us to identify a local crowding-out channel
- - whereby government debt reduces investment by tightening financing constraints on private firms

Contribution

- Contribute to research on the effects of the Chinese fiscal stimulus in the wake of the global financial crisis (Deng et al., 2014; Ouyang & Peng,2015; Wen & Wu, 2019)
- **Our paper**: public debt issuance constrained the investment of private firms but not that of SOEs.

Contribution

- Our paper improves our understanding of local government debt in China
- Previous studies: estimate total local government debt with no geographical breakdown(National Audit Office,2013; Zhang and Barnett, 2014), or focus only on bond issuances(Liang et al., 2017)
- Our paper: build a detailed data set on total borrowing by LGFVs in 261 prefecture-level cities between 2006 and 2013

2.Data and variables

- **Prefecture-level cities:** we collect debt data for all 293 prefecture-level cities from 2006 to 2013, our statistical analysis is limited to 261 such cities.
- **Local government debt**: consists of bank loans and bonds, required to disclose their balance sheets for the current year as well as (at least) the three previous years.
- **City-level data:** GDP, total bank loans, and population and economic growth come from the China City Statistical Yearbook
- **Firm-level data:** Chinese Industrial Enterprise Database (CIED)

Geographical Segmentation

- Banks: 3 policy banks(**10%**), 1 postal bank, 5 large commercial banks(**40%**), 12 joint stock commercial banks(**19%**), 40 locally incorporated foreign banks(**1%**), 133 city commercial banks, and more than 2,000 rural banks or credit cooperatives(**30%**).

- **Geographical segmentation arises from two characteristic**s:

  - city and rural financial institutions rarely operate outside their own city or province.(2006年以前禁止，2006-2009允许，但跨区域经营的少)
  - even the policy banks and large commercial banks, often conduct business on a local basis.
  - limited capital mobility across regions
  - systematic dispersion in returns to capital across Chinese regions and cities
  - the local branches of large banks had substantial decision-making power and autonomy vis-à-vis their headquarters
  - The internal capital markets of large banks thus appear unable to balance out differences in the demand for credit across cities.
  - local Communist Party officials often had more say in investment project approval
  - need to reduce lending to nonconnected individuals when they lend more to government bureaucrats.

3.Investment and Local Public Debt

- 3.1 City-Level Regressions
  - Investment and Local Government Debt
  - Capital Productivity and Local Government Debt
- 3.2Firm-Level Regressions
  - Firm Investment and Local Government Debt
  - Firm Leverage, Local Government Debt, and Share of Local Bank Lending to LGFVs

3.1 City-level

- 1)City-level investment by manufacturing firms and local government debt.

$$I_{c,t} = \beta LGD_{c,t} + X_{c,t}\Gamma + \alpha_c + \tau_t + \varepsilon_{c,t}, \qquad (1)$$

- $\boldsymbol{I_{c,t}}$ is the ratio of investment to assets for manufacturing firms in city *c* and year *t*, $\boldsymbol{I_{c,t}}$ is the weighted average of the investment-to-asset ratios of the city's manufacturing firms
- $\boldsymbol{LGD_{c,t}}$ is the ratio of local government debt to local GDP
- $\boldsymbol{X_{c,t}}$ is a vector of city-level controls (bank loans over GDP, local government balance over GDP, GDP growth, log of GDP per capita, log of population, and average price of land)
- $\mathbf{a_c}$ and $\boldsymbol{\tau_t}$ are city and year fixed effects

