WORKING PAPER · NO. 2019-29

The Financing of Local Government in China: Stimulus Loan Wanes and Shadow Banking Waxes

Zhuo Chen, Zhiguo He, Chun Liu

AUGUST 2019

Macro Finance Research Program

A Program of Becker Friedman Institute

5757 S. University Ave.
Chicago, IL 60637
Main: 773.702.5599
bfi.uchicago.edu

The Financing of Local Government in China: Stimulus Loan Wanes and Shadow Banking Waxes*

forthcoming in *Journal of Financial Economics*

Zhuo Chen[a], Zhiguo He[b,*], Chun Liu[c]

[a] *PBC School of Finance, Tsinghua University, No. 43, Chengfu Road, Haidian District, Beijing 100083, P.R. China*
[b] *Booth School of Business, University of Chicago, and NBER, 5807 S Woodlawn Ave, Chicago, IL 60637*
[c] *School of Economics and Management, Tsinghua University, Beijing 100084, P.R. China*

Abstract

The upsurge of shadow banking is typically driven by rising financing demand from certain real sectors. In China, the four-trillion-yuan stimulus package in 2009 was behind the rapid growth of shadow banking after 2012, expediting the development of Chinese corporate bond markets in the post-stimulus period. Chinese local governments financed the stimulus through bank loans in 2009, and then resorted to non-bank debt financing after 2012 when faced with rollover pressure from bank debt coming due. Cross-sectionally, using a political-economy-based instrument, we show that provinces with greater bank loan growth in 2009 experienced more municipal corporate bond issuance during 2012–2015, together with more shadow banking activities including Trust loans and wealth management products. China's post-stimulus experience exhibits similarities to financial market development during the U.S. National Banking Era.

JEL: E61, G21, H72, O17

Keywords: Local Government Financing Vehicles, Municipal Corporate Bonds, Political Cycle, Shadow Banking in China, Railroad Finance, Trust Companies

*We thank Chong-En Bai, Jennifer Carpenter, Will Cong, Haoyu Gao, Kinda Hachem, Zhangkai Huang, Chang-tai Hsieh, Jinyu Liu, Jacopo Ponticelli, Zheng Michael Song, Jun Qian, Hong Ru, Aleh Tsyvinski, Eric Zwick, and participants at the 2016 Nankai University School of Finance Annual Conference, Shanghai University of Finance and Economics, Central University of Finance and Economics School of Finance, Renmin University of China Hanqing Institute, Chinese University of Hong Kong (Shenzhen), 2017 NBER Chinese Economy Working Group, the 2^{nd} IMF-Atlanta Fed Research Workshop on China's Economy, and 2017 Asian Bureau of Finance and Economic Research Conference, the 2^{nd} China Financial Research Conference, 2017 China International Conference in Finance, 2017 Summer Institute of Finance Conference, 2017 HKUST Finance Symposium, and 2019 Tsinghua Research Program on Growth and Institutions for helpful comments. We thank Yunjun Yu and Yilin Zhang for providing more recent issuance purpose data on municipal corporate bonds. Chen acknowledges financial support from Minsheng Wealth Management Research Center at Tsinghua University and National Science Foundation of China (Grant NO. 71790605, 71790591, 91746301).

*Corresponding author

Email addresses: chenzh@pbcsf.tsinghua.edu.cn (Zhuo Chen), zhiguo.he@chicagobooth.edu (Zhiguo He), liuch@sem.tsinghua.edu.cn (Chun Liu)

1. Introduction

Lacking universal definition, shadow banking refers to markets and/or institutions that operate partially outside the traditional commercial banking sector with lighter regulations. Importantly, it can thrive in both developed economies (EC, 2012) and emerging markets (Ghosh, Gonzalez del Mazo, and Ötker-Robe, 2012), in both the present day (the recent 2007/08 financial crisis) and even throughout history (Rockoff, 2018). In almost all situations, the upsurge of shadow banking is linked to the rising financing demand from certain real sectors, with one such leading historical example being the popularity of state-chartered trust companies in America in the late nineteen century associated with the unprecedentedly large-scale railroad construction at that time. The same universal insight prevails in the world's second largest economy today, as our paper argues that the accelerated growth of China's shadow banking after 2012 is tightly linked to its 2009 stimulus plan.

The four-trillion-yuan stimulus plan in China was launched in November 2008, right after the 2007/08 global financial crisis hit the export-driven Chinese economy hard when its annualized GDP growth dropped from 9.5% in 2008Q3 to 6.4% in 2009Q1. In implementing this infrastructure-centric stimulus plan, Chinese local governments borrowed heavily—mostly in the form of commercial bank loans—during the year of 2009. The 2009 stimulus package caused many unintended consequences on the growth of China's economy and financial markets after 2009, and we show that one of them is the unprecedentedly rapid growth of shadow banking activities in China after 2012.

The dawn of shadow banking in China around 2008 can be attributed to other factors (e.g., Hachem and Song, 2017a,b), but it is after 2012 that China's shadow banking started experiencing accelerated growth. For instance, wealth management products (WMPs), a widely used tool to attract off-balance-sheet deposits in China, grew by a total of RMB 3.5 trillion during the three-year period from 2008 to 2011 but increased by RMB 2.5 and 3.1 trillion in the single years 2012 and 2013, respectively. A similar pattern holds for Trust loans (including both trust and entrusted loans), which grew a total of 4.6 trillion during 2008–2011 but increased by 7 trillion in 2012–2013.

In contrast to most of the recent literature on China's shadow banking (e.g., Acharya, Qian,

and Yang, 2017; Hachem and Song, 2017a), our study links the timing of the 2009 stimulus loans to that of a rapid growth of shadow banking after a delay of three-to-five years, as just described. We term this mechanism the *stimulus-loan-hangover* effect: local governments who received stimulus bank loans in 2009 had to repay these loans which matured three to five years later (He and Xiong, 2012; Diamond and He, 2014), and/or finance the continuation phase of the plan's long-term infrastructure projects. Due to the sheer size of the stimulus loans sitting on the balance sheets of local governments, as well as Beijing's back-to-normal credit policy in 2010, this stimulus-loan-hangover effect creates a vast financing demand that is unmet by the tightly regulated traditional banking system. Consequently, local governments, together with financial institutions, had strong incentives to engage in regulatory arbitrage, which fostered the shadow banking sector in China starting in 2012 and propelled the swift growth of Chinese corporate bond markets around the same time. As we discuss in Section 5.1, this episode in today's China corresponds remarkably well with the U.S. history, when railroad financing in the nineteenth century triggered the rising importance of state-chartered trust companies and even stimulated the corporate bond market on Wall Street (Chandler, 1965; Neal, 1971).

The contribution of this paper is twofold. First, we illustrate how the 2009 stimulus package in China following the 2007/08 global financial crisis unexpectedly affected the development of Chinese financial markets. Specifically, by instrumenting the heterogeneous stimulus shocks in 2009 across provinces with local governors' tenure terms, we causally establish a hangover mechanism underlying the accelerated growth of shadow banking in China after 2012. Second, and in a more general sense, this paper illustrates a fundamental pattern for the rise of shadow banking by comparing China today with the U.S. more than one hundred years ago: the financing demand from certain real sectors along with tighter regulations on the traditional banking system promotes shadow banking development.

We start by describing the background of the 2009 four-trillion-yuan stimulus package and its connections to Chinese local governments in Section 2. Unlike standard fiscal policies in developed countries, such as the American Recovery and Reinvestment Act of 2009 (ARRA), where the financing involves all levels of government, in China it is mainly those off-balance-sheet local government financing vehicles (LGFVs)—not municipals themselves—that borrowed from banks and carried out the 2009 stimulus plan.

Beijing reverted its aggressive credit policy back to normal in 2010, but these 2009 stimulus loans were left on LGFVs' balance sheets and became a major liability implicitly assumed by Chinese local governments. In December 2010 and June 2013, the National Audit Office (NAO) conducted two comprehensive surveys on local government debts, including those borrowed by LGFVs. We focus on four subcategories on the liability side of local governments: *bank loans*, *munibonds*, *municipal corporate bonds*, and *Trust loans*, with the latter three types being non-bank debt. Consistent with the hypothesis of a stimulus-loan-hangover effect, Section 3 documents a robust pattern of local government debt changing its composition from bank loans to non-bank debt obligations over the period of 2008 to 2016.

Our paper focuses on the third type of debt, namely, municipal corporate bonds (MCBs hereafter).[1] These bonds are issued by LGFVs and hence are corporate bonds in a legal sense. But on the other hand, they have implicit guarantees from corresponding local governments, and hence enjoy the extra safety of typical municipal bonds. Moreover, LGFV-issued MCBs are tightly linked to the shadow banking sector, which is the major funding source of Chinese corporate bond markets.

We perform our main empirical analysis in Section 4. The hypothesis of the stimulus-loan-hangover effect has the following cross-sectional prediction: provinces with more stimulus bank loans in 2009 should have more MCB issuance several years later. To deal with potential endogeneity concerns, we borrow from the literature of political economy to exploit whether a provincial governor was in the late stage of an official term (i.e., had been in office for three years or more, as of 2009 when the stimulus shock occurred). We find that, consistent with Tan and Zhou (2015) and Liu, Shu, Wang, and Wei (2018), there were more stimulus loans in municipalities with late-term governors. This arguably exogenous instrumental variable (IV) captures how the incentive to promote massive stimulus investments becomes stronger in the later years of a governor's term, and we explain why the dramatic shift of political regime in 2012 after Xi Jinping took power helps the chosen instrument satisfy the exclusion restriction in our context.

[1] It is "cheng-tou-zhai" in Chinese, which literally translates to "city investment bonds." We adopt "municipal corporate bonds" from the English translation of the "cheng-tou-zhai" index provided by the China Securities Index Company, Limited (CSI), which is the leading index provider in China and is jointly owned by the Shenzhen Stock Exchange and the Shanghai Stock Exchange. In the literature, papers have used different translations; for instance, "local government bonds" by Huang, Pagano, and Panizza (2016), "Chengtou bonds" by Bai and Zhou (2018), and "urban construction and investment bonds" by Gao, Ru, and Tang (2018). Some practitioners' articles also use the term "LGFV bonds".

We denote β_τ the response of MCB issuance to stimulus loans in year τ, identified from the panel regression with the usual fixed effects and controls. Both our OLS and IV estimators paint the same picture. There is no pre-treatment trend (i.e., β_τ start with zero before 2009). During 2009–2011, these coefficients turn positive but are still quantitatively small because traditional banks, rather than shadow banking, still played the major role in financing the stimulus. Only after 2012 do we observe a significant surge in β_τ when LGFVs started facing rollover and continuation of investment pressures from maturing stimulus loans.

We further explore MCB issuance purposes, which are self-reported by LGFVs whenever they issue MCBs in the public corporate bond market. We classify them into three categories by the purpose of funds raised: repayment of existing bank loans; investment in projects; and others (e.g., replenishing working capital). Similar patterns of estimated $\hat{\beta}_\tau$ hold when we run the same panel regression but with the bank-loan-repayment MCBs as dependent variable. We can provide a useful interpretation of the economic magnitude of our estimates as the coefficients on the repayment MCBs are linked to the maturity of stimulus loans. A simple back-of-the-envelope calculation implies a 3.8-year maturity of stimulus bank loans, a number that is remarkably close to the average maturity of 4.1 years for LGFV loans documented in Gao, Ru, and Tang (2018). We also confirm in the data that this hangover effect is alleviated for provinces with more policy-bank loans in 2009, consistent with the fact that policy banks on average issue longer-term loans. Lastly, the data seem to suggest that the 2009 stimulus loans have some positive impact on local economic growth, but the evidence is less robust.

All pieces of evidence presented here suggest that the stimulus-loan-hangover effect is an important driver of China's overall shadow banking activities after 2012. Non-bank local government debt has become increasingly significant relative to shadow banking activities in China, rising from 1.5% in 2008 to 48% in 2016. Cross-sectionally, provinces with more bank-loan-fueled stimulus in 2009 experienced more entrusted loan growth during later years. Finally, by the end of 2016, 62% (or RMB 4.2 trillion) of MCBs were purchased by WMPs, suggesting a close connection between local government debt and shadow banking in China.

Is China's post-stimulus experience unique? Does the economic mechanism behind this extraordinary episode reflect some universal insight in understanding shadow banking in other markets around the world? To answer these questions, we conduct an international comparison to the U.S.

financial system at its developing stage around the National Banking Era (1864–1912), a period during which railroads were a burgeoning industry in the U.S. as it expanded westward. At that time, to meet the vast capital demand of funding railroads that lacked support from tightly regulated national banks, western states engaged in aggressive regulatory competition by allowing for state-chartered banks with fewer restrictions.

State authorities also vigorously competed with the federal regulator by establishing more trust companies. These American shadow-banking entities bear almost perfect resemblance to the trust companies in today's China. According to Neal (1971), trust companies in the late nineteenth-century U.S. invested in new industrial securities on the asset side, while on the liability side they expanded the money supply greatly. In today's China, trust companies hold MCBs that support the long-term infrastructure projects carried out by LGFVs, and in the mean time are financed by WMPs that become an important savings vehicle for Chinese households.

More importantly, China's shadow banking, which has grown to meet the LGFVs' financing needs especially after 2012, helps the development of Chinese corporate bond markets. This echoes the commonly held view that the unprecedentedly large-scale railroad financing in America stimulated the corporate bond market on Wall Street at that time (Chandler, 1965). Investment banks thrived by offering investors comparative information about bonds on sale, together with the emergence of agencies that specialized in credit information who later evolved to the modern-day credit rating agencies. But the Chinese manifestation of this phenomenon has a little twist: investors' demand for information grew only when LGFVs with rollover pressures started tapping non-bank sources from the financial market after 2012. Indeed, we find that the number of research reports issued by rating agencies and security firms jumped around 2012 in China. In short, the 2009 stimulus and its hangover effect served as the catalyst for the rapid development of Chinese bond markets over the past decade.

Besides drawing parallels to U.S. history, we also draw a contemporaneous comparison between Obama's economic stimulus ARRA package and the 2009 stimulus plan in China. The "debt swap program" launched by Beijing in 2015, which essentially introduced the distinction between "revenue" and "general obligation" bonds, is likely to bring China's future municipal budgeting closer to international standard practices.

Literature review

This paper belongs to several distinct yet interrelated strands of literature in the recent development of the Chinese economy and its financial markets. Bai, Hsieh, and Song (2016) offer a comprehensive investigation of the unprecedented four-trillion-yuan stimulus package and its resulting inefficiency. Other studies consider disproportionate allocation of bank credit to the SOE sector (Deng, Morck, Wu, and Yeung, 2015; Cong, Gao, Ponticelli, and Yang, 2018) which represents a reversal of the trend observed before 2008 (Song, Storesletten, and Zilibotti, 2011), a crowd-out effect of public debt on private investment (Huang, Pagano, and Panizza, 2016), the impact of local government debt on banking sector valuation (Chen and Gu, 2012), and the political economy of local government financing decisions (Gao, Ru, and Tang, 2018). First, unlike these studies, our paper focuses on the liability side of local governments and analyzes one of the unintended consequences of the stimulus package in 2009—namely, the delayed upsurge of China's shadow banking sector. Our study sheds light on how a fiscal shock that aims at stimulating real economic growth could unexpectedly shape financial market development in the context of an evolving market economy, where both market forces and government intervention interact with each other.

Second, our main empirical analysis focuses on MCBs, one type of corporate bonds issued by LGFVs. While a couple of other papers examine the cross-sectional pricing determinants of MCBs (Bai and Zhou, 2018; Liu, Lyu, and Yu, 2017a), and the pledgeability effect on asset pricing (Chen, Chen, He, Liu, and Xie, 2018a), we study the quantity of MCBs as well as their issuance purposes. More broadly speaking, our finding about the evolution of local governments' financing from bank loans to bonds and/or other non-bank sources adds to those studies on Chinese local government debt, including LGFV debts (Zhang and Barnett, 2014), LGFV borrowing backed by land sales (Ambrose, Deng, and Wu, 2015), and the economic tournament among local governments (Xiong, 2018).

Third, our paper also belongs to the burgeoning literature on China's greatly increased shadow banking activities, including both WMPs and Trust loans. To explain the origin of shadow banking in China, some researchers compare the different behaviors of small- and medium-size banks with big banks, such as regulatory arbitrage triggered by regulation change on liquidity requirement (Hachem and Song, 2017a) or competition for deposits using WMPs (Acharya, Qian, and Yang,

2017). In contrast, we highlight the stimulus-loan-hangover effect due to local government debt, which explains the accelerated increase in shadow banking activities after 2012. To the best of our knowledge, our paper is the first study that links the financing of local governments to the fast growth of China's shadow banking markets. According to our paper, the development of Trust loans investigated by other papers (Allen, Gu, Qian, and Qian, 2017; Allen, Qian, Tu, and Yu, 2019; Chen, Ren, and Zha, 2018b) is likely due to the 2009 bank-loan-fueled stimulus as well.

Methodology wise, our approach is similar to the recent literature on the effect of the 2009 ARRA program on various aspects of economic output in the U.S. based on cross-sectional data, including Conley and Dupor (2013), Leduc and Wilson (2013), Dupor and Mehkari (2016), Crucini and Vu (2017), Leduc and Wilson (2017), and Chhabra, Levenstein, and Owen-Smith (2018). Exploiting the arguably exogenous cross-state variations in highway grants thanks to the pre-existing formulas for grants allocation, researchers investigate the multiplier effect of the ARRA as well as its employment effect; for a recent survey, see Chodorow-Reich (2019).

Finally, we draw a striking similarity between the upsurge of shadow banking in China's post-stimulus period with the U.S. history of financial development during the National Banking Era (1863-1912). Sprague (1910) is perhaps one of the earliest books that portrays banking panics during the Gilded Age, and Chandler (1965) argues that railroad financing helps stimulate the formation of centralized financial markets during that period. We review more papers on this topic in Section 5.

2. Institutional Background

We briefly describe the background of China's four-trillion-yuan stimulus plan in 2009, and its connections to local governments and their financing vehicles.

2.1. China's Four-Trillion-Yuan Stimulus Package in 2009

In the fall of 2008, China's export-driven economy slumped in the wake of the 2007/08 financial crisis. China's annualized GDP growth rate dropped from 9.5% in 2008Q3 to 6.4% in 2009Q1 (Fig. 1 Panel A) as the total exports more than halved, falling from 137 billion USD in September 2008 to 65 billion USD in February 2009.

In November 2008, the Chinese premier Wen Jiabao announced a four-trillion-yuan stimulus, with RMB 1.5 trillion to be spent on railways, roads, airports, water conservancy, and urban power grids; 1 trillion on post-disaster reconstruction (the Wenchuan earthquake occurred in May 2008); 1.14 trillion on indemnificatory and comfortable housing, rural livelihood, and infrastructure; and 0.36 trillion on environmental protection and education. At that time, this aggressive stimulus plan was believed to protect the world from deteriorating recessions; for instance, the day after the announcement, Dominique Strauss-Kahn, the then managing director of the International Monetary Fund, stated in *New York Times* that "*it will have an influence not only on the world economy in supporting demand but also a lot of influence on the Chinese economy itself.*" However, less than a decade later, unintended consequences of this vast stimulus package have started to emerge. One of these consequences is the massive debt burden assumed by Chinese local governments.

2.1.1. Local governments and their financial vehicles

The stimulus package and the debt burden of local governments are just two sides of the same coin. The major component of the stimulus package is infrastructure projects, which were naturally implemented through local governments. Financing-wise, only about one trillion came out of the central government budget, implying a financing gap of three trillion. Because Chinese local governments were not allowed to borrow by themselves as a result of the 1994 tax-sharing reform, they borrowed via LGFVs.

Several papers explain the history of local government financing in China (e.g., Bai, Hsieh, and Song, 2016). Before 1994, local governments in China enjoyed considerable freedom in allocating local tax revenues. The tax-sharing reform in 1994 overhauled the budget law, which not only removed control of local governments over local tax revenues but also made it illegal for them to run deficits. However, municipals can run implicit deficits by establishing LGFVs and borrowing through them. An LGFV is a state-owned enterprise (SOE) with the corresponding local government as the only or dominant shareholder; legally, there is no difference between LGFVs and other typical local SOEs which produce, say, cars. Prior to 2009, these LGFVs, as engaged in off-balance-sheet activities for local governments, were severely restricted to limited financing activities.

To push the stimulus package in late 2008, the central government orchestrated the effective relaxation of the 1994 budget law and encouraged local governments to use LGFVs to take on bank loans. The China Banking Regulation Committee (CBRC), the regulatory body of the Chinese banking system, made the following announcement:

> "*Encourage local governments to attract and to incentivize banking and financial institutions to increase their lending to the investment projects set up by the central government. This can be done by a variety of ways including increasing local fiscal subsidies to interest payments, improving rewarding mechanisms for loans, and establishing government investment and financing platforms compliant with regulations.*" (No. 92 Document, CBRC, March 18, 2009)

In the meantime, the Ministry of Finance, which manages budgetary issues of local governments, issued a regulation document that urged local governments to finance investment projects using all sources of funds:

> "*Local governments are allowed to finance the investment projects by all sources of funds, including budgetary revenue, land revenue, and funds borrowed by local financing vehicles.*" (No. 631 Document, Ministry of Finance, October 12, 2009)

Local governments have been keen in promoting local economic growth over the past several decades (e.g., Li and Zhou, 2005). Given the relaxation of regulation and explicit encouragement from Beijing, local governments carried out the unprecedented stimulus package through their LGFVs by taking on a massive amount of bank loans.

