International Review of Economics and Finance 69 (2020) 435–455

Contents lists available at ScienceDirect

International Review of Economics and Finance

journal homepage: www.elsevier.com/locate/iref

Marketization vs. market chase: Insights from implicit government guarantees

Xiaoqian Zhang *, Zhiwei Wang

School of Economics, Academy of Financial Research, Zhejiang University, China

ARTICLE INFO

Keywords:
Implicit guarantee
State ownership
Credit spreads
Government intervention

ABSTRACT

Local Government Financing Vehicles (LGFVs) and state-owned enterprises (SOEs) provide implicit guarantee during the issuing of bonds, thereby reducing their funding cost. The credit spreads are lower when issued by a LGFV with a higher administrative level. This means that implicit guarantee is also strengthened with government centralization. We also explain the anomaly of municipal corporate bonds (MCBs)' spreads decrease after a marketization regulation of removing implicit guarantees. This paper provides strong evidence that the market will chase implicit guarantee when default wave comes even under tight government regulations.

1. Introduction

Implicit government guarantees that favor state-owned firms are becoming more prominent during recessions. It reduces the financing cost, and distorts corporate investment decisions. Current literature analyzes the effect of government intervention on economic activity during the Great Recession and the aftermath. Cong et al. (2019) document that China's credit expansion driven by the economic stimulus plan of 2009–2010 disproportionately favored state-owned firms based on loan-level data. In the post-stimulus period, Chinese local governments resorted to non-bank debt with the development of the Chinese corporate bond market (Chen et al., 2020b). Both papers demonstrate the effect of government guarantee on firm financing.

The difference between government guarantees between China and the U.S. is highlighted in municipal bonds. In China, municipal bonds are also issued by Local Government Financing Vehicles (LGFVs), which are state-owned enterprises to support the infrastructure investment. There are two areas in particular that make China's municipal corporate bonds are different from American municipal bonds from the following two perspectives. First, individual investors hold municipal bonds directly or through municipal bond funds in the U.S., while financial institutions buy the municipal corporate bonds (MCBs) in China. Second, the credit rates of China's MCBs are highly and have never defaulted. As our data shows, almost all the MCBs were high rated in China while there are lots of speculative-grade municipal bonds in the U.S. as Babina et al. (2020) show. Borisova et al. (2015) find that government ownership is generally associated with a higher cost of debt in 43 countries over 1991–2010. In contrast, we find China market chases more implicit government guarantees.

This paper provides strong evidence that the implicit government guarantee does exist and reduces the funding costs by exploring bonds' credit spreads. We find that the spreads of MCB and other local SOEs are 85 and 81 basis points lower than that those of POE bonds while their ROA is significantly lower. Central SOEs have even lower spreads. The implicit government guarantee does exist in MCBs when we control bonds' credit rates. Our finding stems from a deeper analysis from three perspectives. First, MCBs and other local

* Corresponding author. .
E-mail address: develop21cn@zju.edu.cn (X. Zhang).

https://doi.org/10.1016/j.iref.2020.06.021
Received 22 October 2019; Received in revised form 11 June 2020; Accepted 15 June 2020
Available online 27 June 2020

SOEs have about 1% lower financing cost when we introduce bond characters and regional economic development. This reveals that the main concern is that of misallocation of capital as Gertler and Klenow (2019) addressed. Government credit may cause crowding out of private companies in the same industry (Ru, 2018). Second, we further exploit the effect of administrative levels of MCBs. Our results identify political decentralization (Bardhan, 2016) in different administrative level of LGFVs. Administrative level decentralization increases funding costs, which is consistent with Huang et al. (2017). Third, our in-depth research on guarantees reveals the heterogeneities of implicit and explicit government guarantees. We find that credit spreads are about 12 bps higher with guarantors or explicit government guarantees, while implicit guarantee significantly decreases the spreads of bonds by 1%, very significantly.

The mechanism is adapted from regional government intervention and macro heterogeneities. We use two indicators to identify government intervention following Hao and Lu (2018), based on employees or and GDP, respectively. We find that there are significant effects stemming from government intervention. Regional macro heterogeneities are also examined from regional economic development, fiscal statement and bank loan credit. We find that the implicit government guarantee has more power over bank loans and decreasing the MCB's financing cost in more developed regions and more bank loans. Economic development dominates this effect. In order to handle the endogeneity, we introduce an instrumental variable to predict local GDP per capita, an interaction of regional medical and health expenditure in public expenditure per capita and the pandemic. The latter is a dummy variable, displaying either high or low cumulative confirmed cases of coronavirus in this region. The results are robust. The reason why we introduce this IV based on public health is on the basis of the power of local governments pertaining to public health, as pointed out by journalists (for example, the lead article on Economist May 30,2020[1]).

Prominent studies have a tendency to focus on the black side of government intervention, like conflicts among different parties in production under asymmetric information (Caillaud et al., 1988), policy burdens and soft budget constraint (Lin & Tan, 1999), making inefficient investment decisions (Chen et al., 2011).[2] However, price is endogenous to government policy, which is a clear sign of a key economic force. When governments make decisions based on information they learn from market prices, this affects the amount of information the government can obtain. Bond and Goldstein (2015) documents that the government discloses details about a variable that would be beneficial to speculators. This in turn, helps the government due to the reduction of risk faced by speculators because of the disclosed stock prices. But Bond and Goldstein (2015) maintains the concern that the government would conduct major interventions without having precise information about the costs and benefits of doing so. China's bond market and the recent tightening of interventions provide insights of Bond and Goldstein's concern. China government has much more information on Municipal Corporate Bonds (MCBs) than the speculators, but it kept marketizing MCBs without learning from the information on MCBs' price. The implicit government guarantee should decrease as these marketing policies being practiced, in contrast, we find that market kept chasing these MCBs because of the implicit guarantees which they regard as much safer.

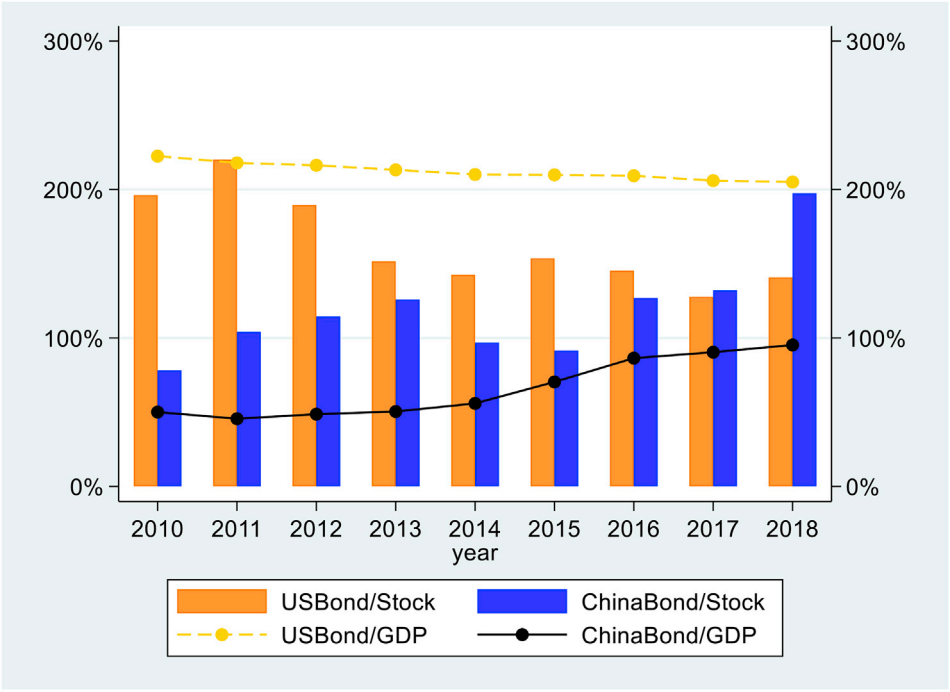
Our paper is related to the literature on political connections or state ownership. Previous research focused on the political connections, originating from the findings of Fisman (2001). Fisman and Wang (2015) which provide evidence on how political connections enable firms to avoid compliance measures based on their finding that the death rate of workers for connected companies is 2–3 times that of unconnected firms. Gao et al. (2019) recently find that established local politicians engage less often in selective defaults on bank loans. Our paper provides a perspective from the bond market to explain the bargaining between government and market. It also provides evidence on the research of state ownership. Shi and Zhang (2018) find the corporate investment heterogeneity of SOEs and POEs during the global financial crisis came and China corporate investment state establishes a new normal. Zhang et al. (2020) further exploited the current policy shock of on-going mixed-ownership reform. This paper focus on a third regulation effect, but specifically focus on bond financing.

The main contribution of this paper is that we further discuss the bargaining between state and market by a new perspective of government debts' marketization. We find a significant effect of Article 43 which issued by China's State Council in September 2014. Local governments are required to issue municipal bonds directly to swap the debt initially raised by LGFVs. Thus, the implicit government guarantees should have been weakened because of Article 43, resulting in a higher spread because the implicit guarantee is reducing. However, we find the contrary effect that the spread of MCB's actually decreases after this policy change by DiD regressions. We compare MCBs with local SOEs and POEs, respectively. All results point to how MCBs have a lower spread after Article 43. Why does the market still chase implicit government guarantees? We provide evidence that market concerns on recent bond default wave in China. We find that POE's bond default is the driver while local SOE's default has the reverse effect. This paper sheds a new light on the relationship between state and market. It may not be one of the conflicting issues Bardhan (2016) addressed, where both state and market are able to balance the trade-offs they generate. Our paper finds a significant evidence to Bond and Goldstein (2015) and the post-stimulus period of Cong et al. (2019) and Chen et al. (2020b).

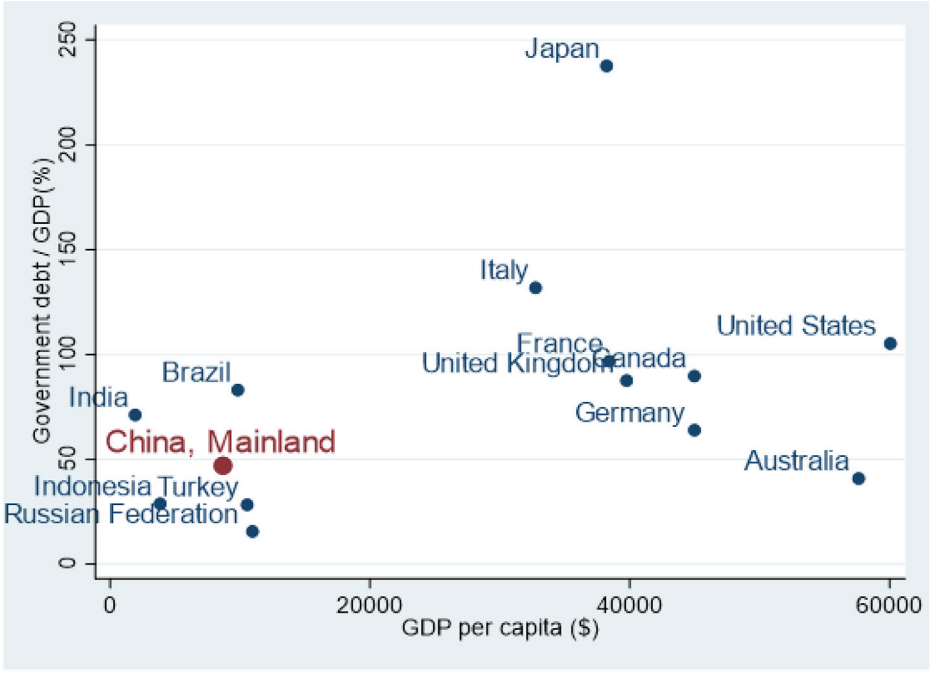
This paper is also helpful for international investors or scholars to understand the Chinese bond market. Along with some of Chinese national bonds and policy financial bonds were officially included in the Bloomberg Barclays Index Aggregate on April 1, a growing number of international investors have entered the interbank market since 2019. At of the end of 2019, about 2608 overseas institutions have entered the Chinese bond market, with a debt holding amount of more than 2.1 trillion RMB. We provide an insight from implicit government guarantee on an aspect of the post-stimulus period in China. While our paper draws evidence from China, the insight is also able to explain the relationship between government and market more broadly. This paper may also provide new evidence on some important theoretic literature, such as Hart and Zingales (2011), Bond and Goldstein (2015), who call for the state to make use of

[1] The American way: How the world's most powerful country is handling COVID-19. Leaders of Economist.