Investment and Local Government Debt: City-Level Regressions

	(1) All	(2) All	(3) POE	(4) SOE	(5) large	(6) small
LGD	−0.083**	−0.093*	−0.104**	−0.029	−0.081*	−0.229**
	(0.033)	(0.041)	(0.039)	(0.050)	(0.040)	(0.080)
BL		−0.011	−0.002	−0.027	−0.008	−0.028
		(0.022)	(0.025)	(0.016)	(0.021)	(0.074)
GB		0.019	0.028	−0.139	0.055	−0.430
		(0.218)	(0.234)	(0.242)	(0.233)	(0.600)
GR		0.408**	0.332*	0.632***	0.424**	0.084
		(0.146)	(0.143)	(0.163)	(0.140)	(0.310)
ln(GDP PC)		4.858*	6.761*	−5.851*	2.919	18.121
		(2.542)	(3.228)	(3.060)	(2.153)	(11.760)
ln(POP)		7.889**	9.774**	−5.674	5.761*	27.243*
		(3.077)	(3.822)	(3.237)	(2.480)	(13.491)
ln(LP)		0.583	0.489	−0.411	0.568	1.624
		(0.561)	(0.564)	(0.992)	(0.603)	(2.406)
N. Obs.	1,862	1,800	1,798	1,514	1,800	1,800
N. Cities	261	261	261	261	261	261
Firms	All	All	Private	State	Large	Small
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes

- These correlations are consistent with the view that local government debt crowds out firm investment,
- and that such crowding-out affects firms that are more likely to be credit-constrained,
- such as small private firms in contrast to state-owned firms

2)Capital Productivity and Local Government Debt

	(1) All	(2) All	(3) POE	(4) POE	(5) SOE	(6) SOE
LGD	0.236***	0.271***	0.251***	0.275***	0.099	0.075
	(0.087)	(0.091)	(0.090)	(0.094)	(0.172)	(0.194)
BL		0.026		0.019		0.178*
		(0.059)		(0.062)		(0.091)
GB		−1.206**		−0.914		−1.923*
		(0.579)		(0.571)		(1.011)
GR		0.209		0.256		−0.096
		(0.319)		(0.331)		(0.855)
ln(*GDP PC*)		17.891*		14.673		49.286**
		(10.293)		(10.533)		(21.094)
ln(*POP*)		52.470***		53.205***		64.286**
		(17.591)		(18.136)		(28.770)
ln(*LP*)		0.352		0.609		−4.573
		(2.124)		(2.187)		(3.961)
N. Obs.	782	739	782	739	782	739
N. Cities	260	257	260	257	260	257
Firms	All	All	Private	Private	State	State
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes

- If capital markets are segmented and local government debt crowds out more efficient firms,
- the productivity of capital in private firms should be positively correlated with local government debt,
- as more public debt issuance should constrain private investment to a greater extent.

3.2 firm-level

- To better control for firm heterogeneity across and within cities, we turn to firm-level data and estimate:

$$I_{i,c,t} = \beta LGD_{c,t} + X_{i,c,t}\Gamma + \alpha_i + \zeta_c + \tau_t + \varepsilon_{i,c,t}, \quad (2)$$

- $\boldsymbol{I_{i,c,t}}$ is the ratio of investment to assets in firm *i*, city *c*, and year *t*
- $\boldsymbol{LGD}_{c,t}$ is the ratio of local government debt to local GDP in city *c* and year *t*
- $\boldsymbol{X}_{i,c,t}$ is a vector of firm-level controls, and α_i, ζ_c, and τ_t are firm, city, and year fixed effects,

1)Investment and Local Government Debt: Firm-Level Regressions

	(1)	(2)	(3)	(4)
I_{t-1}	−0.271***	−0.271***	−0.271***	−0.274***
	(0.006)	(0.006)	(0.006)	(0.002)
REV_{t-1}	4.050***	4.050***	4.050***	3.772***
	(0.089)	(0.089)	(0.089)	(0.079)
CF_{t-1}	7.779***	7.780***	7.780***	6.987***
	(0.519)	(0.519)	(0.519)	(0.195)
STATE		−0.386**	−0.697***	−0.253
		(0.174)	(0.224)	(0.176)
LGD	−0.055***	−0.055***	−0.056***	
	(0.016)	(0.016)	(0.016)	
STATE × *LGD*			0.027***	0.013*
			(0.009)	(0.007)
N. Obs.	1,035,427	1,035,427	1,035,427	1,035,400
N. Cities	261	261	261	261
Firm FE	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	No
Year FE	Yes	Yes	Yes	No
City-Year FE	No	No	No	Yes
LGD + *STATE* × *LGD*			−0.029	
p-Value			0.12	