2.1.2. Stimulus package in 2009 fueled by bank loans

Bai, Hsieh, and Song (2016) estimate that about 90% of local government investments were financed

via bank loans in 2009. The stimulus package caused a sudden dramatic increase in newly issued bank loans in 2009, which is visualized in Fig. 1.

Panel A plots the annual new bank loans scaled by GDP together with annual GDP growth in China over the period of 2004–2016. Whereas in normal years, new bank loans had remained at about 15% of GDP, this number skyrocketed to 27.5% in 2009. To address the concern that this might be driven by a relatively low GDP in 2009, Panel B plots new bank loans each year scaled by 2004 GDP (left scale), together with GDP levels for later years but in 2004 fixed price (right scale). The pattern is even stronger: new bank loans in the two years after 2008, especially 2009, stood out as abnormally high. Panels C and D further show that most of the increase in 2009 new bank loans is toward the non-residential sector, consistent with the stimulus package being predominantly infrastructure-investment oriented.

One caveat in reading Fig. 1 is that the ultra-loose monetary policy in 2009, which aimed to help local governments implement the fiscal expansion, also led to remarkable bank credit growth in other sectors in China (see, e.g., Cong, Gao, Ponticelli, and Yang, 2018). We estimate that a total of RMB 4.7 trillion "extra" new bank loans was extended to the Chinese economy in 2009, with estimation details given in the Online Appendix A. Among them, LGFVs obtained roughly RMB 2.3 trillion, among which 2.06 trillion came from commercial banks and 0.26 trillion from policy banks.[2] The non-residential sector (excluding LGFVs) received about 1 trillion in extra new bank loans, and the remaining 1.4 trillion went to the residential sector (mainly in the form of mortgage loans).

2.2. Categories of Local Government Debt

Shortly after the implementation of the stimulus package, many economists and practitioners raised warnings about the solvency of Chinese local governments. What is worse, Beijing lacked statistics to even gauge the aggregate outstanding debt of local governments, let alone to monitor the potential default risks of LGFVs. This pushed the National Auditing Office (NAO) of China to

[2]In China, besides commercial banks, there are three policy banks (Agricultural Development Bank of China, China Development Bank, and Export-Import Bank of China) whose common objective is to support the country's economic and political agenda. The empirical analysis in Section 4.4.3 uses loan data from China Development Bank.

conduct two nationwide surveys on local government debts, one dated December 31, 2010 and the other dated June 30, 2013.

Besides *bank loans*, there are three major forms of non-bank debt obligations in the 2013 NAO report: *municipal corporate bonds (MCBs), trust*, and *munibonds*. Due to data limitations, we exclude from our analysis several other liability items such as *accounts payable, build-and-transfer, fiscal on-lending,* and *other entity & individual borrowing;* they are either common working capital items or standard local-central government arrangements. Specifically, "accounts payable" are mainly unpaid bills owed to business suppliers, "build-and-transfer" is a common arrangement of public-private partnership between local governments and contractors for massive infrastructure project development, "fiscal on-lending" refers to local governments' obligations owed to the central government which raises funds by issuing special Treasury bonds and lends the proceeds to local governments, and "other entity & individual borrowing" includes obligations from all unclassified parties.

MCBs are corporate bonds issued by LGFVs that have implicit government guarantee (Liu, Lyu, and Yu, 2017a). The words "municipal" and "corporate" reflect two simultaneous features of MCBs: government guarantee as other government-issued bonds and credit risk as standard corporate bonds. As we will explain shortly, most MCBs are invested by WMPs, which are sold through commercial banks and considered the barometer of shadow banking in China. Trust, as another significant shadow banking activity in China, will be discussed in detail in Section 2.3.1.

Munibonds are the "official" municipal bonds issued by local governments. The 1994 tax-sharing reform prohibited local governments from borrowing by themselves directly, but they may issue munibonds via the Ministry of Finance. In October 2014, the State Council issued the "No. 43 Document" which put strict restrictions on LGFVs raising funds for new investments, but allows LGFVs to use MCB proceeds to repay existing bank loans or other borrowings. In "No. 43 Document," the central government encouraged local governments to replace other maturing debt with munibonds, and hence, since 2015 there has been rapid growth of munibonds under the so-called local government bond swap program. Some of our later empirical results are linked to the "No. 43 Document" and the bond swap program, and Section 5.3 provides a more detailed discussion regarding this program.

Table 1 presents the RMB value and the percentage of the major categories of local government

debts, as well as their changes between these two auditing dates. For comparison, we follow the data format of 2010 report with relatively coarser classifications; see the Online Appendix Table A1 for NAO reports with their original format. As a key observation of this paper, while the RMB value of bank loans increased from RMB 8.5 trillion to 10.1 trillion, the fraction of bank loans dropped sharply from 79% to 57%. In contrast, other non-bank debt categories became increasingly important during the period of 2010–2013.

2.3. Shadow Banking and Corporate Bond Markets in China

In this section, after a brief introduction of China's shadow banking activities, we explain why the Chinese corporate bond market (where MCBs are issued and traded) is an integrated part of the shadow banking sector connected through banks' off-balance-sheet investment vehicles.

2.3.1. Major forms of shadow banking activities

The Chinese shadow banking system is composed of Trust loans, WMPs, undiscounted bankers' acceptances, peer-to-peer lendings, and so forth. Among them, the two most important categories are Trust loans (including both trust and entrusted loans) and WMPs, though they overlap each other to a great extent.

Trust loans refer to individual-to-firm loans intermediated by a trust company, and entrusted loans refer to firm-to-firm loans intermediated by a bank; both measure the asset side of shadow banking and typically involve banks moving loans off their balance sheets. In contrast, WMPs, which are sold via bank branches to unsophisticated retail investors at a rate above the deposit rate, measure the liability side. WMPs can be used to finance trust companies which then may use the funds to lend to firms, buy corporate bonds, and/or invest in other assets even including other WMPs. Facing looser constraints than traditional banking businesses, both Trust loans and WMPs are recognized as a form of regulatory arbitrage with potentially sophisticated structure characterized by layers of financial innovations.

2.3.2. Corporate bonds and shadow banking in China

The market for corporate bonds (including MCBs) in China has grown rapidly in recent years and become the third largest in the world behind only the U.S. and Japanese markets (Amstad and He, 2018); later we tie the fast development of the Chinese corporate bond market to the 2009 stimulus loans. In a developed economy like the U.S., corporate bonds, as a transparent financial market instrument invested by heavily regulated insurance and pension companies, are rarely considered as a form of "shadow banking." This is not the case in China.

In China, the corporate bond market is an integrated part of the bank-dominated shadow banking sector. First, about 90% of corporate bonds are issued and traded in the interbank market, a market dominated by commercial banks (China's other bond market is the exchange market; see Amstad and He, 2018 for institutional details on the two markets). Only bank-affiliated investment banking divisions are allowed to underwrite corporate bonds in the interbank market for client firms. Second, WMPs channel a significant proportion of funds into the bond market. Lei, Cai, Tsui, Huang, Zhu, Chen, and Lim (2018) estimate that, out of the RMB 18 trillion in outstanding corporate bonds, 38% is funded by WMPs by 2017; this number was 40% in 2016.

Third, policies targeted on off-balance-sheet WMPs have a profound impact on Chinese corporate bond markets. The CBRC "No. 8 Document" issued in March 2013 restricted WMPs' exposure to non-standard debt assets, pushing WMPs to invest in publicly-traded corporate bonds. Several years later, the growing complexity of the shadow banking sector and increased incidents of corporate defaults raised warnings of systemic risk, and starting in 2017 Beijing tightened regulations on WMPs. In turn, the corporate bond sector shrank dramatically in 2017: the net aggregate social financing from corporate bonds dropped to RMB 0.45 trillion in 2017 from RMB 3.04 trillion in 2016.

3. Bank Loan Wanes and Shadow Banking Waxes

We first describe the sources of data used in this paper, and then show that the liabilities of Chinese local governments have shifted from being composed of mostly bank loans in 2009 to having a significant proportion of non-bank debts after 2012.

3.1. Data Sources and Summary Statistics

Most data used in this paper come from Wind Information Co. (WIND), the leading data vendor of Chinese financial and economic data. Other data sources include the People's Bank of China (PBoC), National Bureau of Statistics, and province/city statistical yearbooks.

3.1.1. Municipal corporate bond data

Mainland China has 31 provincial-level administrative divisions whose LGFVs have MCBs outstanding. We drop Xizang as it only has one MCB ever issued in our sample, leading to 30 provinces in our final sample. We also conduct a city-level analysis on 325 unique prefecture-level cities (excluding the four direct-controlled municipalities Beijing, Shanghai, Tianjin, and Chongqing whose administrative status is equivalent to that of a province, following Huang, Pagano, and Panizza, 2016 and Gao, Ru, and Tang, 2018).

As explained in Amstad and He (2018), LGFVs issue MCBs in five different forms, all of which we call "corporate bonds." These forms are exchange-traded corporate bonds, enterprise bonds, medium-term notes, commercial papers, and private placement notes. For each MCB issuance, WIND provides the bond-specific information, including actual issuing amount, issuing date, maturity date, issuer's location, bond rating, issuer's rating, and the purpose of funds raised.

WIND classifies MCBs following the ChinaBond Pricing Center. As a subsidiary wholly-owned by China Central Depository & Clearing Co., Ltd., ChinaBond provides authoritative pricing benchmarks of Chinese bond markets. Whenever ChinaBond changes its MCB component list, WIND adjusts its classification retroactively, causing the number of MCBs in our study to potentially differ from other studies on MCBs (Liu, Lyu, and Yu, 2017a). And the classification by ChinaBond also differs from that of NAO. We follow ChinaBond (and hence WIND) for three reasons: 1) ChinaBond's classification is widely used among market participants; 2) NAO's bonds outstanding data are only available for June 2013; and 3) our main empirical analyses are based on WIND's data on individual MCBs.[3]

[3]Based on the single observation of NAO, the outstanding MCBs as of June, 2013 is RMB 1.1 trillion, which is 54% of WIND's MCB outstanding amount. The smaller NAO number of MCBs is consistent with the finding in Bai, Hsieh, and Song (2016) that NAO does not include those LGFV debts that are not official obligations of local

Except for the private placement notes, the prospectus of each individual MCB provides information on its issuance purpose. We manually read the prospectus and classified the issuance purpose into three categories: repayment of bank loans, investment, and other purposes.[4]

3.1.2. Bank loans and other data

Our bank loan data are from the PBoC, whereas data on trust and entrusted loans are from the *Aggregate Financing to the Real Economy* released by the PBoC since 2011. The National Bureau of Statistics provides data on provincial GDP, fiscal deficit, fixed-asset investment, GDP growth, and GDP per capita at quarterly frequency. All city-level data are from *City Statistical Yearbook* with missing values filled by *City Statistical Communique on Economic and Social Development*. Bank branch data are downloaded from CBRC.

Data on bank loan balances of local governments before 2012 are from various validated news sources that are collected by WIND. The annual outstanding munibonds, corporate bonds by ratings, and WMPs are from WIND. WMPs' holding information on corporate bonds by ratings is from *China Commercial Bank Wealth Management Products Annual Report* issued by the China Banking Wealth Management Registration System. The official annual municipality-trust cooperation data are from China Trustee Association.

3.1.3. Summary statistics

Table 2 gives summary statistics at the provincial level. Panel A reports the summary statistics of all variables for the sample period from 2004 to 2015, including five control variables (fiscal deficit over GDP, fixed asset investment over GDP, GDP growth, GDP per capita, and Big-Four banks' branch share) to be explained later. Panels B and C report the summary statistics of the four MCB issuance variables (total MCB issuance, repayment of bank loans, investment, and others) in two subperiods, 2004–2008 and 2009–2015; there is almost zero MCB issuance before 2009. We

governments. In fact, Bai, Hsieh, and Song (2016) likewise find that the NAO measure of LGFV debt is about 60% of their estimate based on WIND's data.

[4]We thank Yunjun Yu and Yilin Zhang for providing more recent MCB purpose data, which improves our original data by employing finer classifications (Yu and Zhang, 2019).

present the total MCB issuance by purpose for each province/region in the Online Appendix Table A2, and summary statistics at the city level in the Online Appendix Table A3.

3.2. Evolution of Local Governments' Debt Obligations

3.2.1. Credit policy tightening and rollover pressure

After the surge of bank loans in 2009, Beijing quickly realized that the policy-driven credit boom could have grown out of control with potentially severe adverse effects on the economy. Panel A of Fig. 1 shows that new bank loans to GDP, following the unprecedentedly high level of 27.2% in 2009, dropped to 19.2% in 2010; the credit policy reverted to its normal level afterwards.

This unexpected credit tightening in 2010 forced local governments to explore other sources of financing. Kroeber (2016) explains this classic "maturity mis-match" of Chinese local governments by writing "*localities often used three- to five-year bank loans to finance infrastructure projects whose economic benefits (and revenue streams, if any) would only materialize over two or three decades*;" and Gao, Ru, and Tang (2018) document an average maturity of 4.1 years for all bank loans borrowed by large LGFVs. Taking all the evidence together, LGFVs experienced heavy pressure to roll over stimulus loans that came due about three to five years after 2009, in addition to the financing needs of the continuation phase of their long-term stimulus projects.

3.2.2. Bank loans down, non-bank debt up

Facing a tightening credit policy, maturity-mismatched local governments resorted to non-bank debt sources, either to refinance portions of maturing bank loans or to finance their continuation investments.

Fig. 2 plots the evolution of outstanding local government debts by category (Panel A), together with percentage for each category (Panel B). While the two official NAO reports (December 2010 and June 2013, indicated by "NAO" on Fig. 2) provide two snapshots of the four major categories of debt, such a decomposition is not available for other years. We fill in the time series of total local government debts and each debt category from 2008 to 2016 as follows, with details of data

construction in the Online Appendix B.

Our data on total local government debts are from two main sources: 1) the two NAO reports covering 2008–2010 and 2012; and 2) public news releases from regulators covering 2014–2016. We have to interpolate the total local government debts in 2011 and 2013, which will not be used in the formal empirical analysis in Section 4.

For outstanding debt balances of each category, first WIND provides detailed bond-level data on MCBs and munibonds, from which we aggregate to have the amount outstanding for these two categories. Second, Trust loans outstanding for local governments are calculated using their June 2013 value and the publicly available municipality-trust cooperation balances, imposing the assumption that the ratio of municipality-trust cooperation balance to Trust loans outstanding remains constant over time. Finally, for bank loans, the official LGFV loans data from the CBRC is available only before June 2013; after June 2013, our estimate is based on the annual reports of China Construction Bank, the only Big Four bank that keeps reporting its LGFV loan exposure regularly. We acknowledge that our estimates of LGFV bank loans outstanding are less accurate after 2013, and thus indicate them by the shaded area/dashed line in Fig. 2.

Fig. 2 serves two purposes. First, to the best of our knowledge, we provide the first breakdown of Chinese local government debts over time. Second, consistent with the two NAO snapshots in Table 1 as mentioned in Section 2.2, there is a steady and noticeable composition shift from bank loans to non-bank debts starting 2012. The fraction of MCBs, munibonds, and Trust loans rose from 14% in 2010 to 24% by mid-2013, and grew dramatically to more than 50% after 2015.

3.3. Direct Evidence from MCB Prospectuses

We now present the first piece of evidence about MCBs that supports the stimulus-loan-hangover effect. Fig. 3 Panel A plots the evolution of MCB-issuance activities over the period from 2004 to 2016, with new bank loans over GDP in the background. The solid line plots the total gross MCB issuance, which picked up only after 2009 with two noticeable jumps in 2012 and 2014. The dashed line plots the net MCB issuance defined as gross issuance minus matured amount. A negligible difference between the solid and the dashed lines before 2015 reflects the relatively long maturity of MCBs, which is about 7-year on average for MCBs issued during 2009–2011.

We have mentioned in Section 3.1.1 that LGFVs reveal the purposes of MCB proceeds in their prospectuses, except for private placement notes. Excluding these private placement notes, the MCB sample with prospectus information is representative (81.6% in RMB value and 79.7% in number of bonds). We classify them into three categories by the purpose of the funds raised: repayment of existing bank loans; investment in projects such as rebuilding shanty areas or constructing infrastructure; and others (including replenishing working capital, financing for other entities through entrusted loans, repayment of other obligations, etc). However, there is reason to be cautious about the disclosure quality of these self-reported issuance purposes, an issue we come back to later in Section 4.3.2.

Fig. 3 Panel B shows that in the two years right after the stimulus, almost all MCB issuance was for investment (likely, continuing the long-term infrastructure projects started in 2009). On the other hand, the repayment-driven MCB issuance reached a quarter of total MCB issuance in 2013 and experienced even faster growth afterwards. In 2015, more than half of MCB proceeds were for repaying maturing bank loans.

Although there exists a noticeable magnitude difference between bank loans (left scale) and MCB issuance (right scale), Fig. 3 quantitatively supports the proposed stimulus-loan-hangover effect. Section 2.1.2 mentions that, out of the total RMB 4.7 trillion stimulus loans extended in 2009, RMB 2.3 trillion went to LGFVs. Since the 2009 stimulus loans occurred one time only, our mechanism implies that the cumulative issuance of non-bank debt instruments (i.e., MCBs and Trust loans) for debt repayment after 2009 should roughly match this 2.3 trillion number. In the data, the cumulative issuance was about RMB 2.27 trillion by the end of 2015, with 1.57 trillion from the repayment part of MCBs and 0.7 trillion from Trust financing.[5]

4. Cross-Sectional Evidences

We now exploit the LGFV-level MCB data to study the stimulus-loan-hangover mechanism in the cross section. We emphasize the importance in distinguishing *the source of funds* from *the use of funds* when studying shadow banking in the cross section. Consider using prospectuses of

[5]The cumulative increase in LGFV trust loans is RMB 1.9 trillion from 2012 to 2015. Based on quarterly trust balances with three specific loan types (investment, refinancing, and custody wealth management) available from the China Trust Association, we estimate the cumulative trust issuance for bank loan repayment to be RMB 0.7 trillion by assuming that the "refinancing" portion is for repaying bank loans.

trust products, which are also available in the WIND database. The prospectuses of trust products usually reveal the location of funds raised but not where the funds are to be used, which poses a serious challenge as Chinese wealthy individuals in developed coastal cities (e.g., Shanghai) often buy trust products to fund some projects from underdeveloped inland cities (e.g., Qinghai). In contrast, MCBs are issued for the financing need of local governments in some particular region, which is exactly the use of funds. This feature provides researchers an ideal empirical setting to test our cross-sectional prediction.

4.1. Hypothesis and Preliminary Evidences

The proposed stimulus-loan hangover mechanism has the following testable hypothesis: *If a province was more aggressive in taking on bank loans in 2009, this province would issue more MCBs three to five years later.* We now present some preliminary evidence that supports this hypothesis.

For each province, we first construct the stimulus bank loan (BL) over GDP at 2009, defined as the 2009 BL/GDP ratio minus its average in the past five years:

$$\frac{BL_{i,2009}^{stimulus}}{GDP_{i,2009}} \equiv \frac{BL_{i,2009}}{GDP_{i,2009}} - \frac{1}{5}\sum_{\tau=2004}^{2008}\frac{BL_{i,\tau}}{GDP_{i,\tau}}. \tag{1}$$

Next, we construct the provincial abnormal MCB over GDP in each subsequent year from 2012 to 2015:

$$\frac{MCB_{i,t}^{abnormal}}{GDP_{i,t}} \equiv \frac{MCB_{i,t}}{GDP_{i,t}} - \frac{1}{5}\sum_{\tau=2004}^{2008}\frac{MCB_{i,\tau}}{GDP_{i,\tau}}, \text{ with } t = 2012, 2013, 2014, 2015. \tag{2}$$

Besides, we also consider seven geographic regions commonly used in China (North China, East China, South China, Center China, Northeast, Northwest, and Southwest) and repeat the same exercise.

The 2009 stimulus BL/GDP in various provinces/regions captures the heterogeneous deviations—i.e., the aggressiveness in credit expansion in response to the stimulus plan—away from the province/region-dependent steady state. This treatment is particularly attractive in light of Fig. 1 Panel B, which shows a steady pattern between new bank loans and GDP in China (except in 2009).

Fig. 4 Panel A presents the regional scatter plot of $\frac{BL^{stimulus}_{i,2009}}{GDP_{i,2009}}$ and $\frac{MCB^{abnormal}_{i,t}}{GDP_{i,t}}$ for each future year during 2012–2015. The "Southwest" region—which suffered from the exogenous Wenchuan earthquake in May 2008 and hence was qualified for post-disaster reconstruction shortly after—had the largest stimulus loan growth in 2009, and this region did rank first in abnormal MCB issuance in three out of four future years. The scatter plot at the province level in Panel B shows a similar pattern: provinces with more stimulus loans experienced larger MCB issuance later.