[2] Some event study analyses on the value of personal connection, see Fisman (2001), Faccio (2006), and Goldman et al. (2009); for event study evidence from China, see Fan et al. (2008).



Panel A: US and China Bond Outstanding



Panel B: Government debt of G20 countries

Fig. 1. International comparison. Fig. 1 (a) reports the growth of the Chinese bond market capitalization scaled by GDP (in bars) or stock market capitalization (in lines). As for the proportions of government debt over GDP in G20 countries, which implies that China has a much lower government debt ratio than developed countries except Australia, and even some developing countries like India and Brazil.

information contained in market prices, as many researchers and policy makers suggest.

The paper is organized as follows. Section 2 briefly reviews China bond market and regulations, and the implicit government guarantees implied in MCBs. Section 3 describes the sample and data. Section 4 presents the empirical results. Section 5 analyzes the

mechanism and section 6 further exploits the bargaining between state and market. Section 7 introduces Bonferroni tests, extreme bounds analysis and placebo tests as robustness checks. Section 8 summarizes our findings and concludes the paper.

2. Background and literature review

2.1. China bond market

With the development of China's economy and the improvement of financial markets, China's bond market has been experiencing a steady uprising trend. Following Amstad and He (2019), Panel A of Fig. 1[3] reports the prominent growth of the Chinese bond market outstanding over GDP (in bars) or over stock market capitalization (in lines). The China bond market is growing rapidly with a 9% growth rate of market capitalization over GDP, rising from 50% in 2010 to 95% in 2018. In contrast, the U.S. bond market capitalization has dropped from 224% in 2010 to 205% in 2018 over GDP, steadily decreasing by an average of 1% per year. As the bars show, the Chinese bond market in 2018 has bypassed its own stock market capitalization and the level of the U.S. bond market in 2017. Therefore, the Chinese bond market plays an increasingly important role, whether within its own capital market or the global perspective.

Panel B of Fig. 1,[4] compares the proportions of government debt over GDP in G20 countries. China has a much lower government debt ratio than other developed countries except Australia, and even some developing countries like India and Brazil. The reason may lie in that some Chinese government debts have been converted into corporate debt, municipal corporate bonds (MCB), whose issuer is a special corporation called as Local Government Financial Vehicle. It is more convenient for the government to conduct financing and investment through these MCBs. Chinese government debt is implied within corporate debt, which is a unique perspective of focusing on the bargain between state and market.

Jiang et al. (2020) provide an overview of Chinese capital markets before 2015. They documented that despite the accelerated growth of China's bond markets are growing fast but bank financing still dominates debt financing in China. As Panel A of Fig. 1 shows, Chinese bond market grows rapidly after 2015, the period examined by Jiang et al. (2020) examined. According to Total Social Financing dataset of the People's Bank of China (PBoC, China's central bank), the Chinese corporate bond market is 23.56 trillion RMB, more than three times of the domestic stock market, 7.36 trillion RMB of non-financial enterprises, at the end of 2019. Even in the historical frustration facing COVID-19, the Chinese corporate bond market still rises with rapid growth. The net financing of non-financial corporate bonds increases by 1.77 trillion RMB according to the report of Central Government Debt Registration and Settlement, around half of the bond market financing last year. Bank loans to firms increase 6.04 trillion RMB according to PBoC's Financial Statistic Report in the first quarter of 2020. Loans and bonds are the greatest contributors to the high rise of social financing, about 85% of the new social financing. Although bank loans still account for a large proportion, bond financing is still in a sustained and rapid growth stage, forming an important part of corporate financing, and may play a more significant role in the future.

As the opening up of China's financial markets to global investors, Chinese bond market is attracting more and more international attention. Chinese domestic bonds became part of a major global index, the Bloomberg Barclays Aggregate Index, on April 1, 2019. This will attract around $150 billion of foreign inflows into China's bond market. At of the end of June in 2019, 1846 overseas institutions entered the Chinese bond market, with a debt holding amount of 1.96 trillion RMB according to China Finance, a journal of Chinese Central Bank, PBoC. Bond internationalization has also set off and have seen a strong push in the exchange market. China launched its Bond Connect (Zhai Quan Tong) on July 2017 to attract more international institutional investors. Up to August 2019, 58 of the top 100 asset management companies in the global asset scale have become Bond Connect users and have entered the Chinese bond market. This paper is helpful for international investors to understand Chinese bond market and its characteristics in pursuing implicit government guarantee.

2.2. Marketization of municipal bonds

Based on issuing entities, the market is classified into three broad bond categories; government, financial, and corporate bonds. According to Amstad and He (2019), government bonds is 57.55% in China which is lower than US (63.94%). Why does China issue less government bonds than the U.S.? The reason Amstad and He (2019) did not mention is that Chinese local government obtains finance through MCBs which is issued by LGFVs. This means, more and more government debts are regarded as corporate bonds which embedded in national balance sheet.

A new wave of research studies the drivers and consequences of China's credit boom, like Cong et al. (2019) and Chen et al. (2020b). China's economic stimulus plan encouraged the creation of LGFVs. LGFVs played an integral role in implementing the fiscal expansion of 2009 and 2010. The local government could not issue bond to raise money and is heavily dependent on the central government before 2015. The local government has to establish LGFVs to raise money indirectly by issuing MCBs. Bai et al. (2016) and Chen et al. (2020a) estimate that the fiscal investment targets were largely financed by LGFVs, and 90% of the increase in local government debts during China's stimulus period, 2009–2010, that surfaced in the form of bank loans, Cong et al. (2019) find that there was a credit boom through LGFV and this credit expansion favored state-owned firms based on China Banking Regulatory Commission loan level database between 2006 and 2013. In 2009, provinces with banks that experienced greater loan growth that was mainly due to greater MCBs issuance during 2012–2015. Chen et al. (2020b) documented higher levels of shadow banking activities, including Trust loans and

[3] Chinese bond data is from Wind Bond Overview. U.S. bond data is from SIFMA US Bond Market Issuance and Outstanding.
[4] The data is from Global Debt Database.

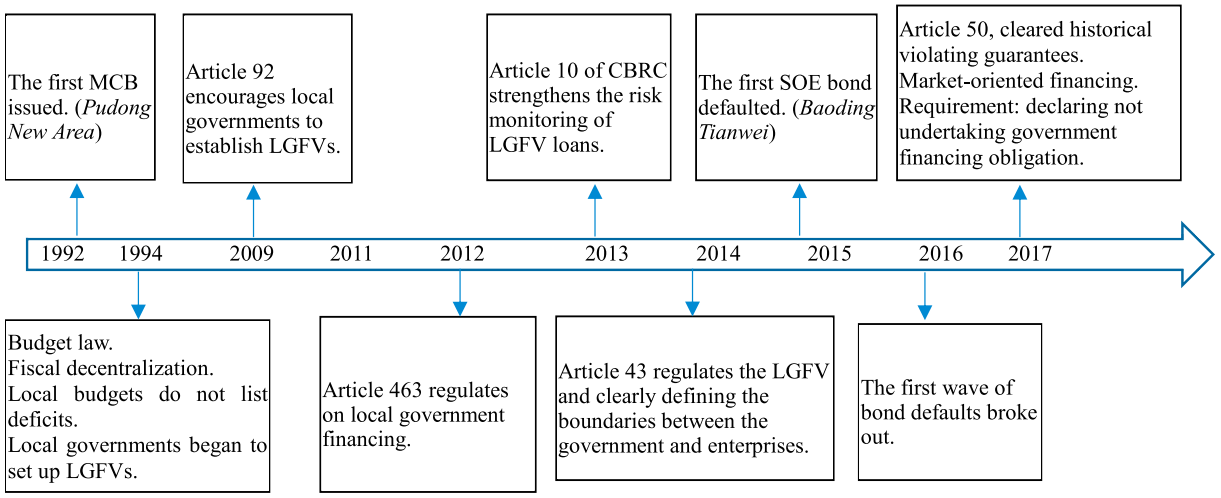


Fig. 2. Timeline of MCBs marketization in China. Fig. 2 shows the revolution of the tightening regulation on China's LGFVs. As the non-standard municipal corporate crisis happened in 2011, and the first SOE bond *Baoding Tianwei* defaulted in April 2015, the market began to explore the value of government's implicit guarantee (Jin et al., 2018). Under the background of deinventory and deleverage, the secure payout of state-owned enterprises is broken, resulting in the market turmoil. Implicit guarantee should have been gradually losing its effectiveness. On the other hand, the rapidly increasing implicit debt of local government has drowned central government's attention, and a growing number of MCBs improve the debt risk. The State Council issued Article 43 request LGFV to be decoupled from local government and the debt cannot be regarded as implicit debt of local government, which decrease the implicit guarantee of local government.

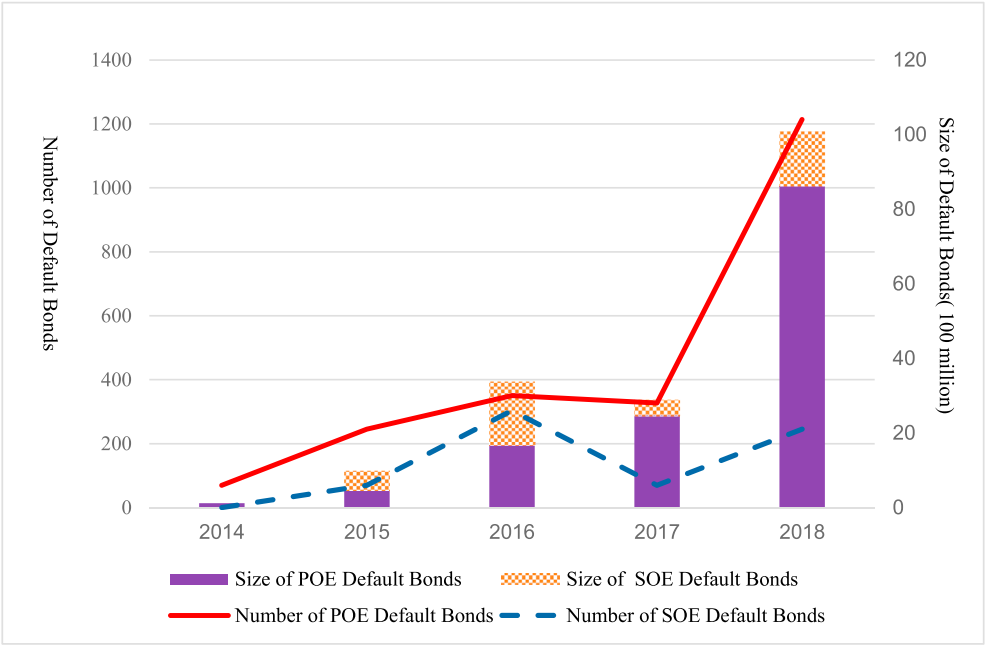


Fig. 3. Trend of Default Bonds. In Fig. 3, the bond default amount of POEs increases year by year. From the first bond default in 2014 (*Shanghai Chaori*) to the first wave of bond defaults events in 2016, the bonds default amount increases to 19.557 billion yuan. In 2018, there were 104 POEs' bonds, and the bond default amount reached 100.451 billion yuan. For SOE bonds, the first SOE bond default broke out in 2015 (*Baoding Tianwei*). In the wave of bonds default in 2016, the default amount reached 19.82 billion yuan for SOE bonds. In 2017, SOE bonds defaulted relatively few, and in the second wave of default in 2018, 21 SOE bonds defaulted, with a default amount of 17.2 billion yuan.

wealth management products during this period. They have drawn many similarities between China's post-stimulus period and the U.S. National Banking Era. We aim to ascertain what happens after the economic stimulus period which Cong et al. (2019) studies and the debt rollover highlighted by Chen et al. (2020b).