2）Firm Leverage, Local Government Debt, and Share of Local Bank Lending to LGFVs

	(1) Lev	(2) Lev	(3) Lev	(4) Lev	(5) Lev	(6) Lev	(7) Lev	(8)
LGD	−0.009**	−0.013***	−0.001					
	(0.004)	(0.004)	(0.015)					
LGFV				−0.073***	−0.077***	0.003	−0.066***	
				(0.006)	(0.007)	(0.027)	(0.022)	
BL	0.025***	0.029**	−0.006	0.022***	0.025***	−0.006	0.024***	0.027***
	(0.001)	(0.002)	(0.007)	(0.002)	(0.002)	(0.007)	(0.006)	(0.006)
GB	−0.067***	−0.063***	−0.234***	−0.077***	−0.075***	−0.235***	−0.058	−0.046
	(0.020)	(0.022)	(0.069)	(0.020)	(0.022)	(0.069)	(0.073)	(0.075)
ln(*GDP PC*)	−2.610***	−2.776***	−0.278***	−2.671***	−2.789***	−0.277	−4.682***	−4.710***
	(0.214)	(0.238)	(0.821)	(0.214)	(0.238)	(0.821)	(1.050)	(1.053)
GR	0.058	0.065***	−0.121***	0.068***	0.072***	−0.121***	0.102***	0.089**
	(0.011)	(0.013)	(0.044)	(0.011)	(0.013)	(0.044)	(0.036)	(0.038)
LP	0.163***	0.057	0.735***	0.111*	−0.006	0.735***	0.216	0.248
	(0.060)	(0.070)	(0.230)	(0.060)	(0.070)	(0.230)	(0.170)	(0.175)
SIZE	−0.454***	−1.245***	−1.677***	−0.446***	−1.228***	−1.677***	−0561*	−0.568*
	(0.050)	(0.057)	(0.264)	(0.050)	(0.057)	(0.264)	(0.335)	(0.336)
RC							0.932	0.619
							(2.389)	(2.455)
N. Obs	751,974	591,084	40,332	751,974	591,084	40,332	591,152	591,152
N. Cities	261	261	261	261	261	261	261	261
Sample	All	Private	State	All	Private	State	All	All
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

- These results are consistent with the view that banks have less funds to lend to private firms when they lend more to local LGFVs.
- this result could also be driven by local governments implementing countercyclical policies and thus borrowing more when private firms deleverage,
- but it is worth noting that, in addition to controlling for year and city fixed effects, our specifications control for city-level GDP growth, total bank loans, and a host of other variables that capture local economic conditions.
- if high government debt were driven by low private-sector demand for credit, firm leverage should be positively correlated with city-level return to capital, while no statistically significant correlation between these two variables.

3) endogeneity bias: reverse causality, common shocks

- Reverse causality: local politicians may respond to negative shocks to private investment by instructing LGFV managers to borrow and invest more
- Common shocks: such as spending on public infrastructure, which increases both private firms' profitability and public debt issuance

- The effect of local government debt (D) on investment (I) is: $I = \alpha + \beta D + \varepsilon$
- Public debt reacts to investment according to:
- $D = a + bI + e$
- Reverse causality: $b < 0$ due to countercyclical local fiscal policy
- Common shocks: there may be a positive correlation $\rho_{\varepsilon e}$ between ε and e

Endogeneity and mechanism

- 4. Local Crowding-Out and Firm Location
- 5. Crowding-Out and Industry Financial Needs
- 6.Cash-Flow Sensitivity with Exogenous Sample Split
- 7. Cash-Flow Sensitivity with Endogenous Sample Split

4.Local Crowding-Out and Firm Location

- Conditional on their ownership and size, all firms located in the same city are equally affected by local government borrowing.
- However, firms that are closer to their city's border may find it easier to tap the capital market of a neighboring city and thus escape any credit shortage due to government borrowing in their own city.