We also run the following simple OLS regression each year and report the results in Table 3:

$$\frac{MCB^{abnormal}_{i,t}}{GDP_{i,t}} = a_t + b_t \cdot \frac{BL^{stimulus}_{i,2009}}{GDP_{i,2009}} + u_{i,t}. \tag{3}$$

Cross-sectionally, 2009 stimulus bank loan growth positively predicts the abnormal MCB issuance in that region/province/city, with satisfactory statistical significance.

4.2. Empirical Design and Instrument Variable

4.2.1. Empirical specification and predictions

We perform our main empirical analysis in this section based on our panel data. Let $\mathcal{T} = \{2004, \cdots, 2015\}$, our main empirical specification is as follows

$$\frac{MCB_{i,t}}{GDP_{i,2009}} = \sum_{\tau \in \mathcal{T} \setminus 2008} \beta_\tau \cdot \mathbf{1}_\tau \frac{BL^{stimulus}_{i,2009}}{GDP_{i,2009}} + \alpha_i + \alpha_t + \sum_{\tau \in \mathcal{T} \setminus 2008} \gamma'_\tau \cdot \mathbf{1}_\tau \mathbf{X}_{i,07Q4-08Q3} + u_{i,t}. \tag{4}$$

Here, as before i indicates province and t indicates year; α_i and α_t are province and year fixed effects, respectively. The year 2008 is used as the benchmark year and excluded from our regression specification. The vector $\mathbf{X}_{i,07Q4-08Q3}$, which includes five economic variables, represents province-level controls right before the launch of 2009 stimulus plan. The first four variables are during the yearlong period of 2007Q4 to 2008Q3: *fiscal deficit over GDP*, *fixed-asset investment over GDP*, *GDP per capita*, and *GDP annual growth*; they capture the cross-sectional divergences among Chinese local governments in their economic development, fiscal conditions, and reliance on infrastructure investments. We add the fifth one—*Big-Four banks' branch share* measured as of 2008Q3—to capture the local banking sector sophistication as China's commercial banking market is dominated by the Big Four before the 2009 bank entry deregulation (Gao et al. 2019). Note

that by having flexible time-varying coefficients γ_τ for each control variable in Equation (4), our specification allows for a fairly rich set of cross-province heterogeneity in the trends of MCB issuance during our sample years. To save space, we do not report the estimation coefficients for our controls in our tabulations (but these are available upon request).

We are mainly interested in the coefficients β_τ, which capture the future MCB issuance in response to heterogeneous cross-province stimulus loan shocks, all relative to its 2009 GDP level. We fix the denominator to be the 2009 GDP to rule out the possibility that stimulus loans affect our dependent variable through future GDPs. We also repeat the same regression by replacing the dependent variable in Equation (4) with three different issuance purposes—namely, bank loan repayment ($MCB_{i,t}^{repay}$), investment ($MCB_{i,t}^{inv}$), and others ($MCB_{i,t}^{other}$).

Our hypothesis predicts that β_τ should start at zero before 2009. From 2009–2011, when bank loans were the major financing source, these coefficients turn positive—but perhaps small—because MCBs and other shadow banking vehicles played a secondary role in financing the stimulus package. We expect to observe a significant surge in β_τ only after 2012 when LGFVs started facing rollover pressures from maturing stimulus loans.

4.2.2. An endogeneity concern: the omitted-variable problem

What drives the cross-sectional differences in $BL_{i,2009}^{stimulus}$? The answer to this question helps us clarify the identification concerns regarding the OLS regression in Equation (4). First of all, although most of the empirical literature focuses on identifying demand and supply forces, in our context it matters little whether the cross-sectional variation in $BL_{i,2009}^{stimulus}$ was driven by demand-side shocks (e.g., LGFVs in some provinces being more aggressive in launching infrastructure projects in 2009) or supply-side shocks (e.g., banks in some provinces lowering their lending standards). Either way, bank loans taken out in 2009 needed to be repaid when these loans became due, giving rise to heterogeneous rollover pressures in later years across provinces.

The omitted-variable problem is a major concern for our identification. In other words, in Eq. (4), it is possible that $MCB_{i,t}$ in later years include some bonds that are issued neither for loan repayment, nor for continuing phases of 2009 infrastructure projects. These bond issuances during 2012–2015 could be correlated with $BL_{i,2009}^{stimulus}$, given the significant regional disparity in China. For instance, regions where banks are more effective in extending stimulus loans in 2009 are likely

to have a better-functioning banking system, above and beyond the effect that is captured by our controls (say, *Big-Four banks' branch share*). Then, the better-functioning banking system may restrain the growth of shadow banking in that area in later years (if traditional banks and shadow banks are substitutes).

The ideal experiment is a random allocation of 2009 stimulus loans across provinces. Along this line, we exploit the unique environment of the political economy in China by taking advantage of the heterogeneous timing of the terms of local governors in different provinces, an arguably exogenous cross-province variation in 2009. We will explain why this variable captures heterogeneous province-level shocks to 2009 stimulus loans, and why it is orthogonal to future MCB/GDP growth across provinces. A well-designed IV estimation also helps us gauge the economic mechanism behind the potential bias of OLS estimators, which is discussed in Section 4.3.

4.2.3. The instrument variable: Late-Term

In China, the typical official term of a provincial governor is five years. After this term, he or she either gets promoted, stays in the same official rank, or retires. The incentive to comply with Beijing becomes stronger in the later years of a governor's term. In the wake of the 2009 stimulus policy shock, we would expect more aggressive stimulus loans in provinces with governors in their late term because those governors were more motivated to follow Beijing's policy guidance. LGFVs at various levels have a strong incentive to comply with the governor's policy agenda thanks to China's "one-level-up" policy which says that the promotion of an government official is largely determined by his/her superior official at the level immediately above (Chen and Kung, 2019). Another equally plausible mechanism for provinces with late-term governors being more responsive is that newly appointed governors may need time to become familiar with their provinces before they launch new infrastructure projects.

We construct the provincial-level dummy $LateTerm_{i,2009}$, which takes a value of 1 if the governor of a province i has served more than two years in his/her official term as of 2009, and 0 otherwise. As expected, $LateTerm_{i,2009}$ is positively correlated with the stimulus bank loans in 2009 (a correlation coefficient of 0.349 with a p-value of 0.059), and hence we use it as an instrument variable (IV) for the key independent variable $\frac{BL_{i,2009}^{stimulus}}{GDP_{i,2009}}$ in Equation (4). Our instrument is motivated by the existing literature that links local government officials' promotion to their incentives of pursuing

local economic growth during different years of official terms (Tan and Zhou, 2015, Liu, Shu, Wang, and Wei, 2018, and Ru, 2018), and shares a similar flavor with studies that exploit exogenous variation in political power and how it could affect federal grant apportion on local governments' highway construction in U.S. (Knight, 2002; Leigh and Neill, 2011).

The exclusion restriction requires that other than the stimulus-loan-hangover channel (which includes both rollover and continuing long-term investment), $LateTerm_{i,2009}$ is uncorrelated with other disturbances to MCBs in later years. One obvious concern, given the nature of our instrument, is that provinces with late-term governors in 2009 are likely to have some early-term governors in office about two to three years later. If this is the case and if early-term governors are less aggressive in pursuing economic growth in general (Li and Zhou, 2005), then our coefficients β_τs tend to be downward biased.

The dramatic shift of political regime in 2012 eliminates this concern to a large extent. After Xi Jinping took power in 2012, Beijing unexpectedly launched an anti-corruption campaign in the second-half of 2012, which disrupted the normal appointment cycle at almost all administrative levels (e.g., Lin, Morck, Yeung, and Zhao, 2016, Liu, Shu, and Wei, 2017b, Li, Wang, and Zhou, 2018, and Chen and Kung, 2019). We construct the same dummy $LateTerm_{i,200t}$ for all provinces in future years 2012–2015, and find negligible correlations between them and $LateTerm_{i,2009}$. Specifically, the correlations are -0.15, -0.11, 0.01, and -0.08 for years 2012–2015, respectively, with p-values of 0.42, 0.56, 0.98, and 0.68 for testing the hypothesis of no correlation (against the alternative of a nonzero correlation). Second, recall that Beijing reverted back to the normal monetary policy after 2010 and imposed strict restrictions on new LGFV bank loans in the years that followed, with the strongest push in late 2014 due to the No. 43 Document. Given that Beijing had consolidated its power significantly thanks to the anti-corruption campaign after 2012, provincial governors who are among the highest rank in China's political hierarchy would have a strong incentive to comply with the regulatory change initiated by Beijing.

Another relevant concern is the possibility of other contaminating policies pushed by Beijing in 2009, so that i) late-term governors responded to these policies more aggressively, and ii) these policies could also affect shadow banking activities in 2012–2015. However, after reading all 103 documents issued by the State Council in 2009, we find none of them were directly on the shadow banking sector (for more details, see the Online Appendix C). Even if there were few policies (e.g.,

on fixed asset investment policies) could have had heterogeneous effectiveness depending on the tenure term of local governors in 2009, they all aimed to have an instant effect on China's economy at that time. As a result, the concern of contaminating concurrent policies is largely mitigated in generating our main empirical regularity that shadow banking started growing faster three-to-five years later.

Unfortunately, our instrument variable is "weak" with a relatively low F-statistic in the first-stage regression (the Online Appendix Table A4). We will come back to this issue and provide a thorough discussion later in Section 4.4.2.

4.3. Main Empirical Results

4.3.1. Regressions based on total MCB issuance

Our main empirical results are best summarized in Fig. 5. Panel A and Panel B plot the estimated $\hat{\beta}_\tau$, i.e., the impact of 2009 stimulus loans on MCB issuance from 2004 to 2015 based on OLS and IV methods, respectively. A couple of observations are worth highlighting. First, no pre-treatment trends exist before 2009, i.e., provinces with larger exposure to stimulus loans did not experience faster growth in MCB issuance in pre-stimulus years. Second, the positive cross-province correlation between 2009 stimulus loans and MCB issuance turns statistically significant right after the stimulus, but becomes economically large only after 2012. Overall, estimation results from both OLS and IV regressions are consistent with the stimulus-loan-hangover effect proposed by our paper.

The magnitude of IV coefficients are larger than those of OLS, which we report in Columns (1) and (2) in Table 4. As mentioned in Section 4.2.2, the leading endogeneity concern of our OLS regression is the omitted-variable problem. One such example is related to the "corrective endogeneity" discussed in Jiang (2017). To see it, suppose that heterogeneity in economic or financial development (say, ready-to-function LGFVs) existed across provinces in 2009, and hence provinces with fewer ready-to-function LGFVs received fewer stimulus loans. But if shadow banking activities—as a substitute to the traditional banking sector—were negatively correlated with financial development, then these provinces should have greater MCBs issuance after 2012. Besides, it is also likely that these relatively underdeveloped provinces experience faster GDP growth and hence greater non-stimulus infrastructure investment later. Both stories imply a negative correlation be-

tween the 2009 stimulus loans and the error term in Equation (4), hence a downward bias of OLS estimates.

4.3.2. Regressions based on MCB issuance purposes

We now repeat the same analysis for three different categories of issuance purposes, i.e., bank loan repayment ($MCB^{repay}_{i,t}$), investment ($MCB^{inv}_{i,t}$), and others ($MCB^{other}_{i,t}$), and report the results in Columns (3) to (8). Across all eight regressions in Table 4, there is no pre-treatment trend, as none of the pre-stimulus coefficients $\hat{\beta}_\tau$ from 2004 to 2008 are statistically significant.

Consistent with the rollover mechanism, the impact of stimulus loans on MCB^{repay} is positive and statistically significant after 2012 for both OLS and IV estimates, though the pattern of larger IV coefficients persists. When comparing the investment and repayment regressions, we observe much larger β_τ coefficients for investment in years right after 2009, but these coefficients for repayment become larger in 2014 and 2015.

To be clear, if MCB^{repay} accurately measure the repayment of 2009 stimulus bank loans, the above "corrective endogeneity" argument—which relies on future MCBs to be issued to finance other LGFV activities—does not apply. There could be two channels for the repayment regression to have larger IV estimates. First, it is possible that MCB^{repay} after 2012 were issued to repay some pre-stimulus bank loans. The magnitude of this effect is likely to be small, given that typical LGFV bank loans have on average four-year maturity (Gao, Ru, and Tang, 2018).

There is a second channel which seems more plausible. We have mentioned in Section 3.3 that MCB issuance purposes are self-reported. Given regulatory tightening, there is always a tendency for LGFVs to manipulate the MCB purpose classification towards "repayment." One good example is that the "No. 43 Document" released in October 2014 still allowed LGFVs to refinance maturing bank loans but prohibited them from raising funds for new investment. This greatly distorted LGFVs' misreporting incentives at that time, and hence explains why the estimated IV coefficient for MCB^{repay} (MCB^{inv}) becomes larger (smaller) after 2014.

4.3.3. Economic magnitude

The estimated coefficients $\hat{\beta}_\tau$ after 2009 in the regression of MCB^{repay} reported in Table 4 represent the annual repayment of stimulus LGFV loans using MCBs (n.b., MCB issuance in each year and the 2009 stimulus bank loans are all scaled by 2009 GDP). As a test of the economic

magnitude of these coefficients, we can gauge the maturity of stimulus bank loans based on these estimates.

Section 3.3 mentions that LGFVs issued 1.57 trillion of MCB^{repay} in total to repay the RMB 4.7 trillion stimulus bank loans, implying 33.4 (=1.57/4.7) cents of total MCB repayment per RMB of stimulus loans. Taking the annual repayment estimates $\hat{\beta}_\tau$s in Column (4) of Table 4, we estimate the average maturity of the 2009 stimulus LGFV loans to be 3.8 years. Alternatively, if we count MCB repayment starting in 2012 instead of 2010, the estimated loan maturity is 4.3 years.[6] Both estimates square well with the average maturity of 4.1 years for LGFV bank loans (Gao, Ru, and Tang, 2018), as well as the reported three- to five-year bank loan maturity by Kroeber (2016).

4.4. Robustness and Further Evidence

We provide further corroborating evidence for our stimulus-loan-hangover mechanism, and discuss briefly how stimulus loans affect future real economic activities.

4.4.1. City-level results

While our main empirical analyses are conducted at the province level, similar results hold at the city level. For IV estimates, we now use both $LateTerm_{2009}$ and $LateTerm_{2009}^{mayor}$ as two instruments, leaving us 304 cities with information on their mayors' terms. In China, the promotion of mayors is largely determined by their provincial governors, who hence exert strong influence on mayors. Consistent with our stimulus-loan-hangover effect, both OLS and IV results in Table 5 depict the same pattern: the stimulus plan pushed up MCBs slightly after 2008, but it was after 2012 that MCBs started to grow at a significant speed.

Comparing the city-level results to those at the province level, we find that all coefficients—including both OLS and IV—are smaller at the city level. One potential explanation for the smaller magnitude at the city level is the spill-over effect which leads to downward biases when the identification comes from cross-sectional heterogeneity. Many projects launched by local governments in 2009 were infrastructure projects that might span multiple cities (e.g., an inter-city highway). For instance, city A started the first stages of construction financed by 2009 stimulus bank loans, and

[6]The IV estimate for repayment MCBs in 2015, which is $\hat{\beta}_{2015} = 0.517$ or 51.7 cents, stands out to be economically large. One possible explanation is as follows. In Section 4.3.2 we mention that the "No. 43 Document" released in October 2014 pushed LGFVs to misreport more repayment-type MCBs in 2015. Any potential bias tends to be amplified by the weak IV problem in our paper (see Section 4.4.2 and Jiang 2017).

a few years later, the neighboring city B continued the highway construction but had to rely on MCB financing. Since our β_τ coefficients are identified via comparing city A's future MCB issuance with that of city B's, this spillover effect introduces a downward bias. The spillover effect at the provincial level should be smaller—it will cause downward biases only if these two cities are in different provinces in this example.

4.4.2. Weak instrument problem

We follow Andrews, Stock, and Sun (2018) to report the effective first-stage F-statistics proposed by Olea and Pflueger (2013), for both province- and city-level regressions.

For the province-level regression, the effective first-stage F-statistic value of 3.1 reported in Table 4 indicates that we have a weak instrument. Because our province-level regression has a just-identified IV, according to Angrist and Pischke (2009), our 2SLS estimate is median-unbiased. Of course, one should keep in mind that being "median-unbiased" does not necessarily guarantee a small bias, as the distribution of 2SLS estimator is Cauchy-shaped with a fat tail if instruments are weak (Andrews and Stock, 2018). We follow Finlay and Magnusson (2009) to conduct the Anderson-Rubin test which provides weak-instrument robust inference. As shown in the Online Appendix Fig. A1, the Anderson-Rubin confidence intervals (which are asymmetric around the point estimators) get a bit wider, but still show significant stimulus-loan-hangover effects after 2013.

For the city-level IV regression, we still face a weak IV problem as the effective first-stage F-statistic is only 3.6. The city-level regression features over-identified IVs, and we follow the suggestion of Angrist and Pischke (2008) (p. 213) to compare the 2SLS estimator and the Limited Information Maximum Likelihood (LIML) estimator, with the latter being robust to weak instrument (Staiger and Stock, 1997). The two estimators are quite similar (the Online Appendix Fig. A2), suggesting the weak IV is less likely a concern.

4.4.3. China Development Bank loans

Provinces with longer-maturity 2009 stimulus bank loans are likely to face less rollover pressure in later years. Although we do not have provincial-level loan-maturity data, we exploit one unique institutional setting in China's banking system. The 2009 stimulus loans came from both commercial banks and policy banks (Section 2.1.2). As the largest of the three policy banks in

China, China Development Bank (CDB) is established to promote China's economic development and improve social welfare, and hence typically extends longer maturity loans to support LGFVs' long-term infrastructure projects than other commercial banks with profit-maximizing objectives. According to Gao, Ru, and Tang (2018), the average maturity of 2009 newly issued LGFV loans is 7.2 years for CDB, versus 4.1 years for commercial banks. Therefore, provinces that received more longer-term CDB loans in 2009 should issue fewer MCBs a few years later, all else equal.

To test this hypothesis, we consider the following regression by constructing the provincial-level data on CDB-loan fractions:[7]

$$\frac{MCB_{i,t}}{GDP_{i,2009}} = \sum_{\tau \in \mathcal{T} \setminus 2008} \beta_{\tau}^{inter} \cdot \mathbf{1}_{\tau} \frac{BL_{i,2009}^{stimulus}}{GDP_{i,2009}} CDB_{i,2009}^{low} + \sum_{s \in \{1,2,3\}} \beta_{s}^{BL} \cdot \mathbf{1}_{s} \frac{BL_{i,2009}^{stimulus}}{GDP_{i,2009}} + \sum_{\tau \in \mathcal{T} \setminus 2008} \beta_{\tau}^{CDB} \cdot \mathbf{1}_{\tau} CDB_{i,2009}^{low} + \alpha_i + \alpha_t + \sum_{\tau \in \mathcal{T} \setminus 2008} \gamma_{\tau}' \cdot \mathbf{1}_{\tau} \mathbf{X}_{i,07Q4-08Q3} + u_{i,t}. \quad (5)$$

Because the distribution of CDB-loan fractions is highly skewed (the median is 15.6% for Neimenggu while the maximum is 74.9% for Hainan), we construct the dummy variable $CDB_{i,2009}^{low}$ that equals 1 if the 2009 CDB-loan fraction in province i is below the median, and 0 otherwise. For the stimulus-loan effect, we allow it to vary across three subperiods (2004–2007, 2009–2011, and 2012–2015), in light of our baseline results in Table 4, to reduce degrees of freedom.

In Equation (5), the coefficients β_{τ}^{inter} in front of the first interaction terms capture the stimulus-loan-hangover effect on those provinces with few long-maturity CDB loans, and we expect them to have a similar pattern as before. Both OLS and IV results in Columns (1) and (2) of Table 6 confirm this prediction.

We also report results for three MCB issuance purposes in Columns (3) to (8), and Table 6 shows similar results as before for MCB^{repay} in Columns (3) and (4). Interestingly, a similar pattern holds for MCB^{inv} as well; for provinces with low CDB-loan fractions, there is a much larger and increasing stimulus-hangover-effect on MCBs issued for investment after 2012. One possible explanation is that CDB, with the objective of supporting long-term policy-related infrastructure

[7] We thank Hong Ru and Haoyu Gao for sharing the data on LGFV loans extended by CDB in 2009. The loan-level data used in Gao, Ru, and Tang (2018) are from the largest 19 banks (including 18 commercial banks and CDB) during 2007–2013H1 for LGFVs with an annual credit line over RMB 50 million.

investments, is directly governed by the State Council and less likely to be subject to the tightening policy set by the CBRC (Ru, 2018). As a result, projects supported by stimulus loans extended by the CDB in 2009 were likely to keep receiving loans from CDB for continued investment after 2012, reducing their reliance on MCB markets.