This paper focuses on an aspect of post-stimulus period in China. In this period, the government tightened the regulations on LGFVs.

Fig. 2 shows the revolution of the tightening regulation on China's LGFVs. As the non-standard municipal corporate crisis happened in 2011, and the first SOE bond *Baoding Tianwei* defaulted in April 2015, the market began to explore the value of implicit government guarantee (Jin et al., 2018). Under the background of de-inventory and deleverage, the once unyielding payouts of state-owned enterprises, resulting in the market turmoil. Implicit guarantee should have been gradually losing its effectiveness. On the other hand, the rapidly increasing implicit debt of the local government has dominated the central government's attention, and a growing number of MCBs improves the level of debt risk. The State Council issued Article 43 requesting LGFV to be decoupled from local government and the debt cannot be regarded as implicit debt of local government, which would decrease the implicit guarantee of the local government.

However, POE bonds face tougher challenges. There is the outbreak of the first bond default, the default of the Shanghai Chaori bond, in the Chinese bond market in 2014. It destabilized the Chinese bond market, and it caused panic across the bond market, with POE bonds bearing the brunt of it. Compared with SOEs, POEs are relatively smaller and are more likely to fall into a liquidity crisis. Once the assets of POEs deteriorate, banks or other financial institutions are often more likely to withdraw or break loans. This resulted in the rapid rise in financing costs, and the default risks of POEs increase. The first wave of bond defaults broke out in 2016, with the default amount increasing to 19.557 billion yuan. In 2018, there were 104 POEs' bonds, and the bond default amount reached 100.451 billion yuan. Therefore, despite the Municipal Corporate Bonds under the marketization process, market is still MCBs as a safe-haven asset due to its implicit guarantee nature (Fig. 3).

2.3. Implicit government guarantee of MCBs

Implicit government guarantee, also known as soft budget constraints, is implied in almost all the developed and developing countries. Dewatripont and Maskin (1995) documents that centralized economy is more likely to have soft budget constraints. The existence of implicit guarantee requires the government to spend more energy to manage the financial security problems caused by this implicit debt, thus triggering the credit crisis of local governments. Enterprises will blindly expand aggressive investment activities with the guarantee, constantly expand credit scale, increase leverage ratio and aggravate risk problems. The market's general expectation of soft budget constraint will disrupt the normal development of financial market order. Because of their close relationship with the government, SOEs are strongly motivated to seek help from the government in the form of soft budget constraints (Lin & Tan, 1999). Banks will tighten credit to higher-risk borrowers with less collateral and higher regulatory costs, which result in credit rationing (Stiglitz & Weiss, 1981). Conversely, if banks prioritize the allocation of credit to politically connected customers, such as SOEs, it is because they often perpetuate implicit or explicit government guarantees. Huang et al. (2018) measures the risk of implicit guarantees on Chinese shadow interbank products. They find that banks extend more implicit guarantees to shadow bank products when their solvency deteriorates.

The implicit government guarantees are critical to China's high-speed growth. Over the past 40 years, the Chinese government has provided either explicit or implicit guarantees and has shouldered the responsibility to improve the level of economic development. Some recent studies on China's implicit government guarantee by the sight of bank loans. Cong et al. (2019) documents that the stimulus-driven credit expansion favored state-owned firms based on China Banking Regulatory Commission loan level database between 2006 and 2013 which means that SOEs hold implicit government guarantees. Jin et al. (2018) find that implicit government guarantees account for at least 1.8% of bond value and have real effects on corporate investment and financing policies. The reduction of implicit guarantees leads to a decline in investment. In our paper, we look at China's MCBs issued by LGFVs which are one of the perfect examples of the mixture between planning and market in today's Chinese economy with implicit backing of local government (the word Municipal), but also like other regular corporations (the word Corporate), as Amstad and He (2019) point out.

The implicit government guarantees are identified by credit spreads when issuing because it could measure the funding costs of the bonds. Some articles point out the benefit of political connection. Li et al. (2008) point out that the Party membership of private entrepreneurs has a positive effect on POEs' performance in regions with weaker legal protection and weaker market institutions in China. Houston et al. (2012) find that the cost of bank loans is significantly lower for companies that have board members with political ties because connections enhance the borrower's credit worthiness. Wellman (2017) verifies that political connections offset the negative relation between investment and political uncertainty because it reduced information asymmetry for connected firms resulting in a delaying of investment in anticipation of future lucrative tax incentives. Nagano (2018) documents that firm information asymmetry, a common feature of emerging markets, moderates the negative relationship between the firm's financial constraints and debt security issuance. The issuing of credit spreads are more dependent on the fluctuations in the macroeconomic cycle (Gilchrist & Zakrajšek, 2012), as well as the quality of issuer (Benzion, Galil, Lahav, & Shapir, 2018) and the microstructure of the new issuing bond (Nagler & Ottonello, 2019). This paper examines this from the perspective of government supervision. It also provides an explanation for the expansion of the MCBs in 2014 (Chen et al., 2020).

3. Data and variables

3.1. Sample and main variables

We start with a sample of all Chinese enterprise bonds (EB hereafter), exchange-traded corporate bonds (ETCB hereafter), and medium-term notes (MTN hereafter) issued between 2010 and 2018. Amstad and He (2019) summarized Chinese bond market from 2008 to 2017. In order to rule out the impact from the global financial crisis of 2008–2009, our sample begins from 2010, with a total of 12345 bonds issued between 2010 and 2018. After dropping 10 bonds with missing regional information, 57 bonds with issuers from Hong Kong and 6 bonds with issuers from Tibet, we finally collect 12272 observations. This sample filter is consistent with Chen et al.

Table 1
Summary statistics of China's bond market data.

	MCBs			Non-MCBs but SOE Bonds			Bonds of POEs		
Year	ETCB	EB	MTN	ETCB	EB	MTN	ETCB	EB	MTN
2010	1	18	1	3	20	0	0	2	0
2011	0	11	1	5	25	1	1	2	0
2012	7	141	12	17	85	9	5	12	0
2013	13	357	17	3	87	19	7	16	0
2014	12	620	98	5	110	76	8	7	2
2015	105	353	214	133	160	285	88	13	20
2016	393	669	266	539	234	286	275	12	44
2017	224	474	346	553	225	386	236	4	120
2018	292	290	529	805	214	713	283	12	109
Total	5464			4998			1278		

Our sample include three kinds of corporate bonds issued between 2010 and 2018, Enterprise Bonds (EB), Exchange-traded Corporate Bonds (ETCB) and Medium-Term Notes (MTN).

Table 2
Existence of implicit government guarantees.

Panel A Existence of implicit government guarantees.

	MCB	Central SOE	Local SOE	POE	MCB vs. POE	Central SOE vs. POE	Local SOE vs. POE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Spread	2.428	1.530	2.469	3.276	−0.848***	−1.746***	−0.807***
	(2.389)	(1.449)	(2.417)	(3.400)	(−1.011***)	(−1.951***)	(−0.983***)
BondSize	1199.271	2337.453	1095.614	1007.464	191.807***	1329.989***	88.15***
	(1000)	(1840)	(1000)	(700)	(300***)	(1140***)	(300***)
Maturity	6.141	5.085	5.858	4.190	1.951***	0.895***	1.668***
	(7.000)	(5.000)	(5.000)	(5.000)	(2.000***)	(0.000***)	(0.000***)
RateAAA	0.282	0.817	0.271	0.174	0.108***	0.643***	0.097***
	(0.000)	(1.000)	(0.000)	(0.000)	(0.000***)	(1.000***)	(0.000***)
FirmSize	10.205	12.141	10.206	10.277	−0.072*	1.864***	−0.071**
	(9.980)	(12.254)	(10.064)	(10.230)	(−0.250***)	(2.024***)	(0.166***)
Leverage	51.945	69.368	53.078	60.503	−8.558***	8.865***	−7.425***
	(53.518)	(73.197)	(55.426)	(63.170)	(−9.652***)	(10.027***)	(−7.744***)
Salegrowth	0.351	0.180	0.365	0.464	−0.113	−0.284***	−0.099
	(0.090)	(0.094)	(0.098)	(0.174)	(−0.084)	(−0.080***)	(−0.076***)
ROA	1.779	2.575	1.662	4.469	−2.690***	−1.894***	−2.807***
	(1.449)	(2.145)	(1.309)	(3.495)	(−2.046***)	(−1.350***)	(2.186***)

Panel B Credit Spread Distribution by Credit Rating

	MCBs		Central SOE bonds		Local SOE bonds		POE bonds	
Credit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rating	obs	*Spread*	obs	*Spread*	obs	*Spread*	obs	*Spread*
AAA	1541	1.599	1068	1.359	2483	1.712	222	2.541
AA+	1422	2.399	144	1.779	2409	2.333	445	3.249
AA	2121	2.929	41	2.370	3283	2.897	512	3.687

Columns (1) to (4) in Panel A of Table 2 report the mean and median credit spreads. Medians are in the brackets. Columns (5) to (7) show the difference compared to POEs. The significance of mean or median tests is based on one-side t-tests or rank-sum tests (in parentheses). Panel B reports the observations and average spreads of MCBs, Central SOE bonds, Local SOE bonds and POE bonds in each credit rates.

(2020b), which uses 30 provinces in mainland China with Tibet omitted. Our sample include three kinds of corporate bonds, Enterprise Bonds (EB), Exchange-traded Corporate Bonds (ETCB) and Medium-Term Notes (MTN). EBs are regulated by the National Development and Reform Commission (NDRC), a powerful government agency overseeing SOEs. 1/3 of EBs are issued and traded in the exchange market, and 2/3 of EBs are issued and traded in the interbank market, according to Amstad and He (2019). ETCBs are issued in the exchange market and regulated by China Securities Regulatory Commission (CSRC). We only keep state-owned enterprises (SOEs) or private-owned enterprises (POEs), thus 11740 bonds constitute our final sample. Table 1 reports our sample distribution. We finally obtain 5464 MCBs, 4998 other SOE bonds, and 1278 POE bonds.

We collect bond characteristics and financial indicators of issuers from WIND database. Bonds issuers are required to submit quarterly financial reports by Securities Law of the People's Republic of China. Therefore, although 85% of bond issuers are not listed, their financial indicators are able to be obtained. We use the data from their financial reports in the last quarter to reduce the concern of endogeneity. All corporate-level financial indicators have been winsorized by year. The definitions of variables are shown in

Table 3
Credit spread distribution by regions.