To implement this strategy

- ***BD*$_i$**: it equal to one for firms that are within 20 km from the city border.
- *intended to measure the firm's potential access to funding outside the city borders.*
- *this measure is inappropriate if no banks are located next to the neighboring city's border.*
- ***BK*$_i$** :it equal to 1 if this distance(the average distance of each firm from the 10 closest bank branches located in another city) is less than 20 km.

- To test whether firms closer to banks in a neighboring city or to the border with a neighboring city are less likely to be crowded out by local debt issuance.

$$I_{i,c,t} = (\delta_1 BK_i + \delta_2 BD_i) \times LGD_{c,t} + X_{i,c,t}\Gamma + \alpha_i + \theta_{ct} + \varepsilon_{i,c,t}, \quad (4)$$

- the coefficients δ1 and δ2 capture the extent to which proximity to nearby-city banks and proximity to the city border mitigate the crowding-out effect of local public debt.

Investment, Local Government Debt, and Proximity to Other Cities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I_{t-1}	−0.258***	−0.258***	−0.258***	−0.258***	−0.259***	−0.263**	−0.263**
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)
REV_{t-1}	2.187***	2.187***	2.187***	2.187***	2.186***	2.210***	2.224***
	(0.047)	(0.047)	(0.047)	(0.047)	(0.048)	(0.054)	(0.056)
CF_{t-1}	4.409***	4.408***	4.412***	4.408***	4.437***	4.650***	4.642***
	(0.330)	(0.330)	(0.330)	(0.330)	(0.333)	(0.371)	(0.378)
$LGD \times BK$	0.017*	0.022**			0.028**	0.031**	0.036**
	(0.008)	(0.008)			(0.012)	(0.012)	(0.015)
$LGD \times BD$	0.015		0.023**				
	(0.010)		(0.010)				
$LGD \times PX$				0.004***			
				(0.001)			
$GR \times BK$					0.023		0.087**
					(0.021)		(0.044)
$BL \times BK$					−0.003		−0.007
					(0.003)		(0.004)
$NLGD \times BK$						−0.002	−0.007
						(0.014)	(0.017)
$NGR \times BK$							−0.089*
							(0.047)
$NBL \times BK$							0.006*
							(0.004)
N. Obs.	792,900	792,900	792,900	792,900	769,328	603,127	581,973
N. Cities	251	251	251	251	251	251	251
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
C-Y FE	No	Yes	Yes	Yes	Yes	Yes	Yes
N. C-Y FE	No	No	No	No	No	Yes	Yes

- The fact that when both interacted variables are included,
- a firm's proximity to nearby-city banks appears to dominate its proximity to the city border itself
- suggests that crowding-out operates specifically through firms' financing,
- rather than through access to other inputs available in nearby cities, such as land, workers, or construction materials.

- **A possible concern** is that the investment of firms that are more peripheral in their city may respond less to their own city's growth and to the depth of the local financial market than firms located more centrally in the same city:

- insofar as these variables are correlated with local government debt issuance, this could bias the estimate of the proximity coefficient δ

- the investment of firms close to banks in neighboring cities may be affected by the issuance of government debt in these cities.
- we construct a variable measuring the local government debt of the city in which the 10 banks closest to firm *i* are located($NLGD_{i,t}$)
- We expect this variable to carry a negative coefficient, capturing crowding-out of firm *i* 's investment in the credit market of the neighboring city.

5. Crowding-Out and Industry Financial Needs

- To examine whether government debt reduces investment more in industries that for technological reasons need more external funds.
- an approach akin to that used by Rajan and Zingales (1998) to test the effect of financial development on investment.