4.4.4. Results with simultaneous controls

In the baseline regressions presented in Section 4.3, we include the interactions of five initial characteristics measured before the 2009 stimulus and year dummies to control for heterogeneous trends across provinces. However, if MCB issuance in later years was driven by channels other than the stimulus-loan-hangover mechanism, we can alleviate this endogeneity issue by controlling for the simultaneous economic conditions, following Knight (2002), Huang, Li, Ma, and Xu (2017), and Leduc and Wilson (2017). Table 7 reports the results with the same set of five controls, but now measured in the year t of MCB issuance. Both OLS and IV estimates have smaller magnitudes after 2012, consistent with the conjecture that other simultaneous forces could partially explain future MCB issuance.

Nevertheless, controlling for simultaneous cross-province conditions may lead to underestimation due to over-controlling. For instance, 2009 stimulus loans in one region might have affected its future economic growth (via stimulus investment) and Big-Four branch share (via WMPs as explained shortly), which in turn affected MCB issuance during 2012–2015 in that region. These indirect stimulus-loan-hangover effects, if they exist, will be absorbed by the simultaneous controls, and hence lead to underestimates.

4.4.5. Stimulus loans and real economic activities

Our paper focuses on how China's 2009 stimulus plan affects future financing structures of LGFVs. But do 2009 stimulus loans affect future real economic activities in China? In the context of ARRA, which is the U.S. stimulus package, the existing literature finds somewhat positive results (e.g., Leduc and Wilson, 2013). We now investigate this question in our framework, with a similar empirical methodology as in Leduc and Wilson (2013).

We consider two measures: GDP^{capita} which is GDP per capita scaled by its 2009 value, and FAI which is fixed asset investment scaled by 2009 GDP. We then repeat the same panel regression in Equation (4), replacing the dependent variable on MCB with these two real economic variables.

The OLS coefficients in Table 8 indicate that stimulus loans seem to have a short-term effect on both measures, i.e., provinces with more stimulus loans experienced faster economic/investment growth during the period of 2010–2012. In contrast, based on IV estimates, 2009 stimulus loans have a large and statistically significant impact on GDP^{capita} in all future years, but an insignificant effect on FAI.

Recall that in the main MCB regressions our OLS estimators are downward biased relative to IV estimators. The same pattern holds here for GDP^{capita} in Table 8, likely for a similar mechanism explained in Section 4.2.2. Provinces that are less effective in extending stimulus loans in 2009 tend to be those underdeveloped provinces with a worse-functioning banking system, and these provinces underwent relatively faster economic growth by catching up the trend in later years.

A closer look at Table 8 reveals that the IV estimates for GDP^{capita} are 3 to 15 times larger than the OLS estimates. Note that the seemingly large difference in IV relative to OLS estimators in GDP^{capita} is consistent with the average in the literature (about 9 times) reviewed by Jiang (2017) who discusses the role of weak instruments, a problem shared by our paper as explained in Section 4.4.2.

Overall, our findings suggest that China's stimulus loans in 2009 positively affect the real economic growth in the future. This is consistent with the time-series evidence that right after the stimulus plan China's GDP growth recovered to 11.9% in 2009Q4 (Fig. 1 Panel A). However, the cross-sectional evidence is not that robust and far from convincing, and we leave this important question for future research.

4.5. Link to Shadow Banking in China

We connect the non-bank debts on the liability side of local governments to the recent surging shadow banking activities in China from two angles: Trust loans (including entrusted and trust loans) and WMPs. These empirical facts will be useful when we discuss the historical development of the U.S. financial markets later in Section 5.1.

4.5.1. Shadow banking activities and local government non-bank debt

Fig. 6 Panel A plots the new Trust loans and increase of WMPs over 2004–2016, together with new bank loans, all scaled by GDP. Both Trust loans and WMPs have grown much faster than GDP growth since 2012, a pattern consistent with our stimulus-loan-hangover mechanism.

At the end of 2015, the magnitudes of these two shadow banking activities become comparable to the traditional on-balance-sheet bank credits. The two forms of shadow banking activities seem to move in opposite directions after 2014; this is because when one form of shadow banking (Trust) is under tighter regulation, the other form (WMP) increases due to market forces (Allen, Qian, Tu, and Yu, 2019, p. 20).

Connecting China's shadow banking back to local governments, Fig. 6 Panel B plots the ratio of local government non-bank debts (the sum of MCBs, munibonds, and Trust loans in Fig. 2) to the sum of trust and entrusted loans, undiscounted bankers' acceptances, and corporate bonds in the *Aggregate Financing to the Real Economy*. We observe a steady growth of this ratio, starting from a negligible 1.5% in 2008, to 22% in 2014 and 48% in 2016.

4.5.2. Bank loans wane and Trust loans wax

We further perform a cross-sectional test by replacing MCB issuance with new entrusted loans, some of which go to LGFVs. Unfortunately, province-level entrusted loan data are unavailable before 2013, which prevents us from performing the formal panel regression as in Equation (4). Instead, we conduct year-by-year regressions similar to that in Equation (3), with entrusted loans scaled by GDP as the dependent variable.

We include the same set of five control variables as before, and Columns (1) and (2) and Columns (3) and (4) of Table 9 report the results of OLS and IV regressions with pre-stimulus and simultaneous controls, respectively. The underlying mechanism driving the positive and significant OLS coefficients in 2013–2014 is similar: entrusted loans were used to channel funds to LGFVs and this effect was stronger for provinces with greater stimulus loans. On the other hand, it is possible that some entrusted loans were used to feed (including but not limited to refinance) industrial firms in real estate and overcapacity industries, the origin of which could also be traced back to the stimulus loans (received by other non-LGFV sectors, see, for instance, Cong, Gao, Ponticelli, and Yang, 2018).

The cross-province relationship disappears in 2015, which is consistent with the time series pattern of decreasing new Trust loans in 2015 shown in Fig. 6 Panel A. Such a decrease is probably due to tightening regulation on trust/entrusted loans (Allen, Qian, Tu, and Yu, 2019, p. 20). For example, in January 2015 the CBRC solicited public opinions regarding "Management Measures

on Entrusted Loans for Commercial Banks," which set tighter restrictions on banks' involvement in entrusted loans.

We perform a cross-sectional test on entrusted loans only, but not trust loans. First, entrusted loans outweigh trust loans in quantity; in 2016, the new entrusted loans were about RMB 2.2 trillion or 3% of GDP with 13.2 trillion outstanding, while new trust loans were RMB 0.9 trillion or 1.2% of GDP with 6.3 trillion outstanding. Second, as discussed in the beginning of Section 4, the way these statistics are reported is such that the region of a trust loan refers to the location of its source (i.e., where the trust gets financed), not the location of its use (i.e., where the trust funds go). Our empirical test relies on identifying the location of fund use, and the problem of source-use mismatch is much less severe for entrusted loans intermediated by a bank, which typically finances local firms for easier monitoring and less information asymmetry (see, e.g., Allen, Qian, Tu, and Yu, 2019).

Columns (5) to (8) of Table 9 further present placebo tests by using the abnormal bank loans over GDP in 2013 to 2015 minus the 2004–2008 average as the dependent variables. Since China's credit policy reverted back to normal starting in 2010, stimulus BL/GDP cannot explain the cross-sectional pattern of new bank loans in later years.

4.5.3. WMPs as investors of MCBs

Qualified financial institutions including bank-issued WMPs invest in MCBs in China's corporate bond markets. Over the past decade, commercial banks have been using complicated financing structures to circumvent regulations and channel WMP funds into the interbank corporate bond market. Such investment behavior is essentially a form of regulatory arbitrage that has propelled both the off-balance-sheet shadow banking sector and the corporate bond market, a topic to be discussed in Section 5.1.4.

Gauging the risk exposure of shadow banking is always a challenge. Since 2014, the China Banking Wealth Management Registration System has started publishing annual official statistics on WMPs, which allows us to estimate the MCB holdings by WMPs. Fig. 7 shows that WMPs mainly invest in MCBs with ratings above AA-. About 40% of MCBs were held by WMPs by the end of 2014, and this number rose to more than 60% in 2016. These numbers likely represent an underestimation of the extent to which WMPs invest in MCBs because before the regulatory

tightening in 2017, it was common to use WMPs to finance so-called asset management plans (AMPs). These AMPs, which are essentially a type of conduit similar to the special purpose vehicles (SPVs) that were popular in the U.S. before the 2007/08 financial crisis, were likely to invest in MCBs heavily. The annual report ignores this indirect exposure of WMPs in MCB via AMPs or trust, and thus introduces a downward bias for our estimate.

5. U.S. versus China: History and Today

We review shadow banking activities during the National Banking Era in U.S. and draw a comparison to those in China today from the perspective of our paper. We then compare the 2009 ARRA program in the U.S. and China's 2009 four-trillion-yuan stimulus plan, highlighting the distinct financing structure of local governments in two countries. We finally discuss the potential default risk of MCBs in the context of the debt swap program launched in 2015.

5.1. United States: Railroad Finance and Shadow Banking

The economic mechanism behind the upsurge of shadow banking following China's four-trillion-yuan stimulus plan has a striking similarity to that of the National Banking Era (1863–1912) in the United States.

5.1.1. National Banking Era, railroads, and state-chartered banks

During the National Banking Era, the construction of railroads and related infrastructure played a significant role in the development of the U.S. after the Industrial Revolution in its Northeast to the settlement of the West (1850–1890). In 1853, railway construction in Ohio "turned into a mania" (Berry, 1943, p. 513), and railroads turned to local private banks by offering equity as collateral. These private banks were shadow banks by today's standard (Rockoff, 2018).

After the passage of the National Banking Act of 1864, the federal government started granting national banking charters with strict reserve requirements. The National Banking Act more or less followed the "real bills doctrine," which is to say that banks should not issue credit on the basis of "fictitious" bills for speculative goods, such as railroads and related infrastructure projects. Whenever a fast-growing industry with a great business potential—railroads in the late nineteenth century in the U.S.—is starved of funds, financial intermediaries figure out some ways to serve it. This is a recurring theme everywhere; our paper shows that China's shadow banking activities can be viewed as regulatory arbitrages to serve the growing financing needs of LGFVs.

In the case of the U.S., the National Banking Act of 1864 imposed entry barriers and constraints on banking activities, which prevented the supply of banking services from keeping pace with the soaring demand as the country expanded westward. As a result, individual states started engaging in regulatory competition of banking legislations. According to Comptroller of the Currency's 1895 survey of state legislation, all but two states' minimum capital requirements were lower than the federal level, few imposed any restrictions on their banks' real estate loans, and only sixteen states had reserve requirements (White, 1982, p. 34).

5.1.2. Trust companies in the 1907 banking panic

Besides state banks, state authorities also vigorously competed with the federal regulator by establishing more trust companies. As state-chartered banking institutions, trust companies had an institutional presence in finance for decades before the 1907 banking panic. According to Neal (1971), the initial charters were designed to make trust companies perform as fiduciary institutions for wealthier clientele, as opposed to the laboring classes served by savings banks. Over time, trust companies obtained the power to both receive deposits and purchase securities of business firms. Carosso (1970) overviews the role of trusts in financial markets at that time, and the following description from his book (p. 99) also describes the Trust industry in China quite well (see, e.g., p. 8-11 of Allen, Gu, Qian, and Qian, 2017 and p. 16-17 of Ehlers, Kong, and Zhu, 2018):

> *Incorporated under liberal state laws, trust companies quickly extended their activities far beyond those usually associated with the services of a fiduciary institution. Beginning in the 1890s, trust companies took on most of the functions of both commercial and private banks. They accepted deposits; made loans; participated extensively in reorganizing railroads and consolidating industrial corporations; acted as trustees, underwriters, and distributors of new securities; and served as depositories of stocks, bonds, and titles ..... Very often they also owned and managed real estate.*

Moen and Tallman (1992) offer a thorough analysis of trust companies in New York City during the 1907 banking panic; for other studies, see as early as Andrew (1908), and more recently, Frydman, Hilt, and Zhou (2015). Trust companies not only had investment opportunities that were prohibited

to national banks, but were also subject to lower reserve requirements. In New York City, until 1906 trusts were not required to hold any minimum reserves against deposits. By contrast, national banks were subject to 25% reserve requirement, and as a result national banks often used trusts to get around their reserve requirement by simply shifting loans to trusts. This practice involved little cost especially for larger national banks, which had close affiliations with—or even owned outright—some trust companies (Moen and Tallman, 1992, footnote 18, p. 615). Trust companies offered depositors higher interest rates than national banks, reflecting their higher risk due to either lower reserve requirement or riskier asset portfolios (Sprague, 1910, p. 255).

This overall description of U.S. trust companies during the National Banking Era maps almost perfectly onto shadow banking in China today. For instance, WMPs, as an important funding source of trust companies in China, are basically a form of deposits but offer a 2–3% spread over the prevailing risk-free rates. And, the shifting of loans from national banks to their affiliated trusts in the U.S. is almost identical to the practice in China, where commercial banks move real estate or LGFV loans to their off-balance sheets via affiliated trusts and AMPs.

5.1.3. Shadow banking and financial markets

Neal (1971) studies the role of trust companies in financial innovations in the early twentieth century U.S., and the discussions in that paper offer deep insights regarding the growth of shadow banking in China following its 2009 infrastructure stimulus plan.

First, trust companies in the U.S. invested in new industrial securities on the asset side of their balance sheets, while on the liability side they expanded the money supply greatly, enabling the general public to gain access to new industries. The same economics underlie China's shadow banking system today; AMPs mentioned in Section 4.5.3 hold corporate bonds (e.g., MCBs), financed by WMPs that become an important savings vehicle for Chinese households. This contributes to the expedited pace of interest rate liberalization in China after 2012 (for details, see our NBER working paper version W23598, Chen, He, and Liu, 2017).

Second, Neal (1971) emphasizes the role of trust companies in establishing a market that feeds industries burgeoning at that time. Neal (1971) writes, "*. . . (Trust companies) invested in the new industrial securities whose influence upon real investment behavior could not be significant until*

a market had arisen for the new financial instruments. Further, they underwrote many of the new issues." In China, shadow banking, which helps fund infrastructure investment, accelerates the development of Chinese corporate bond markets (Amstad and He, 2018), a point we turn to shortly.

Lastly, besides competition brought on by trust companies, these companies were also well-connected to other more traditional banking institutions, forming the so-called "Money Trust" that was behind many scandals at that time (Neal 1971, p. 51). Leaving aside fraudulent activities, similar industrial organizational forces are also present in China's shadow banking system, due to the absolute dominance of traditional commercial banks in China. For example, WMPs, the major funding source of China's shadow banking, are sold through branches of commercial banks (Amstad and He 2018).

5.1.4. Railroad finance and corporate bond market

Many economic historians argue that the unprecedentedly large-scale railroad finance during the late nineteenth century stimulated the development of a means for tapping public sources, leading segmented securities trading activities to evolve into the first major public market in corporate issues. According to Chandler (1965), "*Not only did these railroad companies' demands bring the development of new financial instruments such as preferred stock and mortgage, income, and convertible bonds, but they also led to the centralizing and institutionalizing of the American investment market in New York City.*"

One of the leading examples is the corporate bond market. Early railroads in densely populated New England primarily relied on equity finance thanks to sufficient local resources; but the railroads constructed through the frontier West after 1850 primarily relied on public bonds, as distant investors preferred bonds with their appearance of secure principal and guaranteed interest. In the 1850s, Henry V. Poor, the editor of *American Railroad Journal* even advocated that municipalities guarantee the railroad bonds (Chandler, 1954, p. 256), just like MCBs in China. Railroads in some states "*must have obtained virtually all of their capital from bonds*" (Baskin, 1988, p. 216), and in 1900 railroad bonds accounted for nearly 80% of total corporate bonds outstanding (Hickman, 1952, Chapter 2).

The popularity of bonds, as opposed to equity, is rooted in information asymmetry (Myers and

Majluf, 1984; Gorton and Pennacchi, 1990). When security markets evolve to encompass increasingly larger geographical areas, this growth demands the development of institutions. Besides the uniform accounting standards established in 1887 (Baskin, 1988), services provided by reputable middlemen were crucial. Investment bankers, as the consummate insiders, thrived by offering investors comparative information about bonds on sale. Specialized business/financial presses covering railroads also emerged, along with the establishment of the Mercantile Agency in 1841 that specialized in collecting and disseminating information regarding the creditworthiness of businesses to its subscribers. The modern-day credit rating agencies, started by Moody in 1909, represents a fusion of functions performed by the above-mentioned information providers (Sylla, 2002).

Just like the U.S. history, Chinese corporate bond markets, where MCBs issued by LGFVs are traded, have experienced similar developments after the 2009 stimulus, especially when LGFVs facing rollover and continuation investment pressures started tapping non-bank financing from the market after 2012. Echoing the rise of the information production industry during American railroad financing, Fig. 8 Panel A shows the number of reports issued by rating agencies in China jumped around 2012; the similar pattern holds for the sell-side research reports on "bond markets" published by security firms. As both a cause and as a consequence, non-bank institutions are playing an increasingly important role in Chinese bond markets (Fig. 8 Panel B). In short, the 2009 stimulus and its hangover effect served as the catalyst for the rapid development of Chinese bond markets in the past decade.

5.2. Comparison to Infrastructure Investment under ARRA

Besides the striking similarity between the historical U.S. and China today, it is also worth comparing the stimulus plans launched by the two countries around 2009. In February 2009, President Obama signed the American Recovery and Reinvestment Act (ARRA) with a planned spending of $787 billion, which aimed to provide a critical "shot in the arm" to the U.S. economy. The majority of ARRA funds went to tax cuts and healthcare, with only about $105 billion, or 0.7% of 2008 U.S. GDP, for infrastructure investment. In contrast, China's 2009 four-trillion-yuan stimulus, about 12.5% of its 2008 GDP, was almost entirely devoted to infrastructure investment. We focus on infrastructure investment for better comparison.

There are several key differences in the implementation of these stimulus infrastructure packages.

In the U.S., to expedite the process, the ARRA stipulated that states had a maximum of 18 months to obligate the funds from the date of apportionment; this was opposed to the normal four-year window for non-ARRA highway grants. However, the actual ARRA outlays were delayed until as late as 2014 (Lew and Porcari, 2017). Besides, the ARRA also waived the cost-sharing requirement for the states, as typical non-ARRA projects call for states to cover 20% of the costs. In contrast, in China's stimulus plan, almost all new bank loans were extended during one single year 2009, among which half went to LGFVs (see Section 2.1).

Regarding ex-post policy evaluations, although Section 4.4.5 in our paper finds suggestive (but rather weak) evidence that China's stimulus plan fostered GDP growth in later years, Bai, Hsieh, and Song (2016) and Cong, Gao, Ponticelli, and Yang (2018) provide a negative assessment by documenting a deteriorating efficiency in the Chinese economy after 2009. In contrast, the ARRA in the U.S. seems to receive a moderately positive reception by U.S. policymakers as well as academics. To name a few, Lew and Porcari (2017) claim that the ARRA delivered a significant relationship between transportation investment and outcomes, such as improved conditions of bridges and airports; Leduc and Wilson (2017) show that the ARRA highway grants crowded in private investment, but Dupor (2017) finds a substantial crowd-out effect on local governments' own spending.

From the perspective of this paper, the difference in local government financing structures may have contributed to the divergent long-run outcomes in these two large economies. In the U.S., there exists a clear legal difference between revenue bonds backed by the revenue generated by a specific project, and general obligation bonds backed by the "full faith and credit" of the municipalities. Because of China's underdeveloped legal system for municipal budgeting, MCBs can be viewed as de jure revenue bonds backed by LGFVs, but de facto general obligation bonds due to the implicit guarantee from these municipalities owning these LGFVs. To address this issue, Beijing launched the debt swap program in 2015, to which we turn in the next section.

5.3. Debt Swap Program in China

5.3.1. Implicit guarantee and default risk

In China, the lack of distinction between revenue and general obligation debts is the key to the implicit guarantee attached to MCBs and other LGFV debts. The market participants, either naive WMP investors who do not even know what they are buying or sophisticated fund managers studying the default risk of LGFVs extensively, all expect potential bailout by municipalities at various levels.

In 2015, the Ministry of Finance started the debt swap program, under which local governments can refinance certain portion of their maturing LGFV revenue debts by general obligation muni-bonds that are ultimately backed by the central government. Whether debts are qualified for swap is based on the mid-2013 NAO report, which classified the outstanding local government debts to be "fully guaranteed," "contingent obligation," or "contingent bailout obligation" depending on the extent to which LGFVs had conformed to regulations. According to the Ministry of Finance, among all these local government debts that came due in 2015, about 54% (33%) of fully-guaranteed (total) obligations were qualified for swap. As a result, the uncertainty of the local governments' repayment ability lingered.

The potential default risk of local governments could be systemic, as China's local government debts are either hidden on banks' off-balance sheets (e.g., MCBs through AMPs), or directly sitting on their on-balance sheets; Gao, Ru, and Tang (2018) document that LGFVs defaulted on their bank loans before 2014. We acknowledge that one needs a more structural framework to quantitatively assess the LGFV default risk and its resulting systemic effect on Chinese economy, a daunting task that is not performed by our paper. Instead, we highlight that the acceleration of development of new financial markets is an important benefit of stimulus LGFV loans.