Panel A. Sorting by deciles of province-level GDP (per capital)									
Province GDP	2010	2011	2012	2013	2014	2015	2016	2017	2018
1(Lowest)	2.141	3.461	3.233	2.984	3.058	2.465	2.388	2.886	3.440
2	2.308	3.153	3.362	2.815	3.194	2.708	2.073	2.564	3.241
3	2.320	2.128	3.013	2.796	3.074	2.683	2.278	2.669	3.103
4	2.433	4.151	3.203	2.900	2.992	2.497	1.928	2.626	2.988
5	1.508	1.955	3.371	3.017	2.956	2.269	1.962	2.604	2.702
6	1.661	2.411	3.265	2.838	2.644	2.111	1.614	2.315	2.569
7	2.499	2.270	3.355	2.943	2.892	2.487	1.755	2.475	2.919
8	1.014	2.065	2.858	2.921	3.010	2.452	1.880	2.544	2.825
9	0.825	3.141	1.573	2.531	2.418	1.866	1.469	2.321	2.004
10(Highest)	0.898	1.632	2.060	1.876	2.195	1.759	1.442	1.748	1.875
Panel B. Sorting by deciles of city-level GDP (per capital)									
City GDP	2010	2011	2012	2013	2014	2015	2016	2017	2018
1(Lowest)	2.643	3.578	3.667	3.278	3.294	2.864	2.492	2.878	3.579
2	1.906	1.885	3.310	2.989	3.095	2.579	2.098	2.823	3.669
3	2.517	3.199	3.319	2.964	3.021	2.477	2.005	2.664	3.145
4	2.644	2.725	3.507	2.892	2.889	2.435	2.156	2.709	3.187
5	1.492	2.827	2.993	2.980	3.002	2.130	1.863	2.563	2.851
6	1.202	3.228	2.949	2.524	2.776	2.439	1.771	2.494	2.772
7	0.969	2.383	2.760	2.771	2.481	2.003	1.294	2.358	2.712
8	0.949	2.269	1.590	2.339	2.336	1.681	1.375	2.244	2.681
9	0.949	2.508	1.677	1.883	2.275	2.096	1.820	2.432	2.301
10(Highest)	1.879	1.744	2.898	2.501	2.545	1.942	1.558	2.340	2.445

In Table 3, we summarize the spreads according to the administrative regions year by year. Subsamples are the deciles sorting by province-level GDP. The lowest group is denoted as 1, while the highest group is denoted as 10. Ten subsamples are sorted by city-level GDP in Panel B of Table 3, and the result is consistent with Panel A of Table 3.X.

Appendix Table A1. Bond daily transaction data and macro-economic data are obtained from CSMAR database. We also use an IV based on the recent shock to the global economy, COVID-19, to reduce the concern from endogeneity, because pandemics are more exogenous compared with policy shocks.

3.2. Data description

3.2.1. Existence of implicit government guarantee

We use credit spread to measure the financing cost of the bonds. *Spread* is the difference between bond yield and the matching central government bond yield, which has the same cash flow characteristics with the same issuance date and maturity following Ang et al. (2019). We also use the second index, *SpreadCDB*, to measure credit spread, defined as the bond yield minus the matching China Development Bank (CDB) bond yields following Chen et al. (2020a). The results are robust.

Panel A of Table 2 compares MCBs and other SOE bonds with POE bonds in order to reveal the existence of implicit government guarantee. POEs are regarded as being without government guarantee, therefore we use POEs as the basis group. The comparison in Panel A of Table 2 demonstrates the existence of government implicit guarantee in MCBs, central SOEs and local SOEs. First, from the perspective of financing cost, the variable *Spread* shows that central SOEs have the lowest funding costs while POEs have the highest funding costs. The spreads of MCBs and local SOE bonds are also significantly lower than POE bonds, 84.8 and 80.7 basis points, on averagely. Central SOE bond's financing cost is 174.6 basis points lower than POEs. The difference is both economically and statistically significant. Second, from the maturity, MCBs have a significantly longer maturity period than POEs, around 2 years longer on average. Both differences imply that implicit government guarantee may lie in MCBs. Third, from the performance of the debt issuers, this table shows that LGFVs, the issuers of MCBs, have lower ROA than POEs. Central SOEs even have much lower sale growth and lower ROA as well. Above all, MCBs have lower financing costs and longer maturity than POEs although MCB's ROA is much lower. This may result from implicit government guarantees. MCBs are similar to local SOEs. Central SOEs have the lowest financing costs although both their sale growth and ROA are lower than POEs since central SOE's government guarantees are even stronger.

Panel B of Table 2 further ascertains whether the difference results from credit rating. We document the bond distribution by sorting the bonds' credit rates. The majority of the bonds were rated as AAA, AA+ and AA. Only 2 MCBs, 3 local SOE bonds and 4 POE bonds were rated as AA-. Chen et al. (2020a) reported more AA-rated bonds because they use the credit rating of the bonds during their sample period, from June 9, 2014 to June 8, 2015. As our variable is credit spread during issuing, the credit rating should be matched when it is issued. Excluding these 9 bonds and the bonds with missing value of credit rating, Panel B shows that MCB has the similar credit rating distribution with POEs, while the majority of the central SOEs are AAA rated. The medians of *Spread* still show the difference between the four categories in each credit rate. MCB's spread is 76–94 basis points lower than POE's with the same credit rate. This results in lower financing cost as *Spread* shows does not originate from credit rates either.

Table 4
The effect of implicit guarantee.

	(1)	(2)	(3)	(4)	(5)	(6)
SOEvsPOE			−1.004***			
			(0.027)			
CentralSOEvsPOE				−1.259***		
				(0.048)		
LocalSOEvsPOE					−0.984***	
					(0.029)	
MCBvsPOE						−0.967***
						(0.033)
PrivateSecter		−1.151***	−1.197***	−0.779*	−1.179***	−0.796***
		(0.168)	(0.158)	(0.418)	(0.180)	(0.216)
MarketCap		0.129***	0.116***	0.063	0.084*	0.097**
		(0.028)	(0.026)	(0.042)	(0.043)	(0.040)
RateAAA	−0.703***	−0.707***	−0.598***	−0.615***	−0.594***	−0.628***
	(0.020)	(0.020)	(0.019)	(0.044)	(0.021)	(0.026)
lnBondSize	−0.109***	−0.110***	−0.080***	−0.021	−0.097***	−0.085***
	(0.013)	(0.013)	(0.013)	(0.023)	(0.014)	(0.017)
lnMaturity	−0.387***	−0.405***	−0.259***	−0.167***	−0.305***	−0.223***
	(0.030)	(0.030)	(0.028)	(0.059)	(0.032)	(0.041)
EB	0.055**	0.059**	0.088***	0.158**	0.062**	0.025
	(0.024)	(0.024)	(0.023)	(0.076)	(0.025)	(0.032)
MTN	−0.326***	−0.331***	−0.229***	−0.101***	−0.277***	−0.297***
	(0.019)	(0.019)	(0.018)	(0.035)	(0.020)	(0.027)
ROA	−0.001	−0.001	−0.037***	−0.020***	−0.034***	−0.027***
	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)	(0.004)
Leverage	0.005***	0.005***	0.003***	0.013***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Salegrowth	0.000	0.001	0.000	0.012*	−0.000	−0.002
	(0.003)	(0.003)	(0.002)	(0.007)	(0.002)	(0.003)
FirmSize	−0.125***	−0.126***	−0.145***	−0.109***	−0.157***	−0.127***
	(0.010)	(0.010)	(0.009)	(0.017)	(0.010)	(0.013)
Age	−0.004***	−0.004***	−0.005***	−0.005***	−0.005***	−0.007***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Intercept	4.403***	4.755***	5.452***	3.870***	5.862***	5.128***
	(0.174)	(0.216)	(0.204)	(0.418)	(0.236)	(0.272)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,184	11,184	11,184	2,421	9,960	6,408
Adjusted R-squared	0.486	0.488	0.546	0.694	0.515	0.545

Table 4 shows the regression results. See Appendix Table A for definition of the variables. ***p < 0.01, **p < 0.05, *p < 0.1.

3.2.2. Impact of economic development

Table 3 reports the average credit spreads of the bonds according to administrative regions year by year. We divide the sample into ten subsamples by sorting deciles of the regional GDP per capital, with the lowest group denoted as 1 and the highest group denoted as 10. The result implies that bond spread is relatively lower in the developed regions with higher average GDP in average. Among them, the anomaly that only exists in 2010 may be due to the relatively small number of bonds issued during the year, which was greatly affected by extreme values. We will further discuss the impact of macro variables on bond spreads in Section 5.2. We also divide the sample by sorting city-level GDP in Panel B of Table 3. The result is consistent with Panel A of Table 3.

4. Empirical results

4.1. Credit spread and implicit government guarantee

First, we propose the following benchmark model to test hypothesis 1:

$$Spread_i = \beta_1 Treated_i + \gamma_1 Macro_{p,t-1} + \gamma_2 Bond_i + \gamma_3 Issuer_{j,t-1} + \alpha_s + \alpha_p + \alpha_t + \varepsilon_i \quad (1)$$

where $Spread_i$ equals the coupon rate of bond i minus the rate of Treasure bonds with the same maturity. $Treated_i$ is a dummy variable, equaling 1 if the bond i is belonging to the treated group, or 0 if it is belonging to the control group. The control group is defined as the bonds issued by POEs. The treated group refers to all the SOEs, central SOEs, local SOEs and MCBs, respectively. ***Macro*** includes 2 macro variables. The first variable is the total employees of private and self-employed enterprises over total employees (*PrivateSector*) and the second variable is the market value of listed companies over GDP (*MarketCap*) in province *p* following Erel et al. (2015). ***Bond*** represents 5 bond characteristic variables, credit rating (*RateAAA*), logarithm of bond issuance (*lnBondsize*), logarithm of bond maturity (*lnMaturity*) and dummy variables of whether the bond is an Enterprise Bond (*EB*, as Chen et al., 2020 documented) or medium-term note

Table 5
The Effect of Implicit Guarantee: MCBs vs. POEs.

VARIABLES	(1)	(2)	(3)	(4)
MCBvsPOE	−0.917***	−0.886***	−0.967***	−0.872***
	(0.033)	(0.056)	(0.033)	(0.055)
Bond	Yes	Yes	Yes	Yes
Issuer	Yes	Yes	Yes	Yes
Macro	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Province FE	No	No	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
PSM	No	Yes	No	Yes
Observations	6,408	5,060	6,408	5,060
Adjusted R-squared	0.522	0.521	0.545	0.551

To deal with the concern that MCBs usually have higher credit ratings compared to bonds of POEs, we further compare the matched sample in Table 5. Column (1) and column (3) reports the regression results in non-matched sample. Column (2) and column (4) reports the results in propensity-score matched sample with the same region, the same year and the same credit rate where we select the closest propensity score without replacement. *** p<0.01, ** p<0.05, * p<0.1.

Table 6
Guarantees from different administrative levels.

	(1)	(2)	(3)	(4)	(5)	(6)
CaitalLevel	−1.413***	−1.413***				
	(0.040)	(0.040)				
PrefecturalLevel			−0.919***	−1.008***		
			(0.047)	(0.0450)		
CountyLevel					−0.828***	−0.910***
					(0.063)	(0.064)
Bond	Yes	Yes	Yes	Yes	Yes	Yes
Issuer	Yes	Yes	Yes	Yes	Yes	Yes
Macro	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
CreditRating FE	No	Yes	No	Yes	No	Yes
Observations	3,727	3,727	3,918	3,918	2,714	2,714
Adjusted R-squared	0.636	0.659	0.511	0.531	0.472	0.501

Table 6 shows MCBs are lower in different administrative level compared to POEs. We use capital-level LGFVs in Column (1) and column (2), and we use prefectural-level LGFVs to compare against POEs in column (3) and column (4). County-level LGFVs in the last two columns. We control the credit rating fixed effect in column (2), column (4) and column (6), which are consistent with column (1), column (3) and column (5). See Appendix Table A for definition of the variables.*** p<0.01, ** p<0.05, * p<0.1.

(*MTN*, following Yang & Pan, 2019.). Issuer includes 5 variables of the firm issuing the bond; return on assets (*ROA*), total debt over total asset (*Leverage*), the difference of current operating income and initial operating income over initial operating income (*Salegrowth*), the logarithm of total asset (*FirmSize*), and the difference between the year firm established and year bond issuance (*Age*). α_s, α_p and α_t is industrial, provincial and year fixed effect, respectively.

Table 4 shows the regression results. Column (1) is the baseline model following Ang et al. (2019). Following Erel et al. (2015), we introduce two impact factors into the regression in column (2), *Privatesector* controlling the development of POEs, and *MarketCap* controlling the financing from equity market in province *p*. Column (3) implies that the financing cost of SOE is 1.004% lower than that of POE. Column (4)- column (6) show the same results that central SOE, local SOE and MCB have 1.259%, 0.984% and 0.967% lower than POE ceteris paribus. We can find that the coefficient of central SOEs is even lower than local SOEs, which implies that central SOEs are provided a stronger implicit guarantee from the central government. In column (6), we define MCB_i as $Treated_i$, which equals to 1 when the bond issuer is LGFV, while it equals to 0 when the issuer is POE. The result shows that mean spread of MCBs is lower than that of POEs by 0.967%.