- we aggregate our data at the industry-city level and estimate:

$$I_{j,c,t} = \beta I_{j,c,t-1} + \delta\left(EF_j \times LGD_{c,t}\right) + \alpha_{jt} + \theta_{ct} + \eta_{cj} + \varepsilon_{j,c,t}, \quad (5)$$

- where $\boldsymbol{I_{j,c,t}}$ is the investment-asset ratio in industry *j*, city *c*, and year *t*,
- $\boldsymbol{EF_j}$ is a time-invariant measure of the external fund dependence of industry *j*,
- $\boldsymbol{LGD_{c,t}}$ is local government debt scaled by GDP in city *c* and year *t*,
- and α_{jt}, θ_{ct}, and η_{cj} are industry-year, city-year, and city-industry fixed effects, respectively.
- ***The parameter δ measures the incremental impact of local government debt on the investment of industries that depend more heavily on external finance.***

- ***index of external financial dependence***(Rajan and Zingales (1998) : is the industry median ratio of capital expenditures minus operating cash flow, scaled by total capital expenditures, for a sample of U.S. firms in the 1980s. (资本支出行业中位数-营业现金流/总资本支出)
- Rajan and Zingales (1998) use data for U.S. firms as they are least likely to be credit-constrained, owing to the high degree of U.S. financial development.
- Hence, the amount of external funds used by U.S. firms is likely to be a good measure of their unconstrained demand for external financing.

- There are two issues of **Rajan-Zingales index:**
  - - not able to match the Chinese three-digit industry code of our survey with the original Rajan and Zingales ISIC code.
  - - the technological parameters of Chinese firms are likely to be different from those of large U.S. firms.
- We use the methodology used by Rajan and Zingales for U.S. firms to construct an industry-level measure of external financial dependence for Chinese firms based on data from the four cities with the most developed financial markets: Beijing, Shanghai, Hangzhou, and Wenzhou.
- We then use this measure to estimate equation (5) for the remaining 257 cities in our sample.

Crowding-Out and Industry Financial Needs

	(1)	(2)	(3)	(4)	(5)	(6)
I_{t-1}	−0.216***	−0.168***	−0.213***	−0.394***	−0.232***	−0.221***
	(0.007)	(0.011)	(0.007)	(0.031)	(0.011)	(0.011)
$EF \times LGD$	−0.017***	−0.014**	−0.017**	−0.004	−0.018**	−0.011
	(0.008)	(0.007)	(0.001)	(0.015)	(0.009)	(0.012)
N. Obs	46,379	18,398	44,527	3,655	21,461	17,370
N. Cities	257	257	257	197	256	256
	With Additional Interactions					
I_{t-1}	−0.217***	−0.174***	−0.214***	−0.398***	−0.234***	0.220***
	(0.006)	(0.011)	(0.007)	(0.111)	(0.001)	(0.011)
$EF \times LGD$	−0.021***	−0.017***	−0.021***	−0.007	−0.023***	−0.012
	(0.007)	(0.006)	(0.007)	(0.079)	(0.009)	(0.011)
$EF \times BL$	0.004***	0.017***	0.004***	0.001	0.004	0.006***
	(0.001)	(0.001)	(0.001)	(0.006)	(0.002)	(0.002)
$EF \times ln(GDP\ PC)$	0.4078*	−0.543***	0.352	0.788	0.456	−0.062
	(0.22)	(0.166)	(0.223)	(2.501)	(0.327)	(0.380)
$EF \times GR$	0.025	0.104***	0.030	0.083	0.067*	−0.015
	(0.019)	(0.013)	(0.020)	(0.189)	(0.034)	(0.034)
$EF \times LP$	−0.174	0.408***	−0.175	−0.311	−0.018	−0.213
	(0.112)	(0.106)	(0.121)	(1.353)	(0.180)	(0.187)
N. Obs	45,753	18,138	43,958	3,554	21,161	17,138
N. Cities	257	257	257	197	255	255
City-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind.-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind.-City FE	Yes	Yes	Yes	Yes	Yes	Yes
Sample	All	All	Private	State	Low Exp.	High Exp

- The coefficient δ on the interaction between external financial dependence and local government debt is negative and statistically significant: local crowding-out is particularly severe for firms that belong to industries that need more external financial resources.
- Local government debt is less important for firms that operate in industries with high exposure to government spending, as the coefficient on the interaction between local government debt and the index of external financial needs is not statistically significant.