On the other hand, what we learned from the 1907 banking panic in U.S. is the need for a last lender of resort (the Federal Reserve System was created in 1913 as a result). From this perspective, the presence of a powerful lender of last resort in China, ultimately the central government, limits the chance for China to slide into a wide-spread financial crisis similar to the 1907 U.S. banking panic triggered by runs on Trust companies.

5.3.2. The political economy of regulation and market forces

China has made tremendous progress in building a market-oriented economy in the past. Although Beijing has received constant criticisms for its heavy and frequent regulatory interventions, it is important to recognize that often regulations are just endogenous responses to underlying market forces (in our context, financing demands from certain real sectors).

Take the regulations on local government debts as an example. In June 2010, the State Council issued the No. 19 Document on LGFVs, underscoring the importance of regulating the mounting LGFV debts. The market responded, and MCB issuance declined during 2010–11 (Fig. 3). In October 2014, the No. 43 Document issued by the State Council prohibited local governments from further raising debt via LGFVs. But why did new MCBs grow even faster in 2014 as shown in Fig. 3?

Our paper offers an explanation for why regulators successfully suppressed MCB growth around 2010 but failed to do so in 2014. LGFVs had to roll over their stimulus loans due in 2014, a market force that had to be unleashed one way or another. As mentioned, the budget of swapping munibonds in 2015, which was preapproved at the end of 2014, was only about 33% of the maturing local government debts in 2015**.** In 2015, it became apparent that the preapproved amount was not enough to absorb all the refinancing needs of LGFVs that year. Authorities then issued other conflicting regulatory changes that enabled LGFVs to borrow via MCBs, allowing local governments to access to non-bank (including shadow banking) financing sources (see, e.g., Liu, 2016).

6. Conclusion

This paper paints a broad picture that connects the 2007/08 financial crisis in the U.S., China's 2009 stimulus package, and the upsurging shadow banking activities in China after 2012. Although both WMPs and Trust loans existed in China before 2008 and increased slightly during the period of the 2009 stimulus plan, our perspective highlighting the stimulus-loan-hangover effect helps to explain why these activities experienced barbarous growth after 2012.

We do not aim to offer an estimate on the relative contribution of stimulus-hangover effect on the entire shadow banking sector in China; this necessarily requires a well-crafted quantitative

model based on a general equilibrium framework. Instead, we show that, as an unintended (but good) consequence, the stimulus-hangover effect provides a catalyst for the development of China's corporate bond markets. The resultant growth of WMPs starting in 2012 offered households an attractive savings vehicle with market-based interest rates, which benefited not only households but also the traditional banking sector, as small- and medium-sized banks started competing with the Big Four banks. Furthermore, the development of financial markets is a one-way street. In fact, the market infrastructure established in the past decade provided the basis for Beijing to draft formal regulatory rules in mid-2017 after these off-balance-sheet activities turned excessive.

After surveying the role of shadow banking in major financial panics in the U.S. starting the early nineteen century, Rockoff (2018) argues that the reliance on the real bills doctrine as a basis for regulating chartered banks creates gaps in the financial system for private institutions to fill. And, the flourishing of shadow banking in its various forms reflects a legal ethos (i.e., that which is not forbidden is permitted) in the U.S. at that time (Rockoff, 2018, p. 85). This same ethos has definitely been playing an important role in China's massive economic reform over the past decades, and LGFVs with vast capital needs and their related shadow banking activities are perhaps the best example of this point. Going forward, as an efficient regulation should cover a variety of financial innovations and institutions (Farhi, Golosov, and Tsyvinski, 2009), since 2016 Chinese regulators have started integrating shadow banking activities into the overall banking regulatory system by launching the Macro Prudential Assessment framework.

References

Acharya, V. V., Qian, J., Yang, Z., 2017. In the shadow of banks: wealth management products and issuing banks' risk in China. Working paper .

Allen, F., Gu, X., Qian, J., Qian, Y., 2017. Implicit guarantee and shadow banking: the case of trust products. Working paper .

Allen, F., Qian, Y., Tu, G., Yu, F., 2019. Entrusted loans: a close look at China's shadow banking system. Journal of Financial Economics 133, 18–41.

Ambrose, B., Deng, Y., Wu, J., 2015. Understanding the risk of China's local government debts and its linkage with property markets. Working paper .

Amstad, M., He, Z., 2018. Chapter 6: Interbank System. Handbook of China's Financial System, edited by Marlene Amstad, Guofeng Sun and Xiong Wei .

Andrew, A. P., 1908. Substitutes for cash in the panic of 1907. The Quarterly Journal of Economics 22, 497–516.

Andrews, I., Stock, J. H., 2018. Weak instruments and what to do about them. NBER Methods Lecture .

Andrews, I., Stock, J. H., Sun, L., 2018. Weak instruments in IV regression: Theory and practice. Working paper .

Angrist, J. D., Pischke, J.-S., 2008. Mostly harmless econometrics: an empiricist's companion. Princeton university press.

Angrist, J. D., Pischke, J.-S., 2009. A note on bias in just identified iv with weak instruments. Technical note .

Bai, C.-E., Hsieh, C.-T., Song, Z., 2016. The long shadow of a fiscal expansion. Brookings Papers on Economic Activity 60, 309–327.

Bai, J., Zhou, H., 2018. The funding cost of Chinese local government debt. Working paper .

Baskin, J. B., 1988. The development of corporate financial markets in Britain and the United States, 1600–1914: overcoming asymmetric information. Business History Review 62, 199–237.

Berry, T. S., 1943. Western prices before 1861: a study of the Cincinnati market. Harvard Economic Studies LXXIV.

Carosso, V. P., 1970. Investment banking in America: a history. Harvard Univ Press.

Chandler, A. D., 1954. Patterns of American railroad finance, 1830–50. Business History Review 28, 248–263.

Chandler, A. D., 1965. The railroads: pioneers in modern corporate management. Business History Review 39, 16–40.

Chen, H., Chen, Z., He, Z., Liu, J., Xie, R., 2018a. Pledgeability and asset prices: evidence from the Chinese corporate bond markets. Working paper .

Chen, K., Ren, J., Zha, T., 2018b. The nexus of monetary policy and shadow banking in China. American Economic Review 108, 3891–3936.

Chen, L., Gu, C., 2012. The impact of loans by local government financing vehicles on bank valuations. Memo, CKGSB.

Chen, T., Kung, J. K.-s., 2019. Busting the "princelings": the campaign against corruption in China's primary land market. The Quarterly Journal of Economics 134, 185–226.

Chen, Z., He, Z., Liu, C., 2017. The financing of local government in china: stimulus loan wanes and shadow banking waxes. National Bureau of Economic Research Working Paper NO. 23598 .

Chhabra, Y., Levenstein, M. C., Owen-Smith, J., 2018. Local fiscal multiplier on R&D and science spending: evidence from the American Recovery and Reinvestment Act. Working paper .

Chodorow-Reich, G., 2019. Geographic cross-sectional fiscal spending multipliers: what have we learned? American Economic Journal: Economic Policy 11, 1–34.

Cong, W., Gao, H., Ponticelli, J., Yang, X., 2018. Credit allocation under economic stimulus: evidence from China. *Review of Financial Studies*, forthcoming.

Conley, T. G., Dupor, B., 2013. The American Recovery and Reinvestment Act: solely a government jobs program? Journal of Monetary Economics 60, 535–549.

Crucini, M. J., Vu, N. T., 2017. Did the American Recovery and Reinvestment Act help those most in need? A county-level analysis. Working paper .

Deng, Y., Morck, R., Wu, J., Yeung, B., 2015. China's pseudo-monetary policy. Review of Finance 19, 55–93.

Diamond, D. W., He, Z., 2014. A theory of debt maturity: the long and short of debt overhang. The Journal of Finance 69, 719–762.

Dupor, B., 2017. So, why didn't the 2009 recovery act improve the nation's highways and bridges? Working paper .

Dupor, B., Mehkari, M. S., 2016. The 2009 recovery act: stimulus at the extensive and intensive labor margins. European Economic Review 85, 208–228.

EC, E. C., 2012. Green paper on shadow banking. Tech. rep.

Ehlers, T., Kong, S., Zhu, F., 2018. Mapping shadow banking in China: structure and dynamics. BIS working paper .

Farhi, E., Golosov, M., Tsyvinski, A., 2009. A theory of liquidity and regulation of financial intermediation. The Review of Economic Studies 76, 973–992.

Finlay, K., Magnusson, L. M., 2009. Implementing weak-instrument robust tests for a general class of instrumental-variables models. The Stata Journal 9, 398–421.

Frydman, C., Hilt, E., Zhou, L. Y., 2015. Economic effects of runs on early "shadow banks": trust companies and the impact of the panic of 1907. Journal of Political Economy 123, 902–940.

Gao, H., Ru, H., Tang, D. Y., 2018. Subnational debt of China: the politics-finance nexus. Working paper .

Gao, H., Ru, H., Townsend, R. M., Yang, X., 2019. Rise of bank competition: Evidence from banking deregulation in China. Working paper .

Ghosh, S., Gonzalez del Mazo, I., Ötker-Robe, İ., 2012. Chasing the shadows: how significant is shadow banking in emerging markets? Economic Premise 88.

Gorton, G., Pennacchi, G., 1990. Financial intermediaries and liquidity creation. The Journal of Finance 45, 49–71.

Hachem, K., Song, Z. M., 2017a. Liquidity regulation and unintended financial transformation in China. Working paper .

Hachem, K., Song, Z. M., 2017b. Liquidity rules and credit booms. Working paper .

He, Z., Xiong, W., 2012. Rollover risk and credit risk. The Journal of Finance 67, 391–429.

Hickman, B. W., 1952. Trends and cycles in corporate bond financing. Working paper .

Huang, Y., Pagano, M., Panizza, U., 2016. Public debt and private firm funding: evidence from Chinese cities. Working paper .

Huang, Z., Li, L., Ma, G., Xu, L. C., 2017. Hayek, local information, and commanding heights: decentralizing state-owned enterprises in China. American Economic Review 107, 2455–78.

Jiang, W., 2017. Have instrumental variables brought us closer to the truth. The Review of Corporate Finance Studies 6, 127–140.

Knight, B., 2002. Endogenous federal grants and crowd-out of state government spending: theory and evidence from the federal highway aid program. American Economic Review 92, 71–92.

Kroeber, A., 2016. China's Economy: What Everyone Needs to Know. Oxford University Press.

Leduc, S., Wilson, D., 2013. Roads to prosperity or bridges to nowhere? Theory and evidence on the impact of public infrastructure investment. NBER Macroeconomics Annual 27, 89–142.

Leduc, S., Wilson, D., 2017. Are state governments roadblocks to federal stimulus? Evidence on the flypaper effect of highway grants in the 2009 recovery act. American Economic Journal: Economic Policy 9, 253–92.

Lei, K., Cai, G., Tsui, S., Huang, J. S., Zhu, H., Chen, M. M., Lim, S. C., 2018. China financials: embracing a rise in corporate bond defaults. J.P. Morgan Asia Pacific Corporate Research .

Leigh, A., Neill, C., 2011. Can national infrastructure spending reduce local unemployment? Evidence from an Australian roads program. Economics Letters 113, 150–153.

Lew, S., Porcari, J., 2017. Eight years later: what the Recovery Act taught us about investing in transportation.

Li, B., Wang, Z., Zhou, H., 2018. China's anti-corruption campaign and credit reallocation from soes to non-soes. PBCSF-NIFR Research Paper .

Li, H., Zhou, L.-A., 2005. Political turnover and economic performance: the incentive role of personnel control in China. Journal of Public Economics 89, 1743–1762.

Lin, C., Morck, R., Yeung, B., Zhao, X., 2016. Anti-corruption reforms and shareholder valuations: event study evidence from China. Working paper.

Liu, L., Shu, H., Wang, S., Wei, K. J., 2018. The political cycle of corporate investments: new evidence from Chinese manufacturing firms. Working paper .

Liu, L. X., Lyu, Y., Yu, F., 2017a. Implicit government guarantee and the pricing of Chinese LGFV debt. Working paper .

Liu, L. X., Shu, H., Wei, K. J., 2017b. The impacts of political uncertainty on asset prices: evidence from the Bo scandal in China. Journal of Financial Economics 125, 286–310.

Liu, Q., 2016. Municipal corporate bond policy, review, and outlook. Pengyuan Credit Rating CO. LTD. Research Report (in Chinese) .

Moen, J., Tallman, E. W., 1992. The bank panic of 1907: the role of trust companies. The Journal of Economic History 52, 611–630.

Myers, S. C., Majluf, N. S., 1984. Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics 13, 187–221.

Neal, L., 1971. Trust companies and financial innovation, 1897–1914. Business History Review 45, 35–51.

Olea, J. L. M., Pflueger, C., 2013. A robust test for weak instruments. Journal of Business & Economic Statistics 31, 358–369.

Rockoff, H., 2018. Chapter 4: It is always the shadow banks: the regulatory status of the banks that failed and ignited America's greatest financial panics. Coping with Financial Crisis: Some Lessons from Economic History, edited by Hugh Rockoff and Isao Suto .

Ru, H., 2018. Government credit, a double-edged sword: evidence from the China Development Bank. The Journal of Finance 73, 275–316.

Song, Z. M., Storesletten, K., Zilibotti, F., 2011. Growing like China. American Economic Review 101, 196–233.

Sprague, O. M. W., 1910. History of crises under the national banking system, vol. 538. US Government Printing Office.

Staiger, D., Stock, J. H., 1997. Instrumental variables regression with weak instruments. Econometrica 65, 557–586.

Sylla, R., 2002. An Historical Primer on the Business of Credit Rating, Springer US, Boston, MA, pp. 19–40.

Tan, Z., Zhou, L.-A., 2015. Officials' tenure, credit cycles and investment cycles. Journal of Financial Research (in Chinese) pp. 80–93.

White, E. N., 1982. The political economy of banking regulation, 1864–1933. The Journal of Economic History 42, 33–40.

Xiong, W., 2018. The mandarin model of growth. Working paper .

Yu, Y., Zhang, Y., 2019. The growing snowball: debt rollover and the liquidity risk of local government bonds. Working paper (in Chinese) .

Zhang, Y., Barnett, S. A., 2014. Fiscal vulnerabilities and risks from local government finance in China. Working paper .

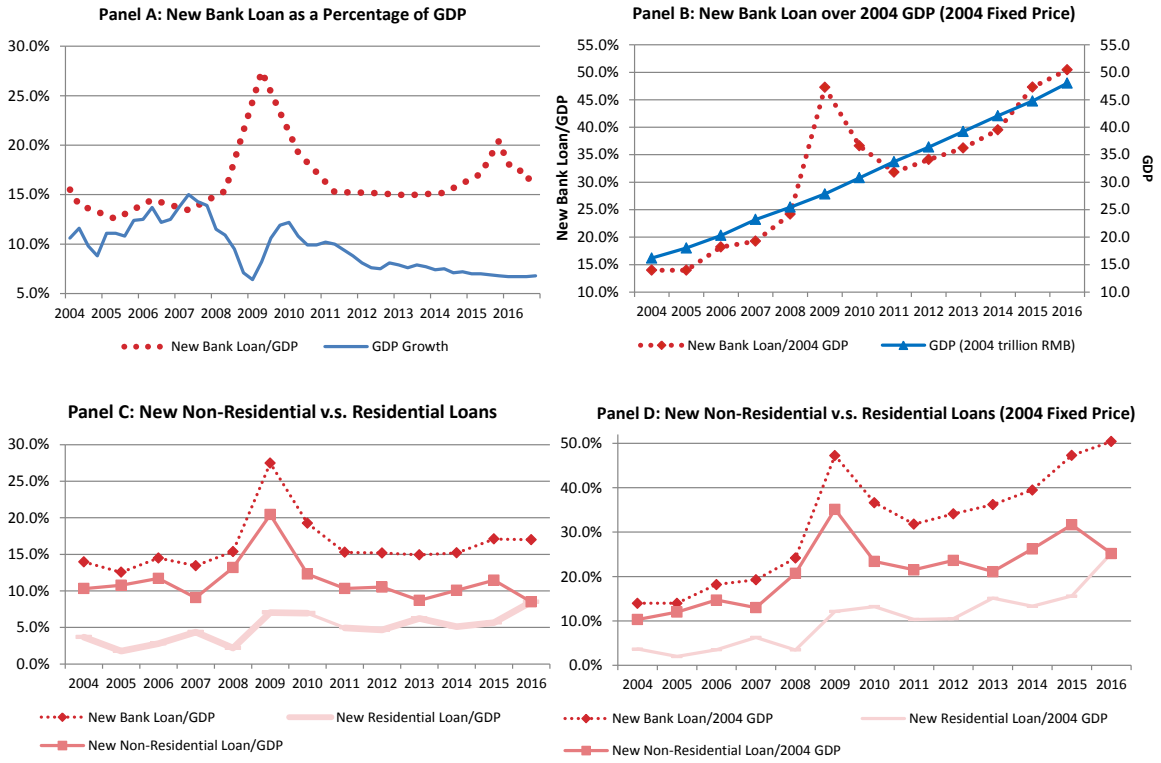

Fig. 1. New Bank Loan Growth in China, 2004-2016. Panel A plots annual new bank loans over GDP and quarterly GDP growth; Panel B plots new bank loans over 2004 GDP (left scale) and GDP in trillion RMB in 2004 fixed price (right scale); Panel C plots new bank loans, new non-residential bank loans, and new residential bank loans, all over GDP; and Panel D plots new bank loans, new non-residential bank loans, and new residential bank loans, all over 2004 GDP and in 2004 fixed price. Numbers in fixed 2004 price are converted using GDP deflator. Data source: People's Bank of China (bank loans) and China National Bureau of Statistics (GDP and GDP deflator).

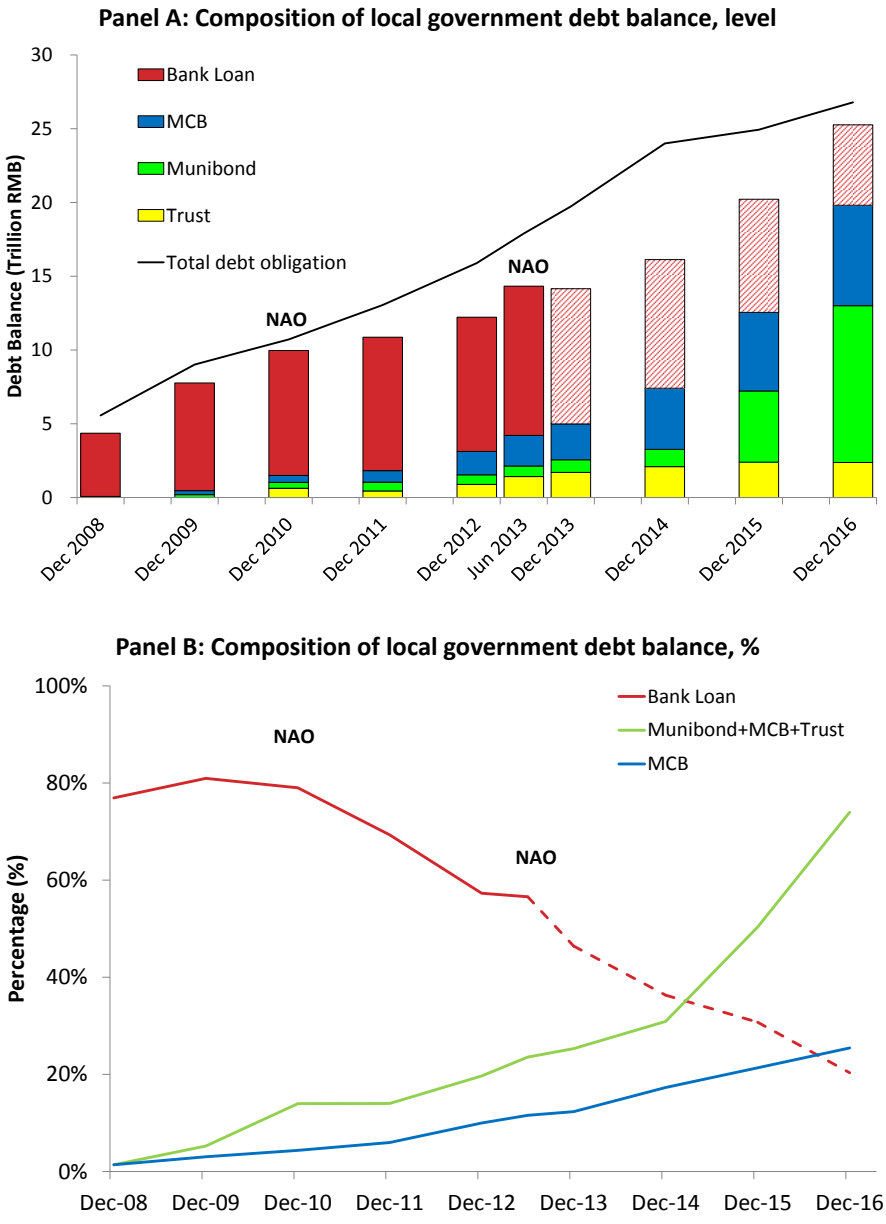

Fig. 2. Local Government Debt Composition, 2008–2016. Panel A plots the composition of local government debt balance in trillion RMB, and Panel B plots the percentage of local government debt balance by composition. Four forms of local government liability include bank loan, municipal corporate bond, municipal bond, and trust. After 2013, LGFV bank loans are indicated by the shaded area/dashed line, as our estimate is based on China Construction Bank only and hence less accurate. The data-construction details are in the Online Appendix B.