To deal with the concern that MCBs usually have higher credit ratings compared to bonds of POEs, we further compare the matched sample in Table 5. Column (1) and column (3) report the regression results in non-matched sample. Column (2) and column (4) report the results in propensity-score matched sample with the same region, the same year and the same credit rate where we select the closest propensity score without replacement. The results are consistent. The coefficients of *MCBvsPOE* are all significantly negative. LGFV, MCB's issuer, has a significantly lower financing cost than POEs, around 90 basis points.

4.2. Effect of administrative levels

Different administrative levels of LGFVs are provided with different degrees of implicit government guarantee. Generally, higher

Table 7
Impact from different guarantees.

	Full Sample			MCBs vs. POEs		
	(1)	(2)	(3)	(4)	(5)	(6)
MCBvsPOE				−1.001***	−1.011***	−0.967***
				(0.0340)	(0.034)	(0.033)
DummyGuarantee	0.139***			−0.191***		
	(0.023)			(0.067)		
ExGovGuarantee		0.116***			−0.345***	
		(0.025)			(0.089)	
ImGovGuarantee			−1.086***			
			(0.028)			
DummyGuarantee × MCBvsPOE				0.306***		
				(0.071)		
ExGovGuarantee × MCBvsPOE					0.480***	
					(0.092)	
Bond	Yes	Yes	Yes	Yes	Yes	Yes
Issuer	Yes	Yes	Yes	Yes	Yes	Yes
Macro	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,184	10,995	9,458	6,408	6,272	6,408
Adjusted R-squared	0.490	0.487	0.561	0.546	0.543	0.545

Table 7 shows the different results among variety of guarantee. See Appendix Table A for definition of the variables. ***p < 0.01, **p < 0.05, *p < 0.1.

administration of LGFVs issue bonds with lower spreads because of systematic risk, so we study the difference among administrative levels:

$$Spread_i = \beta_1 Administration_j + \gamma_1 Macro_{p,t-1} + \gamma_2 Bond_i + \gamma_3 Issuer_{j,t-1} + \alpha_s + \alpha_p + \alpha_t + \varepsilon_i \quad (2)$$

where *Administration* represents different administrative level of the *j*th LGFV. Specifically, we divided it to three kinds of LGFV, *CapitalLevel*, *PrefecturalLevel* and *CountyLevel*. *CapitalLevel* is a dummy variable, and it equals to 1 if the issuer is LGFV and the administrative level of LGFV is provincial, or the capital of the province or cities specifically designated in the state plan, while it equals to 0 when the issuer is POE. *PrefecturalLevel* is a dummy variable. It equals to 1 if the issuer is LGFV and the level of LGFV is prefectural level, while it equals to 0 when the issuer is POE. *CountyLevel* is a dummy variable. It equals to 1 if the issuer is LGFV and the level is county and county-level cities, while it equals to 0 when the issuer is POE.

Table 6 shows that MCBs are lower in different administrative level compared to POEs. Column (1) and column (2) imply that MCBs issued by capital-level LGFVs have 1.413% less spread than those of POEs. Prefectural-level LGFVs have around 1% lower spreads than POEs as shown by column (3) and column (4) show. County-level LGFVs have around 0.83% lower spreads than POEs as the last two columns demonstrate. Our results imply that the provincial government provides the strongest implicit guarantee, followed by the prefecture-level government and county level. We control the credit rating fixed effect in column (2), column (4) and column (6), which are consistent with column (1), column (3) and column (5). Our paper provides strong evidence on *Political Decentralization* as mentioned by Bardhan (2016) and Huang et al. (2017). China state (the central government) has been decentralizing those SOEs with poor performance. Our paper provides evidence to their findings by the side of MCBs.

4.3. Implicit guarantee compared with explicit guarantee

Some credit bonds have guarantor to increase market confidence in anticipation of successful issuance. However, the market will respond differently to the guarantor's qualifications. Then we study the impact of different kind guarantor.

$$Spread_i = \beta_1 Guarantee_i + \gamma_1 Macro_{p,t-1} + \gamma_2 Bond_i + \gamma_3 Issuer_{j,t-1} + \alpha_s + \alpha_p + \alpha_t + \varepsilon_i \quad (3)$$

where *Guarantee* $_i$ is a dummy variable to indicate the guarantee state of bond *i*. We use three variables, *DummyGuarantee*, *ExGovGuarantee* and *ImGovGuarantee*, respectively.

The first indicator, *DummyGuarantee*, equals 1 if the bond is guaranteed, otherwise is 0. The coefficient of *DummyGuarantee* in column (1) in Table 7 is positive, which means the spread of guaranteed bonds is 0.241% higher than those unguaranteed. The second indicator, *ExGovGuarantee*, is a dummy variable to indicate explicit government guarantee, which equals 1 if the bond is guaranteed by government or SOE, otherwise is 0. The result in column (2) shows that the credit spread is 0.156% higher.

The third indicator, *ImGovGuarantee*, is a dummy variable to grasp the effect from implicit government guarantee. We only keep the bonds unguaranteed. It equals to 1 if the bond is unguaranteed but the issuer is state owned, otherwise 0. This is because unguaranteed SOE bonds are largely subject to implicit government guarantees for political purposes to prevent bond defaults. Column (3) shows that the coefficient of *ImGovGuarantee* is significantly negative, which proves that the spread of state-owned corporate bonds with implicit

Table 8
Impact from Government interventions on credit spreads of bonds.

	MCB vs POE		MCB vs. Local SOE	
	(1)	(2)	(3)	(4)
MCBvsPOE	−0.702***	−0.788***		
	(0.142)	(0.160)		
MCBvsLocalSOE			−0.087	−0.018
			(0.101)	(0.100)
GovInt1	0.177***		0.042	
	(0.059)		(0.042)	
GovInt2		1.589**		0.858**
		(0.702)		(0.394)
GovInt1 × MCBvsPOE	−0.081			
	(0.060)			
GovInt1 × MCBvsLocalSOE			0.049	
			(0.043)	
GovInt2 × MCBvsPOE		−0.473		
		(0.714)		
GovInt2 × MCBvsLocalSOE				0.205
				(0.417)
Bond	Yes	Yes	Yes	Yes
Issuer	Yes	Yes	Yes	Yes
Macro	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
PSM	Yes	Yes	Yes	Yes
Observations	5,060	5,060	5,281	5,281
Adjusted R-squared	0.524	0.526	0.513	0.515

Table 8 reports the result of equation (4). Column (1) and (2) compare the difference in mechanism of government intervention's impact on spreads between MCBs and POE bonds. Column (3) and (4) compare the difference in mechanism between MCBs and local SOE bonds. See Appendix Table A for definition of the variables.***p < 0.01, **p < 0.05, *p < 0.1.

government guarantees is averagely 1.074% lower.

We further introduce the interaction terms with *MCBvsPOE* to ascertain the heterogeneity between MCBs and POEs in column (4)-column (6). The *ImGovGuarantee* in column (1)- column (3) equals *MCBvsPOE* in column (4) –column (6). Therefore, these three regressions run performance tests between the two explicit guarantees and implicit guarantee. The regression results show that both the guarantees are significant. Implicit guarantee, which is indicated definitely as *MCBsvsPOE*, reduces the spread about 1%, i.e. 100 basis points. For the two explicit guarantees, *DummyGuarantee* and *ExGovGuarantee*, both reduce the spread for the control group, POEs. The two interaction terms are significantly positive and more than the coefficients of the two explicit guarantees, implying that explicit guarantee increases MCB's spread. Therefore, the conclusion from column (4)-column (6) is much clearer than the above conclusion in column (1)-column (3) in which MCB and other bonds of SOEs are much more than POEs. Considering the heterogeneity between MCB and POE, we find that for POEs, explicit guarantee has a significant effect of reducing the spread, but it increases the spread of MCBs because the of market's concerns.

5. Mechanism

5.1. Government intervention

This section aims to explain why there are variances in spread in different regions as Table 3 shows. First, we exploit the effect of government intervention by the following model,

$$Spread_i = \beta_1 MCB_i + \beta_2 GovInt_{p,t-1} + \beta_3 GovInt_{p,t-1} \times MCB_i + +\gamma_1 Macro_{p,t-1} + \gamma_2 Bond_i + \gamma_3 Issuer_{j,t-1}$$

$$+\alpha_s + \alpha_t + \varepsilon_i \quad (4)$$

where $GovInt_{p,t-1}$ is the indicator measuring the strength of government intervention in province p. We use two measures following Hao and Lu (2018), the ratio of the number of employees in public administration, social security and social organizations to the total number of employees (*GovInt1*) and the ratio of government expenditure to local GDP (*GovInt2*).

Table 8 reports the result of equation (4). Column (1)-column (2) compares MCB with POEs. Column (3)-column (4) compares MCB with local SOEs. Both of the coefficients of government intervention based on GDP, *GovInt2*, are significantly positive, which is helpful to explain our findings of Table 3. There is a relatively low degree of marketization in the provinces with strong government intervention, that goes against the firm's objective of maximizing profit. The government has been interfering with the companies' normal operations and risk is increasing, so the credit spread increases.

The interaction terms exploit the heterogeneity. Column (1) and (2) compares the difference in mechanism of government

Table 9
Regional financial situation and credit spread.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
LnperGDP	−0.395***						−0.414***			
	(0.025)						(0.056)			
RealEstateGDP		−0.161***					−0.210***			
		(0.012)					(0.049)			
RealEstateTAX			−0.178***				0.149***			
			(0.012)				(0.051)			
HousePriceGrowth				−0.475***			0.023			
				(0.172)			(0.177)			
GovInv1					0.043***		0.004			
					(0.014)		(0.018)			
GovInv2						1.657***	−0.634*			
						(0.137)	(0.324)			
LnpercityGDP								−4.583***		−4.401***
								(0.262)		(0.274)
PrivateCredit									−0.138***	−0.058***
									(0.019)	(0.019)
Bond	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Issuer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,211	5,211	5,211	5,192	5,211	5,211	5,192	4,158	4,146	4,123
Adjusted R-squared	0.511	0.507	0.508	0.488	0.489	0.502	0.513	0.526	0.497	0.526

We use MCBs as the sample to test equation (5) in Table 9 because we only focus on the impact of government fiscal situation on MCBs, which have close relationship with government. Column (1)-column (6) exploit the effect from each provincial-level fiscal statement. Column (7) considers their effects together. Column (8)-column (10) show significant impact from these two city-level factors. For bank loan's effect, the higher *PrivateCredite* means it is easier for the firm to obtain bank loans. See Appendix Table A for definition of the variables.***p < 0.01, **p < 0.05, *p < 0.1.

Table 10
2SLS regressions with IV.

	(1)	(2)	(3)
	Step 1: *lnperGDP*	Step 2: *Spread*	Step 2: *Spread*
HealthExpenditure × *Pandemic*	0.022***		
	(0.0061)		
$lnperGDP_{t-1}$	0.875***		
	(0.0237)		
$\widehat{lnperGDP}_{t-1}$		−0.476***	−0.558***
		(0.020)	(0.044)
RealEstateGDP			−0.101***
			(0.034)
RealEstateTAX			0.046
			(0.037)
HousePriceGrowth			0.257**
			(0.123)
GovInv1			3.912***
			(1.324)
GovInv2			−1.258***
			(0.236)
Bond	No	Yes	Yes
Issuer	No	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	No	Yes	Yes
Observations	341	11,184	11,142
Adjusted R-squared	0.989	0.464	0.464

In order to reduce the endogeneity, we also introduce an exotic instrumental variable to predict *lnperGDP*. The COVID-19 outbreak is an exogenous shock to the global economy, as recent papers examined the relationship between pandemic and economic development, ex. Jia et al. (2020), Fang et al. (2020) and Qiu et al. (2020). We introduce an interaction of regional medical and health expenditure in public expenditure per capita with the pandemic, and lag item of regional GDP in the first stage. The second sage is regressed using the predict regional economic development of the first stage. See Appendix Table A for definition of the variables.*** p<0.01, ** p<0.05, * p<0.1.

intervention's impact on spreads between MCBs and POE bonds. Column (3) and (4) compares the difference in mechanism between MCBs and local SOE bonds. The coefficients of interaction terms are all insignificant, implying the robustness of our conclusion.