6. Cash-Flow Sensitivity with Exogenous Sample Split

- The Rajan-Zingales approach enables us to identify credit rationing as the economic channel through which local crowding-out operates, but it is based on strong assumptions about the determinants of firms' external funding needs.(基于外部融资需求的强大假设)
- However, manufacturers in a given industry may well adapt their technologies to local conditions, so as to save on external funding.
- This would lead us to underestimate the impact of local government debt on manufacturing investment.

- To overcome this limitation, we adopt an empirical strategy that relies on firm-level estimates of cash-flow sensitivity to test whether government debt tightens the financing constraints of private firms.
- Fazzari et al.(1988): investment sensitivity to internally generated funds should be greater for credit-constrained firms.
- Love (2003): financial market depth is associated with lower sensitivity of investment to internal funds.

Empirical strategy

- The sensitivity of investment to cash flow has been criticized as a measure of financing constraints (Kaplan and Zingales, 2000) :
- We split the sample into constrained versus unconstrained firms using an exogenous sample separation rule. (SOEs vs. POEs; large vs. small firms)
- Second, we endogenize the sample separation rule by estimating a switching model of investment in which the probability of a firm facing financing constraints is estimated jointly with firms' cash-flow investment sensitivity.
- *This approach does not hinge on a predetermined sample separation between constrained and unconstrained firms.*

Model

We employ a similar model, but using city-level government debt as a measure of financing constraints:

$$I_{i,c,t} = \beta I_{i,c,t\text{-}1} + \delta REV_{i,c,t\text{-}1} + \gamma_1 CF_{i,c,t\text{-}1} + \gamma_2 LGD_{c,t} * CF_{i,c,t\text{-}1} + \alpha_i + \theta_{ct} + \varepsilon_{i,c,t}, \quad (6)$$

$I_{i,c,t}$:the fixed capital investment
$REV_{i,c,t}$: change in revenue
$CF_{i,c,t}$:cash flow of firm i in city c and year
$LGD_{i,c}$: local government debt scaled by GDP in city *c* and year *t*
α_i :firm-level fixed effects
θ_{ct}: city-year effects

Table XI: Cash-Flow Sensitivity of Investment

	(1)	(2)	(3)	(4)	(5)
I_{t-1}	−0.273***	−0.280***	−0.371***	−0.230***	−0.333***
	(0.002)	(0.002)	(0.008)	(0.004)	(0.005)
REV_{t-1}	3.773***	3.799***	2.398***	5.955***	1.954***
	(0.031)	(0.034)	(0.167)	(0.117)	(0.057)
CF_{t-1}	6.725***	7.334***	4.328***	5.815***	4.472***
	(0.231)	(0.256)	(1.190)	(0.660)	(0.539)
$CF_{t-1} \times LGD$	0.028**	0.029**	−0.097	−0.020	0.075*
	(0.011)	(0.013)	(0.055)	(0.026)	(0.030)
N. Obs.	1,035,400	858,624	45,922	110,091	107,694
N. Cities	261	261	261	261	261
Firm FE	Yes	Yes	Yes	Yes	Yes
City-Year FE	Yes	Yes	Yes	Yes	Yes
Sample	All	Private	State	Large	Small

Omitted variable bias

- However, these specifications may omit an important variable, namely, the interaction between cash flow and total bank loans relative to GDP.
- As bank loans are positively correlated with local government debt and negatively correlated with credit constraints, their exclusion from the model should lead to a downward bias in the estimate of $\gamma 2$.

Table IX

$CF_{t-1} \times LGD$	0.028^{**}	0.029^{**}	-0.097	-0.020	0.075^{*}
	(0.011)	(0.013)	(0.055)	(0.026)	(0.030)

Table X

$CF_{t-1} \times LGD$	0.075^{***}	0.083^{***}	-0.044	-0.016	0.157^{***}	0.073^{***}
	(0.014)	(0.016)	(0.069)	(0.038)	(0.045)	(0.017)

- The presence of large banks does not appear to mitigate the crowding-out effect of local government debt