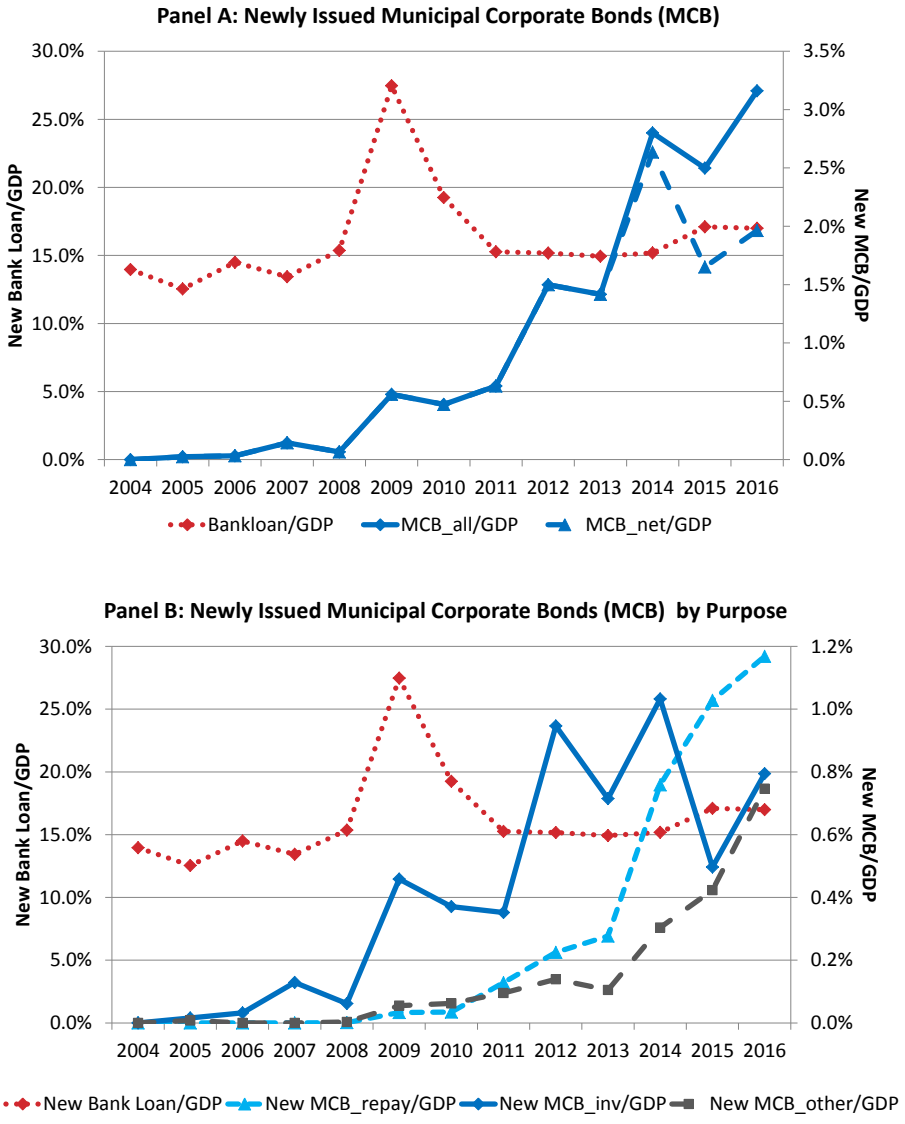

Fig. 3. Municipal Corporate Bond Issuance, 2004–2016. Panel A plots the total MCB issuance over GDP, the net MCB issuance over GDP, and new bank loans over GDP. Panel B plots the total MCB issuance over GDP by usage, including repayment of bank loans, financing of an investment, and other purposes (including replenishing working capital, financing for other entities through entrusted loan structure, repayment of trust loans or other financial institutional borrowings, and undisclosed purpose). New bank loans over GDP are plotted against the left vertical axis and MCB issuance over GDP is plotted against the right vertical axis. The annual MCB-issuance data are aggregated from individual municipal corporate bonds downloaded from WIND.

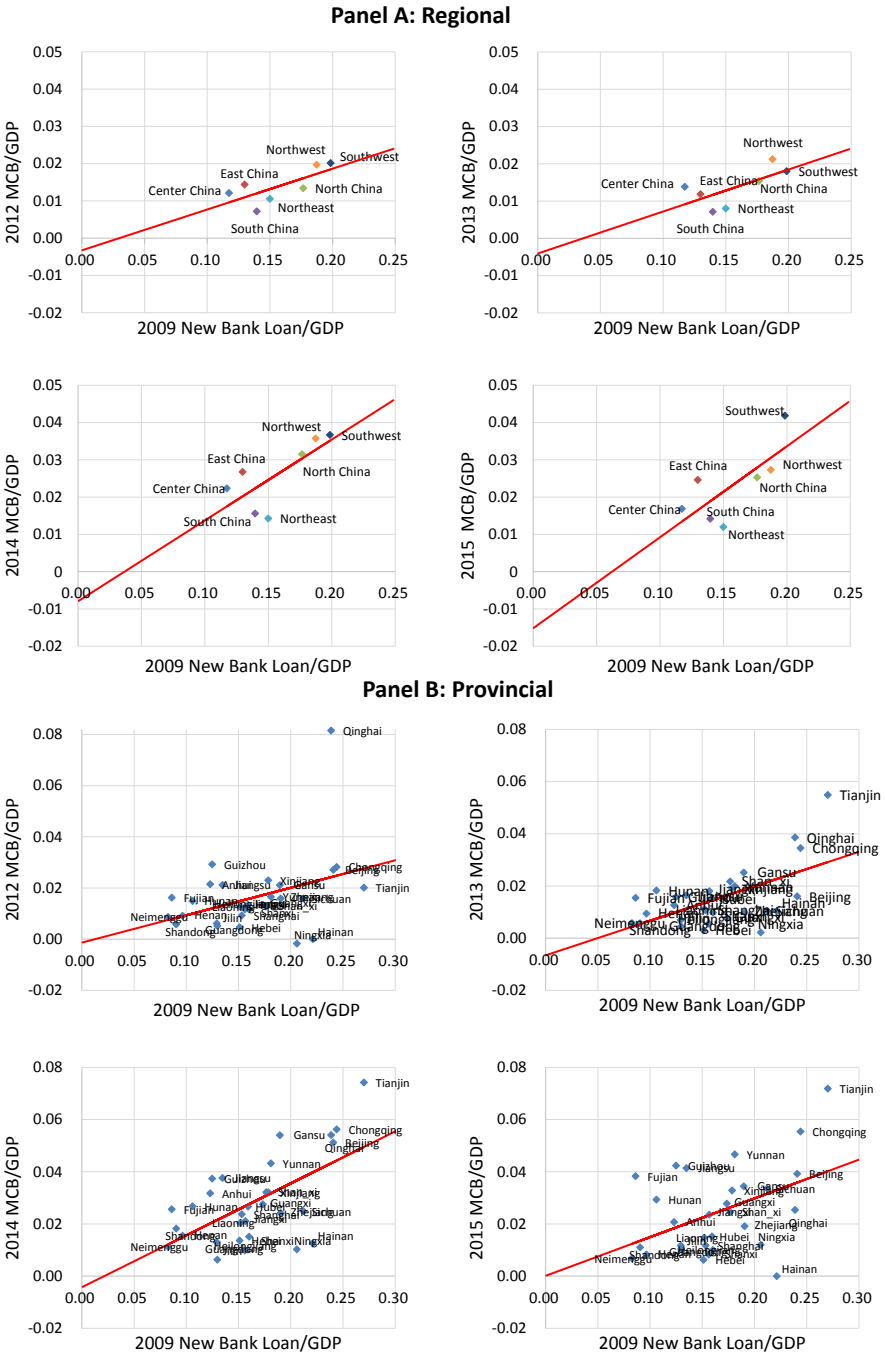

Fig. 4. 2009 Stimulus New Bank Loan and 2012–2015 Abnormal Municipal Corporate Bond Issuance. Panel A (B) presents the scatter plot with a fitted line for regional (provincial) data. Stimulus new bank loan and abnormal MCB issuance (as a percentage of GDP) are calculated over their average values between 2004 and 2008, respectively. The bank loan data are from the People's Bank of China, and the MCB-issuance data are from WIND.

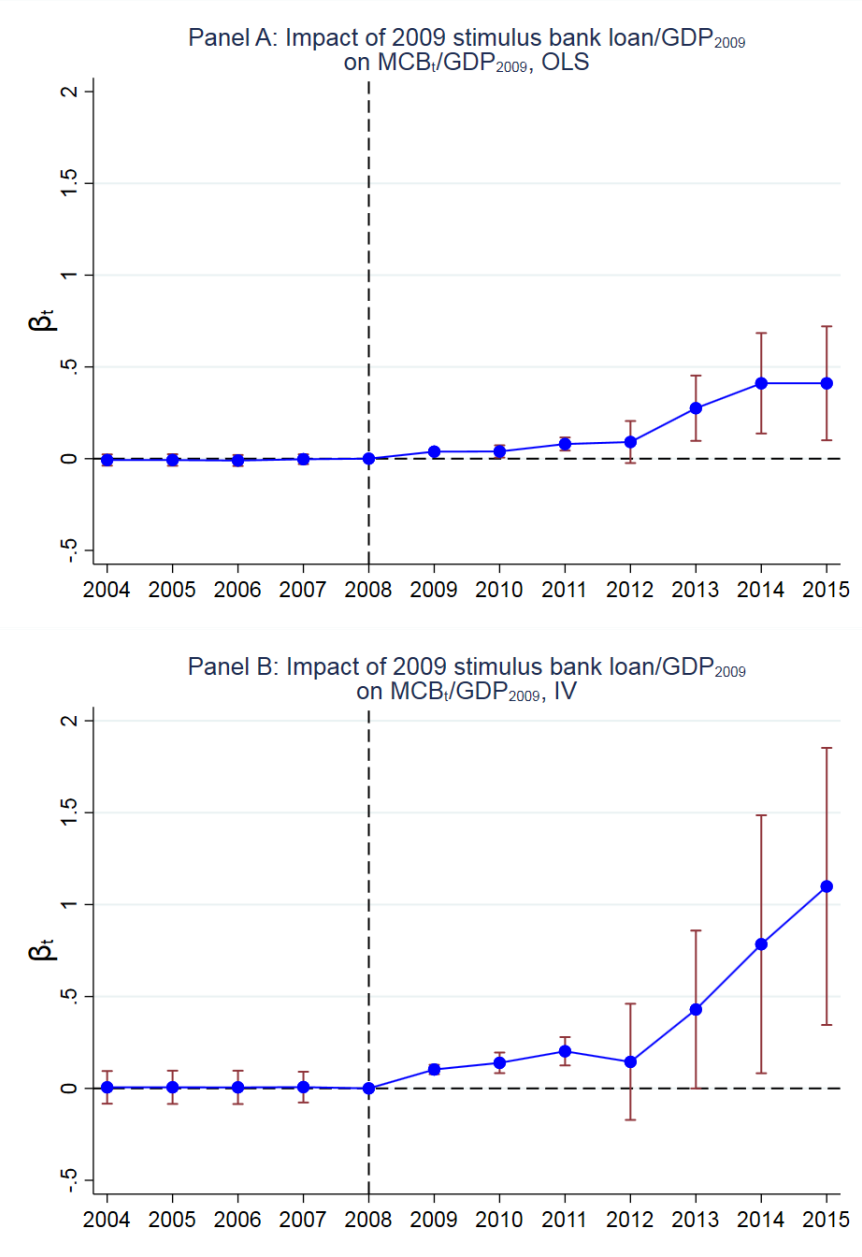

Fig. 5. Effects of 2009 Stimulus Bank Loan on MCB Issuance over 2009 GDP. Panels A and B plot the coefficients along with the 95 percent confidence intervals for the OLS and 2SLS regressions of MCB issuance over the 2009 GDP on the 2009 stimulus new bank loan scaled by GDP, respectively. The instrumental variable $LateTerm_{2009}$ equals 1 if a province governor was not in the first two years of his or her governor tenure as of 2009, and 0 otherwise. Province fixed effects, year fixed effects, and the interaction terms of control variables and year dummies are included. Control variables include fiscal deficit scaled by GDP, fixed asset investment scaled by GDP, GDP growth, GDP per capita, and Big-Four branch share, the former four of which are measured over the one-year window of 2007Q4-2008Q3 and the last one is measured as of 2008Q3. Heteroscedasticity-consistent standard errors clustered by province and year are used to calculate the confidence intervals.

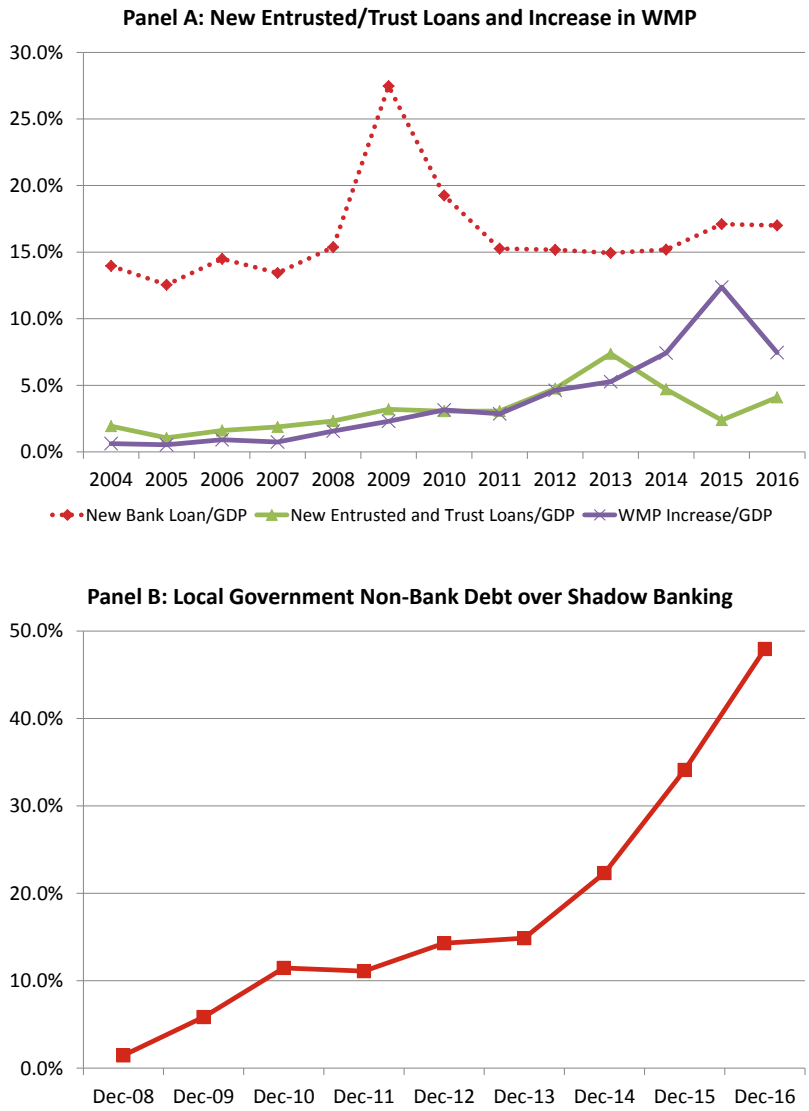

Fig. 6. Shadow Banking Activities and Local Government Non-bank Debt. Panel A plots new Trust loans (entrusted and trust loans) and change in WMPs over GDP from 2004 to 2016. Aggregate new bank loans over GDP is also plotted for comparison. Panel B plots local government non-bank debt balance as a fraction of China's shadow banking balance from 2008 to 2016. Local government non-bank debt is the sum of MCBs, munibonds, and local government trust balance. Shadow banking balance is proxied by three items in *Aggregate Financing to the Real Economy*, including Trust loans (trust and entrusted loans), undiscounted bankers' acceptances, and corporate bonds. The annual WMP balance data are from *China Commercial Banks' Wealth Management Products Annual Report* issued by China Banking Wealth Management Registration System. The *Aggregate Financing to the Real Economy* by category data are from the PBoC.

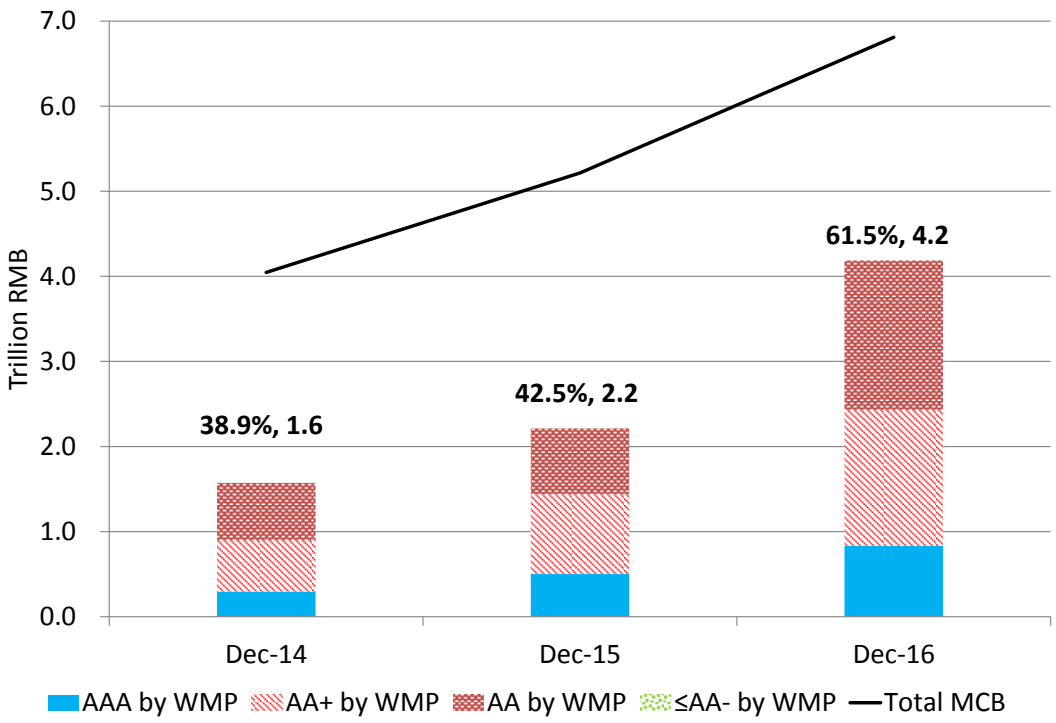

Fig. 7. Wealth Management Products Investment in Municipal Corporate Bonds, from 2014 to 2016. The solid line plots the total MCB balance, and bars represents WMPs invested in MCBs with various ratings. The percentage and RMB value (in trillions) of MCBs held by WMPs are given above the bars. The MCB data are from WIND, and the WMP investment data are from *China Commercial Banks' Wealth Management Products Annual Report* issued by China Banking Wealth Management Registration System. More estimation details are in the Online Appendix D.