5.2. Macro heterogeneities of the implicit guarantee

In this section, we discuss about the effects of different macro environments:

$$Spread_i = \beta_1 Fiscal_{r,t-1} + \gamma_2 Bond_i + \gamma_3 Issuer_{j,t-1} + \alpha_s + \alpha_t + \varepsilon_i \quad (5)$$

where *Fiscal* represents the provincial fiscal statement in the region *r* where the issuer is located. Here we consider both provincial-level and city-level fiscal statements. Provincial-level variables include the logarithm of the per capita GDP ($LnperGDP_{p,t-1}$), the logarithm of the local GDP of the real estate sector ($RealEstateGDP_{p,t-1}$), the logarithm of the local tax revenue of the real estate sector ($RealEstateTax_{p,t-1}$) and the growth rate of housing prices in each province ($HousePriceGrowth_{p,t-1}$). City-level variables include the logarithm of per capita GDP of the city of the LGFV ($LnpercityGDP_{c,t-1}$) and which is defined as the value of the outstanding loan balance of a financial institution prefectural-level, financial institution divided by the GDP of that city ($PrivateCredit_{c,t-1}$). Since *Macro* includes the provincial-level variables, we exclude these two macro control variables to reduce multicollinearity.

We use MCBs as the sample to test equation (5) in Table 9 because we only focus on the impact of government fiscal situation on MCBs, which have close relationship with the government. Column (1)-column (6) ascertains the effect from each provincial-level fiscal statement. Column (7) considers their effects together. First, from the effect of local GDP, column (1), column (7) and column (8) all imply that spreads decline in developed province or city. Column (7) shows the impact from GDP is the strongest among all the factors. This is consistent with our prior findings. MCB has about 0.395% decrease in spread with every 1% increase in local GDP per capita, which is even stronger in the city level.

Second, we also consider the impact from real estate following Ang et al. (2019). We use three variables to indicate the impact from real estate, the local GDP of the real estate sector, real estate tax and the growth rate of housing prices. The regression results show that when the real estate GDP increases by 1%, the issued credit spread will decrease by 0.161%, and significantly at the 1% level. The results in columns (5) and (6) show that the greater the degree of government intervention, the lower the spread of the MCBs. By adding all provincial variables in column (7), $LnperGDP_{p,t-1}$ and $RealEstateGDP_{p,t-1}$ still exert a significant negative impact. This implies that MCBs have lower financing cost in developed province.

Third, further considering the impact from bank loans, we keep the strongest impact factor, GDP but at city level, and add *PrivateCredit*, the ratio of bank loans over GDP in the city. Column (8)-column (10) show significant impact from these two city-level factors. The coefficients are both negative whenever we put them in the regression separately or together. GDP still has significantly negative impact. For bank loan's effect, the higher *PrivateCredit* means it is easier for the firm to obtain bank loans. Our results show that if

PrivateCredit increases by 1%, MCB's spread falls 0.138%. But the effect shrinks rapidly, by 0.058% if we consider the effect of economic development as column (10) shows. This provides evidence that economic development has stronger effect on reducing MCB's financing cost than bank loans do.

In order to reduce the endogeneity, we also introduce an exotic instrumental variable to predict *lnperGDP*. Since we use GDP per capital, the population characteristic and investment should be critical to it. The COVID-19 outbreak is an exogenous shock to the global economy, as recent papers examined the relationship between the pandemic and economic development, ex. Jia et al. (2020), Fang et al. (2020) and Qiu et al. (2020). We introduce an interaction of regional medical and health expenditure in public expenditure per capita with pandemic, and lag item of regional GDP in the first stage to predict regional economic development.[5] The 2SLS regression is as follows,

$$lnperGDP_{rt} = \beta_1 HealthExpenditure_{r,t-1} \times Pandemic + \gamma_1 lnperGDP_{r,t-1} + \alpha_r + \alpha_t + \varepsilon_{rt} \tag{6}$$

$$Spread_i = \beta_1 \widehat{lnperGDP}_{r,t-1} + \gamma_2 Bond_i + \gamma_3 Issuer_{j,t-1} + \alpha_s + \alpha_t + \varepsilon_i \tag{7}$$

where *HealthExpenditure* is the logarithm of regional medical and health expenditure in public expenditure per capita. *Pandemic* is a dummy, which equals 1 above the median of the cumulative confirmed cases in this region on April 8, 2020, otherwise is 0. April 8, 2020 is the date when Wuhan, the city that was the epicenter of the coronavirus outbreak, reopened and the lockdown restrictions were eased, indicating that the number of cases has been steady afterwards. We also use the number of deaths and recoveries as well. The results are robust. Table 10 still reports the robust results as Table 9 shows.

6. Further research

6.1. The shock of Article 43

The implementation of Article 43, which is issued in September 2014 by the China State Council, requests local government to reduce implicit guarantee, therefore MCB's credit spread should have been going up. Fig. 4 shows the average spread of MCB in navy lines. Panel A compares MCB with local SOE, implying that there is no difference even after the shock. Panel B compares MCB with POEs, showing that the spread is much lower after 2014. This implies that MCB still holds implicit government guarantee although the government aims to speed up its marketization. In order to reduce the difference from other factors, we use the PSM sample with the same credit rating, same year and same province (Fig. 4).

We use DID model to exploit the structural change of Article 43 as follows,

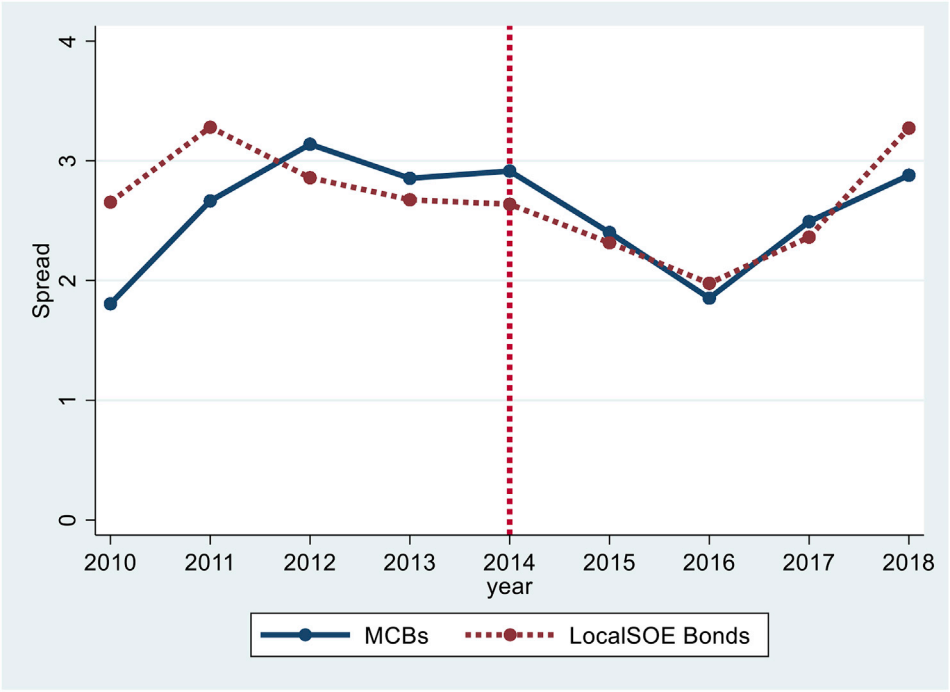
$$Spread_i = \beta_1 MCB_i + \beta_2 MCB_i \times Post + \gamma_1 Macro_{p,t-1} + \gamma_2 Bond_i + \gamma_3 Issuer_{j,t-1} + \alpha_s + \alpha_p + \alpha_t + \varepsilon_i \tag{8}$$

where $Post_t$ is a dummy, equaling to 1 if the bond was issued after 28 September 2014. $\boldsymbol{\alpha_s}$ means the industry fixed effect, and $\boldsymbol{\alpha_p}$ means province fixed effect and $\boldsymbol{\alpha_t}$ shows year fixed effect. Column (2) and (4) show the result of PSM-DID, which we match the bond credit rating, year and province fixed-effect. Column (2) represents that compare to the local SOEs' bonds with same credit rating and issuance year and province.

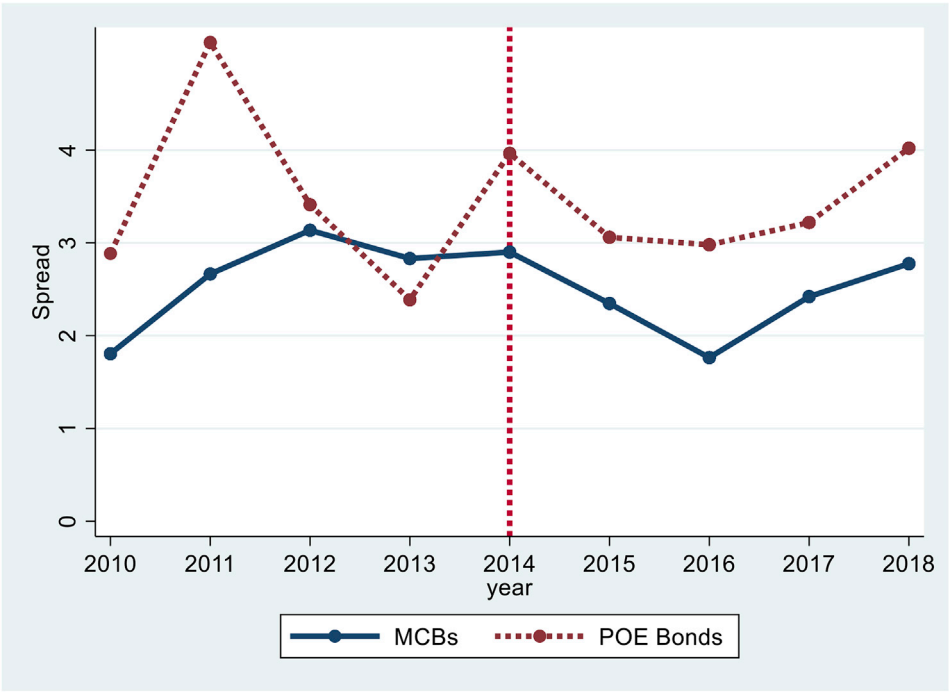
Table 11 shows the heterogeneous effects of MCB with local SOE and POE, and the structural change from the shock of Article 43. Column (1) and column (2) show the results compared with local SOE. We use the unmatched sample in column (1) and matched sample in column (2). The regression results are consistent. The coefficients of *MCB* are significantly positive and those of interaction term, *MCB* × *Post*, are significantly negative. From the indication of each coefficient, we find that MCB has 0.27% higher than local SOE before Article 43, but 0.022% lower after Article 43 as column (1) shows. The decrease is even lower when we use the matched sample, even 0.28% lower than local SOE. Column (3) and column (4) show the results compared with POE. The coefficients of *MCB* and interaction term, *MCB* × *Post*, are significantly negative, which implies that MCB has lower spread than POEs by around 0.3% before the shock, then even lower after that. MCB has even lower financing costs by about 1% whether we use matched sample or not.