Table X: Cash-Flow Sensitivity of Investment: Controlling for Bank Loans

	(1)	(2)	(3)	(4)	(5)	(6)
I_{t-1}	−0.274***	−0.281***	−0.371***	−0.230***	−0.333***	−0.274***
	(0.002)	(0.002)	(0.008)	(0.004)	(0.005)	(0.002)
REV_{t-1}	3.770***	3.796***	2.393***	5.954***	1.951***	3.774***
	(0.031)	(0.033)	(0.168)	(0.135)	(0.067)	(0.031)
CF_{t-1}	8.343***	9.141***	6.020***	6.367***	7.062***	10.073***
	(0.374)	(0.411)	(1.902)	(1.193)	(1.037)	(0.447)
$CF_{t-1} \times LGD$	0.075***	0.083***	−0.044	−0.016	0.157***	0.073***
	(0.014)	(0.016)	(0.069)	(0.038)	(0.045)	(0.017)
$CF_{t-1} \times BL$	−0.022***	−0.025***	−0.023	−0.007	−0.035***	−0.031**
	(0.004)	(0.004)	(0.019)	(0.011)	(0.011)	(0.004)
$CF_{t-1} \times LGD \times LB$						−0.033
						(0.028)
$CF_{t-1} \times BL \times LB$						0.034***
						(0.007)
$CF_{t-1} \times LB$						−5.258***
						(0.708)
N. Obs.	1,035,400	868,624	45,922	110,091	107,694	1,035,383
N. Cities	261	261	261	261	261	261
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
City-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sample	All	Private	State	Large	Small	All

Credit market segmentation

- We use the city-level return to capital as a proxy for the geographic heterogeneity in credit frictions and check whether the credit scarcity due to local government debt issuance is particularly severe in cities with high return to capital, which presumably feature high barriers to capital flows.
- We examine whether government debt triggers a larger increase in the cash-flow sensitivity of investment in cities where the return to capital is higher.
- We first split the sample into city-years with above- and below-median return to capital.
- The credit scarcity due to high government debt issuance is more severe when return to capital is particularly high.

Table XI Cash-Flow Sensitivity of Investment and the Return to Capital

	(1)	(2)	(3)	(4)	(5)	(6)
I_{t-1}	−0.304***	−0.228***	−0.313***	−0.235***	−0.272***	−0.272***
	(0.002)	(0.004)	(0.003)	(0.004)	(0.002)	(0.002)
REV_{t-1}	3.611***	4.151***	3.655***	4.137***	3.782***	3.782***
	(0.048)	(0.068)	(0.053)	(0.072)	(0.036)	(0.036)
CF_{t-1}	7.597***	6.500***	8.254***	6.851***	6.907***	6.791***
	(0.330)	(0.435)	(0.377)	(0.472)	(0.238)	(0.238)
$CF_{t-1} \times LGD$	0.167***	−0.018	0.162***	−0.019	0.051**	0.048***
	(0.033)	(0.020)	(0.037)	(0.022)	(0.021)	(0.021)
$CF_{t-1} \times RC$					−29.889***	−32.054***
					(3.065)	(3.170)
$CF_{t-1} \times LGD \times RC$					0.898***	0.868***
					(0.228)	(0.228)
$CF_{t-1} \times BL$						3.002***
						(0.6667)
$CF_{t-1} \times BL \times RC$						25.651***
						(8.521)
N. Obs	469,038	219,659	373,025	188,808	764,769	764,769
N. Cities	147	143	147	143	171	171
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
City-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sample	High Ret. Cities All Firms	Low Ret. Cities All Firms	High Ret. Cities Private	Low Ret. Cities Private	All Cities All Firms	All Cities All Firms

- Higher local government debt increases the sensitivity of investment to cash flow in private firms.
- The coefficient on the interaction between local government debt and cash flow is always positive, statistically significant, and almost equal to that in our baseline regression.

7.Cash-Flow Sensitivity with Endogenous Sample Split

- so far, a firm's financing status—credit constrained or not—is identified by exogenously splitting the sample.
- *There are two problems with this approach：*
- It does not jointly control for all of the factors that affect firms' substitution of external funds with internal funds,
- it does not allow for firms switching from being credit-constrained to unconstrained or vice versa.