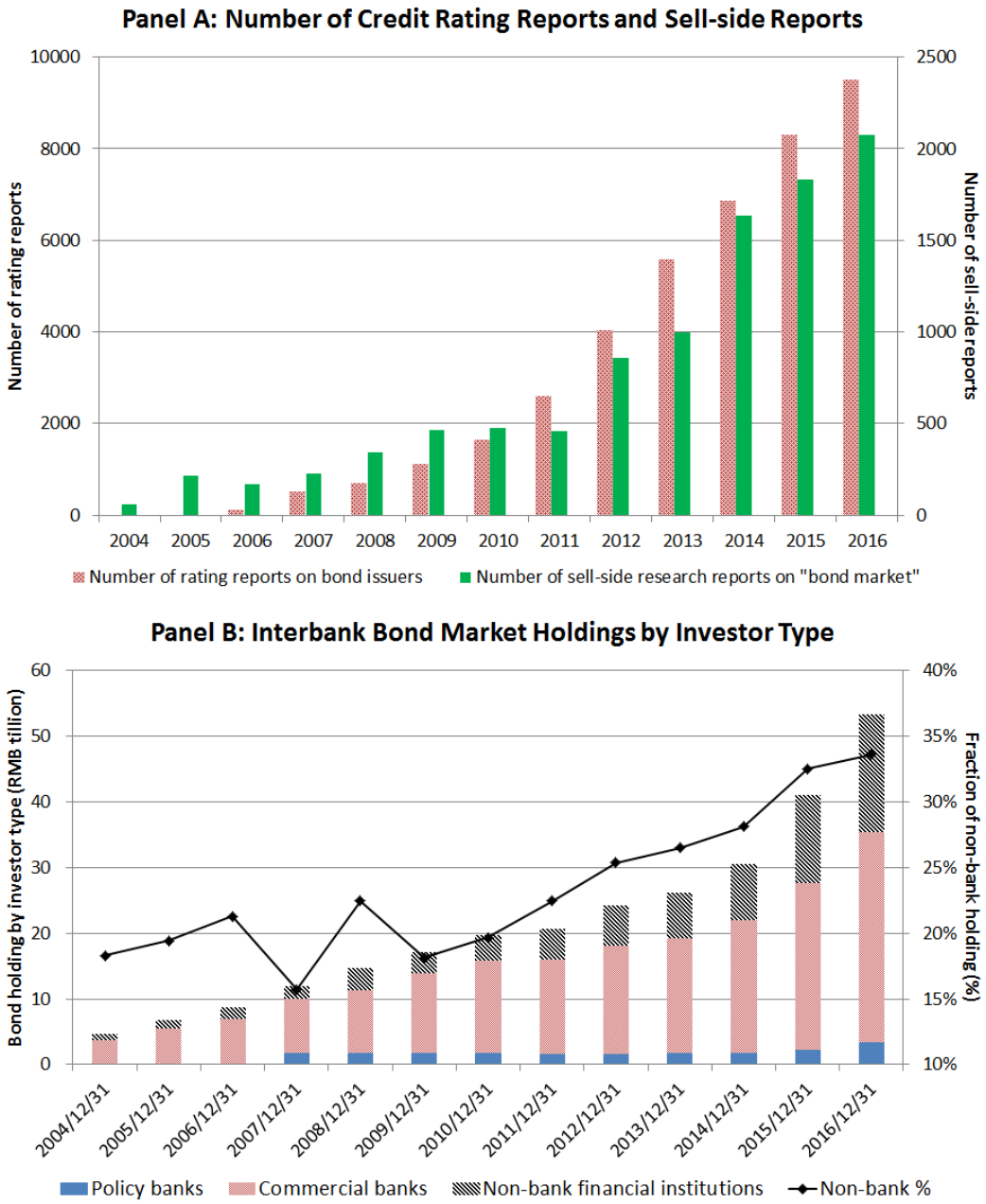

Fig. 8. Non-bank Market Development in China. Panel A plots the holding composition of the interbank bond market by investor category from 2004 to 2016. Investor categories include policy banks, commercial banks, and non-bank financial institutions. Data on holding composition are from China Central Depository & Clearing Corporation Limited and Shanghai Clearing House. Panel B plots the number of credit rating reports on bond issuers (left-axis) and the number of sell-side research reports with the key word "bond market" in the title (right-axis). The data for the sample of 2004 to 2016 are downloaded from WIND.

Table 1
Local Government Debts from NAO Reports

This table reports sources of local government debt from two reports issued by the National Auditing Office of China. Panels A and B report the local government debt outstanding by category in value (RMB billion) and percentage. Seven forms of local government debt include bank loan, fiscal on-lending, bond, other entity and individual borrowing, build and transfer, trust, and others. Two reports are as of December 31, 2010 and June 30, 2013.

Panel A: RMB billion

	2010/12/31	2013/6/30	*Change*
Bank loan	8,468	10,119	*1,651*
Fiscal on-lending	448	303	*-145*
Bond	757	1,846	*1,089*
Other entity and individual borrowing	1,045	839	*-206*
Build & Transfer	0	1,476	*1,476*
Trust	0	1,425	*1,425*
Others	0	1,882	*1,882*
Total	10,717	17,891	*7,174*

Panel B: Percentage

	2010/12/31	2013/6/30	*Change*
Bank loan	79.0%	56.6%	*-22.4%*
Fiscal on-lending	4.2%	1.7%	*-2.5%*
Bond	7.1%	10.3%	*3.2%*
Other entity and individual borrowing	9.8%	4.7%	*-5.1%*
Build & Transfer	0.0%	8.3%	*8.3%*
Trust	0.0%	8.0%	*8.0%*
Others	0.0%	10.5%	*10.5%*

Table 2
Summary Statistics

This table reports the summary statistics of key variables for provincial municipal corporate bond (MCB) issuance and economic conditions. Panel A reports the summary statistics of all variables over the full sample. Panels B and C report the summary statistics of MCB issuance over the 2004–2008 and the 2009–2015 subperiods. Dependent variables include MCB over GDP, MCB for repayment of bank loans over GDP, MCB for investment over GDP, MCB for other purpose over GDP, fixed asset investment over GDP, and GDP per capita, all of which are scaled by 2009 GDP. The main explanatory variable is stimulus bank loan, defined as 2009 bank loans over GDP minus its average value over the past five years. Control variables include fiscal deficit over GDP, fixed-asset investment over GDP, GDP growth, GDP per capita (in RMB thousand), and Big-Four branch share, the former four of which are measured over the one year window of 2007Q4–2008Q3 and the last one is measured as of 2008Q3. The sample period for dependent variables are from 2004 to 2015, except for the entrusted loan (EL)/GDP with the sample period of 2013 to 2015.

Panel A: Summary statistics of full sample

	Obs	Mean	SD	Min	P25	Median	P75	Max
$MCB_{i,t}/GDP_{i,2009}$	360	0.016	0.027	0.000	0.000	0.003	0.020	0.162
$MCB^{repay}_{i,t}/GDP_{i,2009}$	360	0.004	0.010	0.000	0.000	0.000	0.003	0.079
$MCB^{inv}_{i,t}/GDP_{i,2009}$	360	0.007	0.010	0.000	0.000	0.002	0.009	0.054
$MCB^{other}_{i,t}/GDP_{i,2009}$	360	0.002	0.004	0.000	0.000	0.000	0.002	0.032
$BL/GDP^{stimulus}_{i,2009}$	30	0.164	0.050	0.083	0.129	0.158	0.190	0.270
$FD/GDP_{i,07Q4-08Q3}$	30	0.086	0.064	-0.002	0.026	0.087	0.105	0.274
$FAI/GDP_{i,07Q4-08Q3}$	30	0.475	0.121	0.236	0.400	0.452	0.557	0.710
$\Delta GDP_{i,07Q4-08Q3}$	30	0.126	0.024	0.086	0.104	0.128	0.136	0.187
$GDP^{capita}_{i,07Q4-08Q3}$	30	25.479	14.649	9.087	16.737	19.580	31.645	65.803
$BigFour_{i,2008Q3}$	30	0.381	0.081	0.237	0.331	0.358	0.439	0.570
$FAI_{i,t}/GDP_{i,2009}$	360	0.847	0.619	0.149	0.330	0.662	1.215	2.969
$GDP^{capita}_{i,t}/GDP^{capita}_{i,2009}$	360	1.184	0.527	0.321	0.724	1.050	1.631	2.721
$EL/GDP_{i,t}$	90	0.033	0.026	-0.018	0.017	0.027	0.041	0.142

Panel B: Summary statistics of MCB issuance for the 2004–2008 subperiod

	Obs	Mean	SD	Min	P25	Median	P75	Max
$MCB_{i,t}/GDP_{i,2009}$	150	0.000	0.001	0.000	0.000	0.000	0.000	0.009
$MCB^{repay}_{i,t}/GDP_{i,2009}$	150	0.000	0.000	0.000	0.000	0.000	0.000	0.001
$MCB^{inv}_{i,t}/GDP_{i,2009}$	150	0.000	0.001	0.000	0.000	0.000	0.000	0.009
$MCB^{other}_{i,t}/GDP_{i,2009}$	150	0.000	0.000	0.000	0.000	0.000	0.000	0.001

Panel C: Summary statistics of MCB issuance for the 2009–2015 subperiod

	Obs	Mean	SD	Min	P25	Median	P75	Max
$MCB_{i,t}/GDP_{i,2009}$	210	0.027	0.032	0.000	0.006	0.016	0.036	0.162
$MCB^{repay}_{i,t}/GDP_{i,2009}$	210	0.007	0.013	0.000	0.000	0.002	0.009	0.079
$MCB^{inv}_{i,t}/GDP_{i,2009}$	210	0.011	0.011	0.000	0.003	0.008	0.015	0.054
$MCB^{other}_{i,t}/GDP_{i,2009}$	210	0.003	0.005	0.000	0.001	0.001	0.004	0.032

Table 3
The Effects of 2009 Stimulus Bank Loan on Future Municipal Corporate Bond Issuance, Year-by-Year Regressions

This table reports the year-by-year regressions of 2012–2015 municipal corporate bond (MCB) issuance on 2009 bank loan. The dependent variable is the abnormal MCB issuance scaled by GDP in years 2012–2015 compared to the average value between 2004 and 2008. Annual MCB issuance at the regional/provincial/city level is aggregated over individual MCB bonds. The explanatory variable is the stimulus bank loan scaled by GDP. Panels A, B, and C report the cross-regional, the cross-provincial, and the cross-city results, respectively. Data on bank loans are obtained from the PBoC and data on MCBs are obtained from WIND. Constants are not reported. Heteroscedasticity consistent standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Regional regressions

	(1) MCB/GDP_{2012}	(2) MCB/GDP_{2013}	(3) MCB/GDP_{2014}	(4) MCB/GDP_{2015}
$BL/GDP_{2009}^{stimulus}$	0.109***	0.113**	0.217***	0.244**
	(0.041)	(0.050)	(0.066)	(0.097)
Observations	7	7	7	7
Adj. R^2	0.418	0.352	0.443	0.457

Panel B: Provincial regressions

	(1) MCB/GDP_{2012}	(2) MCB/GDP_{2013}	(3) MCB/GDP_{2014}	(4) MCB/GDP_{2015}
$BL/GDP_{2009}^{stimulus}$	0.107	0.132***	0.199***	0.149**
	(0.069)	(0.051)	(0.058)	(0.072)
Observations	30	30	30	30
Adj. R^2	0.103	0.315	0.338	0.168

Panel C: City level regressions

	(1) MCB/GDP_{2012}	(2) MCB/GDP_{2013}	(3) MCB/GDP_{2014}	(4) MCB/GDP_{2015}
$BL/GDP_{2009}^{stimulus}$	0.040**	0.036***	0.075***	0.056***
	(0.018)	(0.010)	(0.019)	(0.021)
Observations	325	325	325	325
Adj. R^2	0.068	0.070	0.137	0.073

Table 4
Panel Regressions: OLS and IV

This table reports the results of provincial panel regressions of both OLS and IV. The dependent variables include MCB issuance, MCB issuance for bank loan repayment, MCB issuance for investment, and MCB issuance for other purposes, all of which are scaled by the 2009 GDP. $LateTerm_{2009}$ is used as the instrumental variable for the 2009 stimulus bank loan scaled by GDP. $LateTerm_{2009}$ equals 1 if a province governor was not in the first two years of his or her governor tenure as of 2009, and 0 otherwise. Province fixed effects, year fixed effects, and the interaction terms of control variables and year dummies are included. Control variables include fiscal deficit scaled by GDP, fixed asset investment scaled by GDP, GDP growth, GDP per capita, and Big-Four branch share, the former four of which are measured over the one year window of 2007Q4–2008Q3 and the last one is measured as of 2008Q3. Heteroscedasticity-consistent standard errors clustered by province and year are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The sample period is 2004 to 2015 without the benchmark year 2008.

	MCB/GDP_{2009}		MCB^{repay}/GDP_{2009}		MCB^{inv}/GDP_{2009}		MCB^{other}/GDP_{2009}	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2004	-0.007	0.006	-0.001	-0.002	-0.007	0.005	0.001	0.002
	(0.016)	(0.045)	(0.005)	(0.013)	(0.008)	(0.022)	(0.002)	(0.005)
2005	-0.007	0.006	-0.001	-0.002	-0.006	0.005	0.001	0.003
	(0.016)	(0.046)	(0.005)	(0.013)	(0.009)	(0.022)	(0.002)	(0.005)
2006	-0.010	0.006	-0.001	-0.002	-0.009	0.005	0.001	0.002
	(0.015)	(0.046)	(0.005)	(0.013)	(0.008)	(0.023)	(0.002)	(0.005)
2007	-0.003	0.007	-0.001	-0.002	0.001	0.015	0.001	0.002
	(0.014)	(0.043)	(0.005)	(0.013)	(0.006)	(0.019)	(0.002)	(0.005)
2009	0.039***	0.103***	0.002	0.002	0.032***	0.087***	0.008***	0.018***
	(0.007)	(0.013)	(0.004)	(0.011)	(0.008)	(0.025)	(0.002)	(0.003)
2010	0.039**	0.139***	0.008	0.019***	0.025**	0.088***	0.009*	0.024***
	(0.017)	(0.029)	(0.005)	(0.007)	(0.012)	(0.034)	(0.004)	(0.007)
2011	0.080***	0.202***	0.016***	0.053***	0.041***	0.062**	0.010**	0.023*
	(0.018)	(0.039)	(0.003)	(0.010)	(0.008)	(0.024)	(0.004)	(0.012)
2012	0.091	0.144	0.023	0.016	0.026	0.122	0.010	0.022
	(0.058)	(0.161)	(0.022)	(0.049)	(0.043)	(0.108)	(0.011)	(0.023)
2013	0.275***	0.429**	0.100***	0.142	0.102***	0.176***	0.017**	0.022*
	(0.091)	(0.219)	(0.034)	(0.091)	(0.031)	(0.065)	(0.008)	(0.012)
2014	0.411***	0.784**	0.131***	0.231*	0.049	0.285***	0.057***	0.106**
	(0.140)	(0.358)	(0.051)	(0.133)	(0.050)	(0.109)	(0.015)	(0.053)
2015	0.411***	1.099***	0.195***	0.517***	0.002	0.158*	0.040*	0.165***
	(0.158)	(0.385)	(0.061)	(0.142)	(0.047)	(0.095)	(0.022)	(0.055)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control×Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	360	360	360	360	360	360	360	360
$F^{effective}_{1st-stage}$		3.100		3.100		3.100		3.100
Adj. R^2	0.722	0.692	0.644	0.617	0.688	0.686	0.570	0.569

Table 5
Panel Regressions: OLS and IV at the City Level

This table reports the results of city-level panel regressions of both OLS and IV. The dependent variables include MCB issuance, MCB issuance for bank loan repayment, MCB issuance for investment, and MCB issuance for other purposes, all of which are scaled by the 2009 GDP. Both $LateTerm_{2009}$ and $LateTerm_{2009}^{mayor}$ are used as the instrumental variables for the 2009 stimulus bank loan scaled by GDP. $LateTerm_{2009}/LateTerm_{2009}^{mayor}$ equals 1 if a province governor/city mayor was not in the first two years of his or her tenure as of 2009, and 0 otherwise. City fixed effects, year fixed effects, and the interaction terms of control variables and year dummies are included. Control variables include fiscal deficit scaled by GDP, fixed asset investment scaled by GDP, GDP growth, GDP per capita, Big-Four branch share, the former four of which are measured in 2008 and the last one is measured as of 2008/12/31. Heteroscedasticity-consistent standard errors clustered by city and year are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The sample period is 2004 to 2015 without the benchmark year 2008.

	MCB/GDP_{2009}		MCB^{repay}/GDP_{2009}		MCB^{inv}/GDP_{2009}		MCB^{other}/GDP_{2009}	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2004	-0.002	0.000	0.000	0.000	-0.002	0.000	0.000	0.000
	(0.004)	(0.013)	(0.000)	(0.000)	(0.001)	(0.005)	(0.000)	(0.000)
2005	-0.001	0.001	0.000	0.000	-0.001	0.001	0.000	0.000
	(0.004)	(0.012)	(0.000)	(0.000)	(0.002)	(0.005)	(0.000)	(0.000)
2006	-0.001	0.001	0.000	0.000	-0.001	0.002	0.000	0.000
	(0.004)	(0.012)	(0.000)	(0.000)	(0.001)	(0.005)	(0.000)	(0.000)
2007	0.000	0.005	0.000	0.000	0.000	0.005	0.000	0.000
	(0.004)	(0.010)	(0.000)	(0.000)	(0.001)	(0.004)	(0.000)	(0.000)
2009	0.005	0.042***	0.000	0.001	0.004**	0.037***	0.000	0.002
	(0.003)	(0.005)	(0.001)	(0.003)	(0.002)	(0.008)	(0.000)	(0.001)
2010	0.009***	0.030***	0.001	0.004*	0.007***	0.013	0.002***	0.010***
	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)	(0.012)	(0.001)	(0.001)
2011	0.016***	0.003	0.005***	0.012***	0.009*	-0.014	0.004***	0.005**
	(0.003)	(0.011)	(0.001)	(0.002)	(0.005)	(0.013)	(0.001)	(0.002)
2012	0.060**	0.074	0.019**	0.034***	0.026***	0.024	0.013***	0.014**
	(0.026)	(0.052)	(0.008)	(0.013)	(0.006)	(0.034)	(0.004)	(0.007)
2013	0.063***	0.100*	0.020***	0.050***	0.016***	0.007	0.008***	0.017***
	(0.017)	(0.056)	(0.008)	(0.014)	(0.006)	(0.029)	(0.003)	(0.006)
2014	0.138***	0.341***	0.059***	0.118***	0.026***	0.253***	0.020***	0.010
	(0.034)	(0.106)	(0.014)	(0.039)	(0.007)	(0.032)	(0.005)	(0.019)
2015	0.086**	0.393***	0.068***	0.208***	0.009**	0.089***	0.032***	0.099***
	(0.038)	(0.102)	(0.012)	(0.043)	(0.004)	(0.021)	(0.007)	(0.023)
City FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control×Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,900	3,648	3,900	3,648	3,900	3,648	3,900	3,648
$F_{1st-stage}^{effective}$		3.564		3.564		3.564		3.564
Adj. R^2	0.392	0.359	0.345	0.277	0.233	0.234	0.249	0.204

Table 6
Panel Regressions: The Effect of CDB Loan Fraction

This table reports the results of provincial panel regressions for the interaction effect between 2009 stimulus bank loan and low CDB loan dummy. The dependent variables include MCB issuance, MCB issuance for bank loan repayment, MCB issuance for investment, and MCB issuance for other purposes, all of which are scaled by the 2009 GDP. $LateTerm_{2009}$ is used as the instrumental variable for the 2009 stimulus bank loan scaled by GDP. $LateTerm_{2009}$ equals 1 if a province governor was not in the first two years of his or her governor tenure as of 2009, and 0 otherwise. The CDB^{low} is an indicator variable that takes the value of 1 if a province's 2009 CDB loan fraction is below the median value across all provinces. Province fixed effects, year fixed effects, and the interaction terms of control variables and year dummies are included. Control variables include fiscal deficit scaled by GDP, fixed asset investment scaled by GDP, GDP growth, GDP per capita, and Big-Four branch share, the former four of which are measured over the one year window of 2007Q4–2008Q3 and the last one is measured as of 2008Q3. Heteroscedasticity-consistent standard errors clustered by province and year are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The sample period is 2004 to 2015 without the benchmark year 2008.