Table 12 further exploits the impact from administrative level before and after Article 43 by considering capital-level and prefectural-level MCBs, respectively. For the capital-level MCBs, we divide the samples into ten groups according to provincial GDP where the issuer of MCB located in. The group of highest GDP is denoted as *High GDP*, and the lowest is denoted as *Low GDP*. As for city level MCBs, we divided the samples into ten groups according to GDP of the city where the issuer of MCBs located. Table 12 shows that the mean spread of each region is lower after the shock than before. For the capital-level MCBs, we find that MCB in high GDP provinces has 0.504% lower spread than in low GDP provinces before Article 43 in column (1). This difference is even strengthened after the shock, which is 0.568% as column (2) shows. For prefectural level MCBs, we still find that this difference is significant, 0.222% in average before the shock. But after the shock, there is no significant difference between high and low cities among the prefectural MCBs. Thus, we find that the mean spread of MCBs even declined after the implementation Article 43 for MCBs at both capital and prefectural level.

[5] This kind of IV was introduced similar to the interactions in Di Maggio and Kermani (2017) and Ru (2018).



Panel A: **MCBs vs. Local SOE Bonds**



Panel B: **MCBs vs. POE bonds**

Fig. 4. Time trends of spreads by different bonds. We use the sample after matching the same credit rating, same year and same province of bonds issuance and winsorize the spreads by year.

Table 11
The shock of Article 43.

	(1)	(2)	(3)	(4)
MCBvsLocalSOE	0.271***	0.230***		
	(0.041)	(0.053)		
MCBvsLocalSOE×Post	−0.293***	−0.510***		
	(0.043)	(0.054)		
MCBvsPOE			−0.359***	−0.289***
			(0.068)	(0.075)
MCBvsPOE×Post			−0.587***	−0.633***
			(0.063)	(0.066)
Bond	Yes	Yes	Yes	Yes
Issuer	Yes	Yes	Yes	Yes
Macro	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
PSM	No	Yes	No	Yes
Observations	9,150	5,724	6,408	5,741
Adjusted R-squared	0.479	0.502	0.528	0.519

Table 11 shows the heterogeneous effects of MCB with local SOE and POE, and the structural change from the shock of Article 43. We use the unmatched sample in column (1) and matched sample in column (2). The regression results are consistent. Column (3) and column (4) show the results compared with POE. See Appendix Table A for definition of the variables.***p < 0.01, **p < 0.05, *p < 0.1.

Table 12
The spreads of different administrative level MCBs before and after Article 43.

	CapitalLevel MCBs		PrefecturalLevel MCBs	
Spread	Pre Article 43	Post Article 43	Pre Article 43	Post Article 43
High GDP region	2.418	1.675	3.144	2.783
Low GDP region	2.922	2.243	3.366	2.937
High-Low	−0.504***	−0.568***	−0.222**	−0.154

Table 12 further exploits the impact from administrative level before and after Article 43 by considering capital-level and prefectural-level MCBs, respectively. For the capital-level MCBs, we divide the samples into ten groups according to provincial GDP where the issuer of MCB located in. The group of highest GDP is denoted as *High GDP*, and the lowest is denoted as *Low GDP*. As for city level MCBs, we divided the samples into ten groups according to GDP of the city where the issuer of MCBs located. See Appendix Table A for definition of the variables.***p < 0.01, **p < 0.05, *p < 0.1.

Table 13
Impact of bond defaults.

VARIABLES	(1)	(2)	(3)	(4)
TotalDefault	−0.219***			
	(0.012)			
LocalSOEDefault		0.091***		0.270***
		(0.011)		(0.012)
POEDefault			−0.259***	−0.408***
			(0.014)	(0.015)
Bond	Yes	Yes	Yes	Yes
Issuer	Yes	Yes	Yes	Yes
Macro	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	5,211	5,211	5,211	5,211
Adjusted R-squared	0.400	0.367	0.401	0.443

Table 13 reports the regression results, where we use the logarithm of number of defaulted bonds, we also use the logarithm of value of the defaulted bonds and the cumulative number of defaulted bonds which are all consistent. See Appendix Table A for definition of the variables.*** p<0.01, ** p<0.05, * p<0.1.

6.2. Market chases implicit guarantee

Finally, we will explain why the spread declines even after the government aims to begin marketization of those MCBs. The reason lies in the market concern on bond defaults. We introduce the variable *Default* to indicate our hypothesis. The regression model is as follows,

$$Spread_i = \beta_1 Default_{t-1} + \gamma_1 Macro_{p,t-1} + \gamma_2 Bond_i + \gamma_3 Issuer_{j,t-1} + \alpha_s + \alpha_p + \alpha_t + \varepsilon_i \quad (9)$$

Table 14
Robustness tests.

Panel A. Bonferroni's upper bound

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
SOE			−1.004***			
			(0.027)			
CentralSOE				−1.259***		
				(0.048)		
LocalSOE					−0.984***	
					(0.029)	
MCBvsPOE						−0.917***
						(0.033)
PrivateSecter		−1.151***	−1.197***	−0.779	−1.179***	−0.839***
		(0.168)	(0.158)	(0.418)	(0.180)	(0.060)
MarketCap		0.129***	0.116***	0.063	0.084	0.014
		(0.028)	(0.026)	(0.042)	(0.043)	(0.007)
RateAAA	−0.703***	−0.707***	−0.598***	−0.615***	−0.594***	−0.682***
	(0.020)	(0.020)	(0.019)	(0.044)	(0.021)	(0.026)
lnBondSize	−0.109***	−0.110***	−0.080***	−0.021	−0.097***	−0.090***
	(0.013)	(0.013)	(0.013)	(0.023)	(0.014)	(0.018)
lnMaturity	−0.387***	−0.405***	−0.259***	−0.167**	−0.305***	−0.248***
	(0.030)	(0.030)	(0.028)	(0.059)	(0.032)	(0.041)
EB	0.055	0.059	0.088***	0.158	0.062	0.041
	(0.024)	(0.024)	(0.023)	(0.076)	(0.025)	(0.032)
MTN	−0.326***	−0.331***	−0.229***	−0.101**	−0.277***	−0.310***
	(0.019)	(0.019)	(0.018)	(0.035)	(0.020)	(0.027)
ROA	−0.001	−0.001	−0.037***	−0.020***	−0.034***	−0.031***
	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)	(0.004)
Leverage	0.005***	0.005***	0.003***	0.013***	0.003***	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Salegrowth	0.000	0.001	0.000	0.012	−0.000	−0.000
	(0.003)	(0.003)	(0.002)	(0.007)	(0.002)	(0.003)
FirmSize	−0.125***	−0.126***	−0.145***	−0.109***	−0.157***	−0.110***
	(0.010)	(0.010)	(0.009)	(0.017)	(0.010)	(0.013)
Age	−0.004***	−0.004***	−0.005***	−0.005*	−0.005***	−0.008***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Intercept	4.403***	4.755***	5.452***	3.870***	5.862***	5.538***
	(0.174)	(0.216)	(0.204)	(0.418)	(0.236)	(0.224)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,184	11,184	11,184	2,421	9,960	6,408
Adjusted R-squared	0.486	0.488	0.546	0.694	0.515	0.522

Panel B. Sensitivity results for basic variables

M-variable	β		Std. Err.	*t*-value	*p*-value	Other Variables	Robust
MCB	max	−0.580	0.032	−17.95	0.0354	*Size, Leverage, Salegrowth, MTN*	Robust
	base	−0.672	0.032	−21.29			
	min	−0.880	0.035	−25.05	0.0254	*Size, Age, ROA, PrivateSecter*	

Panel C. Placebo tests

	(1)	(2)	(3)	(4)
VARIABLES	Article 463	Article 10	Article 88	Article 50
MCB(vs. POE)	−0.936***	−0.901***	−0.835***	−0.863***
	(0.217)	(0.093)	(0.061)	(0.058)
MCB(vs. POE) × Post	0.054	0.018	−0.093*	−0.045
	(0.216)	(0.078)	(0.056)	(0.051)
Controls	YES	YES	YES	YES
PSM	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Observations	5,617	5,617	5,617	5,617
Adj. R-squared	0.507	0.507	0.507	0.507

Note: Panel A: We calculate the Bonferroni's upper bound of joint distribution on the true joint p-value. We have 13 control variables and an independent variable in the base model, so we use the 1/13 p-value as the significant standard. ***, **, * means $p < 0.00077$, $p < 0.0038$, $p < 0.0077$, respectively. Panel B: Leamer (1983) use extreme bounds analysis (EBA) to do the robustness test of the coefficient estimation in the information set. Can see the sensitivity results in Panel B of Table 14. Panel C: We test different events to compare the effects against the shock of Article 43 in April 2015, including the implementation of Article 463, Article 10, Article 88 and Article 50. The coefficients of *MCB(vs. POE) × Post* are all insignificant, which means that Article 43 does matter. See Appendix Table A for definition of the variables.***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

where we use the total default, local SOE default and POE default, respectively. Table 13 reports the regression results, where we use a logarithm of the number of defaulted bonds, we also use the logarithm of value of the defaulted bonds and the cumulative number of defaulted bonds which are all consistent.

We still focus on the MCB subsample in Table 13. Column (1) shows that the more default bonds, the lower spread of MCB has. The average spread of MCB declines by 21.9 basis points as the number of default bonds increases 1%. Column (2) and column (3) further consider the impact from local SOE's default and POE's default, respectively, which reveals the heterogeneity of these two categories of firms. Local SOE's default increases MCB's spread while POE's default reduces it. Column (4) considers these two factors together, the conclusion still holds and we find POEs default has more impact. Those POEs' defaults restore the market's confidence in the MCBs. That is the reason why LGFV could issue bonds at lower spreads.

7. Robustness tests

7.1. Bonferroni tests (family wise error mechanism)

We calculate the Bonferroni's upper bound of joint distribution on the true joint p-value. We have 13 controls and an independent variable in the base model, so we use the one-thirteenth p-value (0.01/13) as the significant standard. In Panel A of Table 14, ***, **, * means $p < 0.00077$, $p < 0.0038$, $p < 0.0077$ respectively, and the results still are robust when we use the strict Bonferroni bound. The result is consistent with our benchmark model of Table 4.

7.2. Extreme bounds analysis

Leamer (1983) used extreme bounds analysis (EBA) to conduct the robustness test of the coefficient estimation in the information set. We use *MCB* as *M*-variable, and *RateAAA, lnBondsize, lnMaturity* as the always-included variables (**I**-variables). Other variables (**Z**-variables) include *MTN, Size, Leverage, Salegrowth, Age, PrivateSector* and *MarketCap*. We can see the sensitivity results in Panel B of Table 14. In the EBA, we don't control the year and industry fixed effect, so the coefficient of *MCB* of base model is similar to Table 4, and the sign and significance are the consistence with Table 4 $\beta_{max}+2\sigma_{max}$ and $\beta_{min}+2\sigma_{min}$ have the same sign and both β_{max} and β_{min} are significant, so the results are robust.

7.3. Placebo tests

We test different events to compare the result with the shock of Article 43 April, including the implementation of Article 463, Article 10, the first SOE bond default event "*Baoding Tianwei*" and Article 50. Panel C of Table 14 shows the coefficients of *MCB(vs. POE)* × *Post* are all insignificant, which means Article 43 does matter.

8. Conclusion

We find strong evidence that government guarantee reduces the funding cost by examining the credit spread of corporate bonds in China. MCBs have significantly lower funding costs because of the implicit government guarantee. According to administrative level of LGFVs, states provide the strongest implicit guarantee, then prefectural level, and county level is the last. We also find the heterogeneity of explicit guarantee and implicit guarantee between MCBs and POEs. Although explicit guarantee reduces POE bond's spread, it is a bad signal for the market on MCBs where the spread increases if it is issued with explicit guarantees. In contrast to explicit guarantee, implicit guarantee is good news because the market has more confidence on MCBs rather than POE bonds.