- We address these issues by estimating an endogenous switching model with unknown sample separation.
- a firm is assumed to operate in one of two regimes: credit-constrained, where investment is sensitive to internal funds, or unconstrained, where it is not.
- The probability of a firm being in one regime or the other is determined by a switching function that depends on firm characteristics that capture the severity of the frictions the firm faces at a given point in time.

- we jointly estimate the three equations

$$W^*_{i,c,t} = M_{i,c.t}\psi + u_{i,c,t}, \qquad (7)$$

$$I_{1,i,c,t} = X_{i,c,t}\alpha_1 + \epsilon_{1,i,c,t}, \qquad (8)$$

$$I_{2,i,c,t} = X_{i,c,t}\alpha_2 + \epsilon_{2,i,c,t}, \qquad (9)$$

- where $W*$ is a latent variable capturing the probability that firm *i* in period *t* is in one of the two regimes.

- Equation (7) is the selection equation that estimates the likelihood that the firm is in the unconstrained regime 1 ($I_{i,c,t} = I_{1,i,c,t}$ if $W^*_{i,c,t} < 0$) versus the constrained regime 2 ($I_{i,c,t} = I_{2,i,c,t}$ if $W^*_{i,c,t} \geq 0$) as a function of variables *M* that proxy for financial strength and other factors that may amplify agency problems and thus lead to a tightening of financing constraints.

- we model selection into the two regimes as a function of the log of firm age, the log of total assets, distance to default (Altman Z-score), a time invariant measure of industry-level asset intangibility, a dummy variable for firm type (one for private domestic firms, zero otherwise), and local government debt

- A firm’s likelihood of being credit-constrained is expected to decrease with age, size, distance to default, and asset tangibility, and to increase with private ownership and local government debt.

Table XII Switching Regression Model

Panel A. Selection Equation			
	(1)	(2)	(3)
ln(*Age*)	10.770***	7.176***	8.437***
	(0.077)	(0.072)	(0.066)
ln(*Assets*)	0.396**	0.685***	1.680***
	(0.034)	(0.002)	(0.027)
Zscore	0.097***	0.994***	0.918***
	(0.018)	(0.016)	(0.011)
Private	−8.943***	−5.063***	−4.248***
	(0.141)	(0.132)	(0.117)
Tangible	8.401***	4.642***	
	(0.280)	(0.261)	
LGD	−0.012*		
	(0.001)		
N. Obs	1,060,404	1,060,404	1,060,404

Table XII Switching Regression Model

Panel B. Investment Equation

	(1.1) Not Constr.	(1.2) Constr.	(2.1) Not Constr.	(2.2) Constr.	(3.1) Not Constr.	(3.2) Constr.
CF_{t-1}	15.65***	4.158***	2.969***	8.208***	13.931***	7.125***
	(0.030)	(0.183)	(0.240)	(0.187)	(3.231)	(0.028)
$CF_{t-1} \times LGD$	−0.410***	0.142***	−0.056***	0.047***	−0.333***	0.114***
	(0.001)	(0.009)	(0.001)	(0.010)	(0.01)	(0.001)
LGD	−0.013***	−0.041***				
	(0.001)	(0.004)				
N. Obs.	305,603	754,800	2745,048	785,355	231,967	828,436
City FE	Yes		No		No	
Year FE	Yes		No		No	
City-Year FE	No		Yes		Yes	
Ind-Year FE	No		No		Yes	

Conclusion

- China reacted to the global financial crisis with a massive fiscal stimulus package, funded mainly by the issuance of local government debt and focused largely on public investment.
- At first glance, the stimulus was a resounding success—China escaped the Great Recession and became one of the main drivers of world economic growth.
- However, our estimates suggest that the massive increase in local government debt had an adverse impact on investment by private manufacturing firms.
- This reallocation of investment from the private to the public sector could undercut China's long-run growth potential, this policy has strengthened the bank-sovereign nexus in China, which creates the potential for serious risks to systemic stability in the future.

- Thanks