We then analyze the mechanism by two perspectives, government intervention and macro heterogeneities. We find that MCB still has lower spread than POE bonds even introducing two indicators of government intervention. Regional economic development has the strongest effect whenever we use province-level or city-level GDP per capita. Bank loans reduce the spread too, but this effect shrinks rapidly introducing economic development. These results contribute to the literature on policy decentralization and government intervention.

Furthermore, the bargaining between market and government is exploited, by introducing the policy shock of Article 43 in which the Chinese government aimed to marketize those MCBs. This should increase MCB's spread because the implicit government guarantee is declining. On the contrary, we find that MCB's spreads do not rise after the implementation of Article 43. We examine the reason by exploiting the impact from bond default. Market still chases implicit government guarantees even after the government tightened the regulations on local government debts.

CRediT authorship contribution statement

Xiaoqian Zhang: Conceptualization, Methodology, Writing - original draft, Writing - review & editing. **Zhiwei Wang:** Data curation, Writing - original draft, Visualization, Software.

Acknowledgement

We thank Editor Brian Lucey, Samuel Vigne, Youwei Li, and Pranab Bardhan. We also thank the editors and two referees. Xiaoqian Zhang acknowledges the financial support from the Major Research Project of Philosophical and Social Sciences of China Education Ministry (Grant No. 14JJD790010) and the National Natural Science Foundation of China (Grant No. 71472167).

Appendix

Variable	Description
Dependent variable	
Spread	Credit spreads. Coupon rate minus the government bond rate with same maturity issued on the same date. (Ang et al., 2019)(%)
SpreadCDB	Credit spreads. Coupon rate minus the China Development Bank bond rate with same maturity issued on the same date. (Amstad and He, 2019)(%)
Local variable	
GovInt1	Indicators of government intervention. Divide government expenditure by local government GDP (Hao & Lu, 2018)
GovInt2	Indicators of government intervention. Divide the number of employees in public administration, social security and social organizations by the total number of employees (Hao & Lu, 2018)
PrivateSector	The total employees in private and self-employed enterprises over total employees in each province
MarketCap	The market value of listed companies over GDP (Erel et al., 2015) in each province
LnperGDP	The logarithm of GDP per capital in each province
RealEstateGDP	The logarithm of GDP of real estate sector in each province
RealEstateTax	The logarithm of local tax revenue of real estate sector in each province
HousePriceGrowth	Growth rate of housing prices in each province
LnpercityGDP	The logarithm of per capita GDP in each city
PrivateCredit	The total outstanding loan over GDP (Erel et al., 2015) in each city
HealthExpenditure	The logarithm of regional medical and health expenditure in public expenditure per capita.
Pandemic	A dummy equals 1 above the median of the cumulative confirmed cases in this region on April 8, 2020, otherwise is 0. April 8, 2020 is the date of the end of the lockdown and the reopening of the city of Wuhan.
Bonds characteristics	
MCB	Municipal Corporate Bond dummy variable. LGFV is 1, and POE is 0
RateAAA	Dummy variable. It equals to 1 if the bond is AAA-rated when issued, otherwise is 0.
lnBondSize	The logarithm of bond size (in million RMB)
lnMaturity	The logarithm of bonds maturity (in year)
EB	Dummy variables. It equals to 1 if the bond is enterprise bond regulated by NDRC, otherwise is 0.
MTN	Dummy variables. It equals to 1 if the bond is middle-term note, otherwise is 0.
CapitalLevel	Dummy variable. It equals to 1 if the administrative level is province, provincial capitals and cities specifically designated in the state plan (Single-listed-city), otherwise is 0.
PrefecturalLevel	Dummy variable. It equals to 1 if the level is Prefecture-level city, otherwise is 0.
CountyLevel	Dummy variable. It equals to 1 if the administrative level is county and county-level cities, otherwise is 0.
DummyGuarantor	Dummy variable. It equals to 1 if the bond is guaranteed, otherwise is 0.
ExGovGuarantee	Dummy variable. It equals to 1 if the bond is guaranteed by SOE, otherwise is 0.
ImGovGuarantee	Dummy variable. It equals to 1 if the bond is unguaranteed but the issuer is SOE, otherwise is 0.
TotalDefault	ln (1+number of all default bonds)
LocalSOEDefault	ln (1+number of default bonds of local SOEs)
POEDefault	ln (1+number of default bonds of POEs)
Issuer's control variables	
ROA	Return On Assets
Leverage	Asset-liability ratio (%)
Salegrowth	Current operating income minus initial operating income over initial operating income
FirmSize	The logarithm of total asset of the issuer.
Age	The difference between the year firm established and year bond issuance

References

Amstad, M., & He, Z. (2019). *Chinese bond market and interbank Market* (Chapter for the Handbook of "China's Financial System").

Ang, A., Bai, J., & Zhou, H. (2019). The great wall of debt: Real estate, political risk and Chinese local government financing cost. *Working papers*.

Babina, T., Jotikasthira, C., Lundblad, C., & Ramadorai, T. (2020). Heterogeneous taxes and limited risk sharing: Evidence from municipal bonds. In *The review of financial studies*. https://doi.org/10.1093/rfs/hhaa028 (in press).

Bai, C. E., Hsieh, C. T., & Song, Z. M. (2016). The long shadow of China's fiscal expansion. *Brookings Papers on Economic Activity, 27*, 129–165.

Bardhan, P. (2016). State and Development: The need for a reappraisal of the current literature. *Journal of Economic Literature, 54*, 862–892.

Benzion, U., Galil, K., Lahav, E., & Shapir, O. M. (2018). Debt composition and lax screening in the corporate bond market. *International Review of Economics & Finance, 56*, 178–189.

Bond, P., & Goldstein, I. (2015). Government intervention and information aggregation by prices. *The Journal of Finance, 70*, 2777–2812.

Borisova, G., Fotak, V., Holland, K., & Megginson, M. (2015). Government ownership and the cost of debt: Evidence from government investments in publicly traded firms. *Journal of Financial Economics, 118*, 168–191.

Caillaud, B., Guesnerie, R., Rey, P., & Tirole, J. (1988). Government intervention in production and incentives theory: A review of recent contributions. *The RAND Journal of Economics, 19*, 1–26.

Chen, H., Chen, Z., He, Z., Liu, J., & Xie, R. (2020a). *Pledgeability and asset prices: Evidence from the Chinese corporate bond markets*. Working paper.
Chen, Z., He, Z., & Liu, C. (2020b). The financing of local government in China: Stimulus loan wanes and shadow banking waxes. *Journal of Financial Economics*. https://doi.org/10.1016/j.jfineco.2019.07.009 (in press).
Chen, S., Sun, Z., Tang, S., & Wu, D. (2011). Government intervention and investment efficiency: Evidence from China. *Journal of Corporate Finance, 17*, 259–271.
Cong, L. W., Gao, H., Ponticelli, J., & Yang, X. (2019). Credit allocation under economic stimulus: Evidence from China. *Review of Financial Studies, 32*, 3412–3460.
Dewatripont, M., & Maskin, E. (1995). Credit and efficiency in centralized and decentralized economies. *The Review of Economic Studies, 62*, 541–555.
Di Maggio, M., & Kermani, A. (2017). Credit-induced boom and bust. *Review of Financial Studies, 11*, 3711–3758.
Erel, I., Jang, Y., & Weisbach, M. (2015). Do acquisitions relieve target firms' financial constraints? *The Journal of Finance, 70*, 289–328.
Faccio, M. (2006). Politically connected firms. *The American Economic Review, 96*, 369–386.
Fang, H., Wang, L., & Yang, Y. (2020). *Human mobility restrictions and the spread of the novel coronavirus (2019-NCOV) in China*. NBER working paper. No. 26906.
Fan, J. P., Rui, O. M., & Zhao, M. (2008). Public governance and corporate finance: Evidence from corruption cases. *Journal of Comparative Economics, 36*(3), 343–364.
Fisman, R. (2001). Estimating the value of political connections. *The American Economic Review, 91*, 1095–1102.
Fisman, R., & Wang, Y. X. (2015). The mortality cost of political connections. *The Review of Economic Studies, 82*(4), 1346–1382.
Gao, H. Y., Ru, H., & Tang, D. Y. (2019). *Subnational debt of China: The politics-finance nexus. Working papers*.
Gertler, M., & Klenow, P. (2019). Economic fluctuations and growth. *NBER Reporter, 2*, 1–13.
Gilchrist, S., P., & Zakrajšek, E. (2012). Credit spreads and business cycle fluctuations. *The American Economic Review, 102*, 1692–1720. https://www.aeaweb.org/articles?id=10.1257/aer.102.4.1692.
Goldman, E., Rocholl, J., & So, J. (2009). Do politically connected boards affect firm value? *Review of Financial Studies, 22*(6), 2331–2360.
Hao, Y., & Lu, J. (2018). The impact of government intervention on corporate investment allocations and efficiency: Evidence from China. *Financial Management, 47*, 383–419.
Hart, O., & Zingales, L. (2011). A new capital regulation for large financial institutions. *American Law and Economics Review, 13*, 453–490.
Houston, J., Jiang, L., Lin, C., & Ma, Y. (2012). Political connections and the cost of bank loans. *Journal of Accounting Research, 52*, 193–243.
Huang, J., Huang, Z., & Shao, X. (2018). *The risk of implicit guarantees: Evidence from the shadow interbank market in China, Working papers*.
Huang, Z., Li, L., Ma, G., & Xu, L. C. (2017). Hayek, local information, and commanding heights: Decentralizing state-owned enterprises in China. *The American Economic Review, 107*, 2455–2478.
Jia, J. S., Lu, X., Yuan, Y., Xu, G., Jia, J., & Christakis, N. A. (2020). Population flow drives spatio-temporal distribution of COVID-19 in China. *Nature*, 1–11.
Jiang, F. X., Zhan, J., & Kenneth, A. K. (2020). Capital market, financial institutions and corporate finance in China. *Journal of Corporate Finance*. https://doi.org/10.1016/j.jcorpfin.2017.12.001 (in press).
Jin, S., Wang, W., & Zhang, Z. (2018). *The value and real effects of implicit government guarantees. Working papers*.
Leamer, E. E. (1983). Let's take the con out of econometrics. *The American Economic Review, 73*, 31–43.
Li, H., Meng, L., Wang, Q., & Zhou, L. A. (2008). Political connections, financing and firm performance: Evidence from Chinese private firms. *Journal of Development Economics, 87*, 0-299.
Lin, J. Y., & Tan, G. (1999). Policy burdens, accountability, and the soft budget constraint. *The American Economic Review, 89*, 426–431.
Nagano, M. (2018). What promotes/prevents firm bond issuance in emerging economies: Bank–firm relationship or information asymmetry? *International Review of Economics & Finance, 56*, 161–177.
Nagler, F., & Ottonello, G. (2019). Inventory capacity and corporate bond offerings. *Working papers*.
Qiu, Y., Chen, X., & Shi, W. (2020). Impacts of social and economic factors on the transmission of coronavirus disease 2019 (COVID-19) in China. *Journal of Population Economics*. https://doi.org/10.1007/s00148-020-00778-2 (in press).
Ru, H. (2018). Government credit, a double-edged sword: Evidence from the China Development Bank. *The Journal of Finance, 73*, 275–316.
Shi, J., & Zhang, X. (2018). How to explain corporate investment heterogeneity in China's new normal: Structural models with state-owned property rights. *China Economic Review, 50*, 1–16.
Stiglitz, J. E., & Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American Economic Review, 71*, 393–410.
Wellman, L. A. (2017). Mitigating political uncertainty. *Review of Accounting Studies, 22*, 217–250.
Yang, G. C., & Pan, Y. (2019). Is Trust priced? Evidence from the bond market. *Journal of Financial Research, 463*, 35–53 (in Chinese version).
Zhang, X. Q., Yu, M. Q., & Chen, G. Q. (2020). Does mixed-ownership reform improve SOE's innovation? Evidence from China's state ownership. *China Economic Review*. https://doi.org/10.1016/j.chieco.2020.101450 (in press).