	MCB/GDP_{2009}		MCB^{repay}/GDP_{2009}		MCB^{inv}/GDP_{2009}		MCB^{other}/GDP_{2009}	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\text{BL}^{2009}\times\text{CDB}^{low}\times\text{I}^{2004}$	0.001	0.008	0.000	0.001	0.001	0.006	0.001	-0.001
	(0.017)	(0.059)	(0.007)	(0.018)	(0.010)	(0.030)	(0.003)	(0.007)
$\text{BL}^{2009}\times\text{CDB}^{low}\times\text{I}^{2005}$	0.001	0.011	0.000	0.001	0.001	0.008	0.000	-0.001
	(0.017)	(0.060)	(0.007)	(0.018)	(0.011)	(0.030)	(0.003)	(0.007)
$\text{BL}^{2009}\times\text{CDB}^{low}\times\text{I}^{2006}$	0.000	0.008	0.000	0.001	0.000	0.005	0.001	-0.001
	(0.017)	(0.059)	(0.007)	(0.018)	(0.010)	(0.030)	(0.003)	(0.007)
$\text{BL}^{2009}\times\text{CDB}^{low}\times\text{I}^{2007}$	0.005	0.007	0.000	0.001	0.008	0.010	0.001	-0.001
	(0.017)	(0.062)	(0.007)	(0.018)	(0.011)	(0.029)	(0.003)	(0.007)
$\text{BL}^{2009}\times\text{CDB}^{low}\times\text{I}^{2009}$	0.087***	0.123***	0.009	0.012	0.068***	0.103**	0.012***	0.018***
	(0.028)	(0.030)	(0.007)	(0.015)	(0.024)	(0.039)	(0.004)	(0.007)
$\text{BL}^{2009}\times\text{CDB}^{low}\times\text{I}^{2010}$	0.100***	0.213***	0.021***	0.030**	0.063**	0.158***	0.014***	0.029***
	(0.032)	(0.041)	(0.008)	(0.015)	(0.027)	(0.042)	(0.005)	(0.010)
$\text{BL}^{2009}\times\text{CDB}^{low}\times\text{I}^{2011}$	0.119***	0.208***	0.030***	0.064***	0.062**	0.074*	0.009	0.015
	(0.036)	(0.053)	(0.008)	(0.016)	(0.026)	(0.044)	(0.007)	(0.012)
$\text{BL}^{2009}\times\text{CDB}^{low}\times\text{I}^{2012}$	0.434***	0.276	0.109	-0.059	0.198***	0.113	0.040	0.038
	(0.152)	(0.321)	(0.090)	(0.143)	(0.065)	(0.117)	(0.034)	(0.059)
$\text{BL}^{2009}\times\text{CDB}^{low}\times\text{I}^{2013}$	0.661***	0.706*	0.200**	0.097	0.254***	0.187	0.048	0.046
	(0.165)	(0.385)	(0.090)	(0.142)	(0.068)	(0.127)	(0.031)	(0.056)
$\text{BL}^{2009}\times\text{CDB}^{low}\times\text{I}^{2014}$	0.880***	1.190***	0.245**	0.204	0.237***	0.224*	0.099***	0.196***
	(0.170)	(0.415)	(0.096)	(0.161)	(0.070)	(0.135)	(0.036)	(0.068)
$\text{BL}^{2009}\times\text{CDB}^{low}\times\text{I}^{2015}$	1.018***	1.479***	0.401***	0.558***	0.193***	0.121	0.115***	0.205***
	(0.169)	(0.418)	(0.093)	(0.148)	(0.067)	(0.140)	(0.036)	(0.067)
$\text{BL}^{2009}\times$Subperiod	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$\text{CDB}^{low}\times$Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control×Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	360	360	360	360	360	360	360	360
Adj. R^2	0.805	0.729	0.721	0.658	0.717	0.676	0.612	0.604

Table 7
Panel Regressions: OLS and IV with Simultaneous Controls

This table reports the results of provincial panel regressions of both OLS and IV. The dependent variables include MCB issuance, MCB issuance for bank loan repayment, MCB issuance for investment, and MCB issuance for other purposes, all of which are scaled by the 2009 GDP. $LateTerm_{2009}$ is used as the instrumental variable for the 2009 stimulus bank loan scaled by GDP. $LateTerm_{2009}$ equals 1 if a province governor was not in the first two years of his or her governor tenure as of 2009, and 0 otherwise. Province fixed effects, year fixed effects, and simultaneous control variables are included. Control variables include fiscal deficit scaled by GDP, fixed asset investment scaled by GDP, GDP growth, GDP per capita, and Big-Four branch share, all of which are as of the same year as MCB issuance. Heteroscedasticity-consistent standard errors clustered by province and year are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The sample period is 2004 to 2015 without the benchmark year 2008.

	MCB/GDP_{2009}		MCB^{repay}/GDP_{2009}		MCB^{inv}/GDP_{2009}		MCB^{other}/GDP_{2009}	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2004	-0.009	-0.012	0.013	0.020	-0.022*	-0.033	0.006	0.010
	(0.030)	(0.062)	(0.012)	(0.021)	(0.011)	(0.020)	(0.003)	(0.008)
2005	0.022	0.020	0.019*	0.023	-0.007	-0.014	0.009***	0.013*
	(0.022)	(0.050)	(0.010)	(0.017)	(0.008)	(0.018)	(0.002)	(0.007)
2006	-0.003	-0.002	0.012	0.015	-0.019	-0.024*	0.004	0.007
	(0.027)	(0.039)	(0.011)	(0.013)	(0.011)	(0.013)	(0.003)	(0.005)
2007	-0.004	0.008	0.005	0.010	-0.009	-0.008	0.001	0.004
	(0.027)	(0.044)	(0.009)	(0.012)	(0.011)	(0.019)	(0.005)	(0.008)
2009	-0.006	-0.017	-0.008	-0.013	0.001	-0.012	0.005	0.004
	(0.025)	(0.057)	(0.010)	(0.020)	(0.014)	(0.026)	(0.003)	(0.006)
2010	-0.034	-0.035	-0.018	-0.027	-0.008	-0.006	-0.001	0.001
	(0.051)	(0.099)	(0.023)	(0.044)	(0.019)	(0.039)	(0.006)	(0.010)
2011	0.017	0.015	-0.004	-0.007	0.005	-0.012	0.001	0.001
	(0.062)	(0.125)	(0.030)	(0.059)	(0.018)	(0.040)	(0.007)	(0.014)
2012	0.116	0.207	0.032	0.061	-0.011	-0.026	0.025*	0.057**
	(0.102)	(0.185)	(0.028)	(0.061)	(0.034)	(0.054)	(0.013)	(0.027)
2013	0.189**	0.149	0.090***	0.101*	0.048**	0.008	0.020*	0.032
	(0.076)	(0.118)	(0.031)	(0.061)	(0.021)	(0.035)	(0.011)	(0.021)
2014	0.362***	0.380**	0.143***	0.185**	0.050*	0.106**	0.052***	0.057
	(0.097)	(0.157)	(0.040)	(0.077)	(0.030)	(0.054)	(0.019)	(0.040)
2015	0.255**	0.185	0.135**	0.117*	-0.011	0.013	0.036*	0.056
	(0.128)	(0.180)	(0.054)	(0.067)	(0.029)	(0.039)	(0.020)	(0.039)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	360	360	360	360	360	360	360	360
Adj. R^2	0.743	0.711	0.659	0.625	0.674	0.674	0.555	0.546

Table 8
Panel Regressions: Real Effects

This table reports the results of provincial panel regressions of both OLS and IV. The dependent variables include GDP per capita scaled by the 2009 GDP per capita, and fixed asset investment scaled by the 2009 GDP. $LateTerm_{2009}$ is used as the instrumental variable for the 2009 stimulus bank loan scaled by GDP. $LateTerm_{2009}$ equals 1 if a province governor was not in the first two years of his or her governor tenure as of 2009, and 0 otherwise. Province fixed effects, year fixed effects, and the interaction terms of control variables and year dummies are included. Control variables include fiscal deficit scaled by GDP, fixed asset investment scaled by GDP, GDP growth, GDP per capita, and Big-Four branch share, the former four of which are measured over the one year window of 2007Q4–2008Q3 and the last one is measured as of 2008Q3. Heteroscedasticity-consistent standard errors clustered by province and year are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The sample period is 2004 to 2015 without the benchmark year 2008.

	$GDP^{capita}/GDP^{capita}_{2009}$		FAI/GDP_{2009}	
	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)
2004	0.037	0.799***	0.142	0.720*
	(0.156)	(0.245)	(0.242)	(0.399)
2005	-0.057	0.306	0.059	0.419
	(0.153)	(0.265)	(0.247)	(0.429)
2006	-0.107	0.103	0.012	0.207
	(0.164)	(0.280)	(0.203)	(0.390)
2007	-0.012	0.369	-0.047	0.142
	(0.102)	(0.247)	(0.156)	(0.355)
2009	-0.108**	0.466***	0.460*	-0.084
	(0.055)	(0.128)	(0.259)	(0.378)
2010	0.031	0.486**	0.704**	0.257
	(0.082)	(0.194)	(0.245)	(0.490)
2011	0.259*	0.815*	0.708***	-0.259
	(0.137)	(0.435)	(0.274)	(0.849)
2012	0.321	1.647**	0.645*	-0.251
	(0.265)	(0.792)	(0.366)	(1.096)
2013	0.322	2.808**	0.729	-0.836
	(0.411)	(1.358)	(0.519)	(1.456)
2014	0.312	4.098**	0.452	-0.600
	(0.614)	(1.936)	(0.696)	(1.714)
2015	0.372	5.584**	1.405*	4.156**
	(0.721)	(2.202)	(0.831)	(1.844)
Province FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Control×Year	Yes	Yes	Yes	Yes
Observations	360	360	360	360
Adj. R^2	0.978	0.981	0.971	0.971

Table 9
The Effects of 2009 Stimulus Bank Loan on Future New Entrust Loans and Bank Loans

This table reports the year-by-year regression results of new entrusted loans (EL) and abnormal bank loans (BL) on the 2009 stimulus bank loan. The dependent variable is the new entrusted loans scaled by GDP for Columns (1) to (4) and abnormal new bank loans scaled by GDP over its 2004–2008 average for Columns (5) and (8). The main explanatory variable is the 2009 stimulus bank loan scaled by GDP. Control variables include fiscal deficit scaled by GDP, fixed asset investment scaled by GDP, GDP growth, GDP per capita, and Big-Four branch share, the former four of which are measured over the one year window of 2007Q4–2008Q3 and the last one is measured as of 2008Q3, or as of the same year as MCB issuance. Data on bank loans and entrusted loans are obtained from the PBoC and data on control variables are obtained from the National Bureau of Statistics of China. Heteroscedasticity-consistent standard errors are reported in parentheses ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The sample period is 2013 to 2015.

	EL/GDP				$BL^{abnormal}$/GDP			
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2013	0.166**	0.270	0.228**	0.021	-0.083	-0.320	0.027	0.153
	(0.079)	(0.196)	(0.105)	(0.333)	(0.106)	(0.300)	(0.093)	(0.393)
$Control_{07Q4-08Q3}$	Yes	Yes	No	No	Yes	Yes	No	No
$Control_{simultaneous}$	No	No	Yes	Yes	No	No	Yes	Yes
Observations	30	30	30	30	30	30	30	30
Adj. R^2	0.400	0.365	0.306	0.157	0.549	0.513	0.565	0.555
2014	0.234***	0.124	0.279***	0.058	-0.118	-0.215	-0.014	0.022
	(0.079)	(0.331)	(0.093)	(0.269)	(0.124)	(0.331)	(0.091)	(0.300)
$Control_{07Q4-08Q3}$	Yes	Yes	No	No	Yes	Yes	No	No
$Control_{simultaneous}$	No	No	Yes	Yes	No	No	Yes	Yes
Observations	30	30	30	30	30	30	30	30
Adj. R^2	0.3432	0.309	0.290	0.138	0.602	0.598	0.547	0.547
2015	-0.025	0.113	0.082	0.096	-0.203	-0.727	-0.024	0.039
	(0.093)	(0.208)	(0.114)	(0.224)	(0.166)	(0.519)	(0.184)	(0.354)
$Control_{07Q4-08Q3}$	Yes	Yes	No	No	Yes	Yes	No	No
$Control_{simultaneous}$	No	No	Yes	Yes	No	No	Yes	Yes
Observations	30	30	30	30	30	30	30	30
Adj. R^2	0.324	0.261	0.098	0.097	0.416	0.321	0.427	0.426

Online Appendix

"The Financing of Local Government in China: Stimulus Loan Wanes and Shadow Banking Waxes?"

(***Journal of Financial Economics***, Forthcoming)

Zhuo Chen, Zhiguo He, Chun Liu

This Online Appendix consists of four sections. In Section A, we describe how we estimate the sector-level stimulus bank loans extended in 2009. In Section B, we provide data-construction details of total local government debt balance and its four major components. In Section C, we discuss all government documents issued by the State Council in 2009. In Section D, we describe how we estimate the investment of wealth management products in municipal corporate bonds. In Section E, additional results are presented.

Appendix A. Estimates of Sector-Level Stimulus Bank Loans in 2009

We estimate that the 2009 stimulus caused RMB 4.7 trillion additional bank loans to the entire Chinese economy, among which, about 2.3 trillion went to LGFVs, about RMB 1 trillion went to the non-residential sector (but excluding LGFVs), and the remaining RMB 1.4 trillion went to the residential sector. Note that the estimated stimulus LGFV bank loans (i.e., 2.3 trillion) square well with Gao, Ru, and Tang (2018), who have detailed loan-level information for LGFVs from the largest nineteen banks (eighteen commercial banks and China Development Bank) in 2009. Finally, with the help of the data in Gao, Ru, and Tang (2018), we estimate that for the RMB 2.3 trillion in bank loans to LGFVs, RMB 2.06 trillion came from commercial banks and RMB 0.24 trillion came from policy banks.

The detailed steps to construct the above estimates are as follows. First, the total stimulus bank loans (RMB 4.7 trillion) is the difference between the actual 2009 new bank loans (9.6 trillion) and the estimated 2009 normal new bank loans (RMB 4.9 trillion, based on the average BL/GDP ratio in 2004–2008). Following the same approach, the 2009 non-residential stimulus bank loan is estimated at RMB 3.3 trillion, implying the residential stimulus bank loan is RMB 1.4 trillion (4.7−3.3). Second, we decompose this RMB 3.3 trillion number further into LGFVs and the rest.

To this end, we estimate the 2009 normal new bank loan to LGFVs to be RMB 0.75 trillion (the ratio of LGFV new bank loans over new bank loans in 2008 multiplied by the estimated 2009 normal new bank loans; the 2008 LGFV new bank loans are based on the 2010 national audit report and WIND). Subtracting this value from the 2009 actual LGFV bank loans 3.05 trillion (Bai, Hsieh, and Song, 2016, p.14), we estimate the 2009 LGFV stimulus bank loans to be RMB 2.3 trillion (3.05−0.75), which then leaves the 2009 non-residential (excluding LGFV) stimulus bank loans to be 1 trillion (3.3−2.3).

Appendix B. Construction of Local Government Debt Balance

B.1. Total local government debt balance

1. The numbers as of the end of 2010, 2012, and 2013H1 are provided by two auditing reports (2011 and 2013) on local government debt issued by the National Audit Office (NAO).
2. The numbers as of the end of 2008 and 2009 are calculated according to local government debt growth given in Figure 2 of the 2011 NAO report.
3. The number as of the end of 2014 is from the proposal to the State of Council submitted by the Ministry of Finance (MOF), which says that by the end of 2014, the local governments' full obligation was RMB 15.4 trillion and the total local government guaranteed/contingent liability was RMB 8.6 trillion.
4. The numbers as of the end of 2015/2016 are calculated according to the 2015/2016 local government full obligation of RMB 16/17.1 trillion and the 2014 fraction of the local governments' full obligation as the total local government debt.
5. The numbers as of the end of 2011 and 2013 are interpolated assuming the growth rate of local government debt to be constant between 2010 and 2012, and between 2012 and 2014.

B.2. Local government bank loan balance

1. The numbers as of the end of 2010 and June 2013 are from the two NAO reports.

2. The numbers as of the end of 2008, 2009, 2011, and 2012 are adjusted from the LGFV bank loan balance data available from WIND.

   (a) The ratio between the average 2010 and June 2013 local government bank loan balance from the NAO reports, and the average 2010 and June 2013 LGFV bank loan balance is used as the adjustment factor.
   (b) LGFV bank loan balance data are from WIND as of the end of 2008, 2009, and 2012.
   (c) The LGFV bank loan balance as of the end of 2011 is interpolated, assuming the growth rate between 2010 and 2012 to be constant.

3. The numbers as of the end of 2013, 2014, 2015, and 2016 are adjusted from the LGFV bank loan balance estimated using China Construction Bank's (CCB) LGFV balance.

   (a) The country-wide LGFV bank loan balance in commercial banks' measurement as of the end of 2013–2016 is estimated using CCB's LGFV bank loan balance and CCB's bank loan balance share of all commercial banks.
   (b) The growth rates of the country-wide LGFV bank loan balance in commercial banks' measurement are used to estimate the LGFV bank loan balance in the WIND measurement from 2013 to 2016.
   (c) The value of the local government bank loan balance as of the end of 2013–2016 is estimated from section 3(b) LGFV bank loan balance adjusted by section 2(a) adjustment factor.

B.3. Municipal corporate bond balance

1. Individual municipal corporate bonds, both outstanding and matured, are aggregated over their corresponding outstanding periods to calculate the MCB balance as of the end of each year.

B.4. Municipal bond balance

1. Individual municipal bonds, both outstanding and matured, are aggregated over their corresponding outstanding periods to calculate the municipal bond balance as of the end of each year.

B.5. Local government trust financing balance

Municipality-trust cooperation balance data are reported officially by China Trustee Association. We assume that the fraction of municipality-trust cooperation outstanding over total Trust loans remains constant over years.

1. Quarterly municipality-trust cooperation balance data are available since 2010.
2. As of June 30, 2013, the NAO report shows that the total local government trust financing balance is RMB 1.43 trillion and the municipality-trust cooperation balance is RMB 0.8 trillion. The adjustment factor is therefore $1.43/0.8 = 1.77$.
3. The numbers of Municipality-Trust cooperation balance as of the end of 2010–2016 are multiplied by 1.77 to reflect the total local government trust financing balance.

Appendix C. Government Documents Issued by the State Council in 2009

The State Council of the People's Republic of China lists all documents on its website (url: http://www.gov.cn/zhengce/content/node_330.htm). In 2009, a total of 103 documents were issued by the State Council. Among all the 103 documents, 29 are classified in the categories of macro economic management, finance, employment, and general government service. Among these twenty-nine documents, eight of them are related to macroeconomic and finance issues that are relevant to our paper, mainly on stimulating economic development and dealing with the financial crisis. Table A.5 presents all eight relevant documents, whose objectives include promoting economic growth and employment in general (No. 4, No. 13, No. 26), providing guidance for the development of some specific industries (No. 8, No. 27, No. 38), promoting the development of

small- and medium-sized firms (No. 36), and stimulating growth for some geographic area (No. 55).

For the remaining twenty-one documents, they are announcements or notices on other economic aspects, such as social welfare (No. 32 Document, "Guiding Opinions of the State Council on Launching a Pilot Program for New Rural Social Pension Insurance"), work plan (No. 23 Document, "Notice of the State Council on Carrying out the Sixth National Population Census"), and miscellaneous (No. 35 Document, "Opinions of the General Office of the State Council on Further Strengthening the Management of Government Procurement").

Appendix D. Construction of Wealth Management Product Investment in Municipal Corporate Bonds

1. Total MCB balance by rating (AAA, AA+, AA, and ≤AA) is aggregated from individual MCBs using bonds rating at issuance. If a bond does not have rating information at issuance, we use its issuer's rating at issuance as a proxy. Only 1.57% of MCB in terms of RMB issuance value do not have any rating information.
2. Total credit bond balance by rating (AAA, AA+, AA, and ≤AA) is from China Central Depository and Clearing Corporation, downloaded from WIND.
3. Credit bond balance by rating (AAA, AA+, AA, and ≤AA) held by WMPs is from *China Commercial Banks' Wealth Management Products Annual Reports* issued by China Banking Wealth Management Registration System.
4. Fractions of credit bond balance held by WMPs by rating are calculated from numbers in 2 and 3.
5. Assuming that WMPs hold MCBs in the same ratio as WMPs hold all corporate bonds, we estimate the MCB balance held by WMPs from numbers in 1 and 4.

Appendix E. Additional Results

Table A1: Original NAO Reports on China's Local Government Debt
This table reports sources of local government debt from two original reports issued by the National Auditing Office of China. Panel A (B) reports the auditing results as of December 31, 2010 (June 30, 2013).

Panel A: Local government debt balance as of December 31, 2010 (billion RMB)

		Contingent Liability		
	Full Obligation	Guaranteed Obligation	Contingent Bailout Obligation	*Total Debt*
Bank loan	5,023	1,913	1,532	*8,468*
Fiscal on-lending	213	235	0	*448*
Bond	551	107	99	*757*
Other entity and individual borrowing	924	82	39	*1,045*
Total	6,711	2,337	1,670	*10,717*

Panel B: Local government debt balance as of June 30, 2013 (billion RMB)

		Contingent Liability		
	Full Obligation	Guaranteed Obligation	Contingent Bailout Obligation	*Total Debt*
Bank loan	5,525	1,909	2,685	*10,119*
Build & Transfer	1,215	47	215	*1,476*
Bond	1,166	167	512	*1,846*
MuniBond	615	49	0	*664*
Enterprise bond	459	81	343	*883*
Mid-term note	58	34	102	*194*
Commercial paper	12	1	22	*35*
Other types	22	2	45	70
Accounts payable	778	9	70	*857*
Trust	762	253	410	*1,425*
Other entity and individual borrowing	668	55	116	*839*
Construction loan	327	1	48	*376*
Other financial institution borrowing	200	31	106	*337*
Fiscal on-lending	133	171	0	*303*
Capital lease	75	19	137	*232*
Other fund raising	37	4	39	*80*
Total	10,886	2,666	4,339	*17,891*

Table A2: Summary Statistics of Municipal Corporate Bond Issuance

This table reports the summary statistics of municipal corporate bond (MCB) issuance. Panels A and B report MCB issuance number, issuance amount (RMB billion), and issuance amount by purpose (repayment of existing bank loan, investment, and other) for seven regions and thirty provinces, respectively. Total issuance amount is greater than the sum of these three purposes because only around 80% of MCBs are with disclosure.

Panel A: MCB Issuance by Region

Province	Number of Bonds	Amount (total)	Amount (repay)	Amount (inv)	Amount (other)
Center China	554	635.9	105.0	318.9	54.0
East China	2428	2272.9	653.5	1019.9	242.3
North China	630	1004.7	260.3	332.6	155.8
South China	404	448.0	142.6	166.8	92.5
Northeast	245	292.5	53.5	158.1	22.9
Northwest	393	428.3	104.6	147.7	54.4
Southwest	800	845.1	249.2	348.9	95.7
Total	5454	5927.3	1568.7	2492.7	717.6

Panel B: MCB Issuance by Province

Province	Number of Bonds	Amount (total)	Amount (repay)	Amount (inv)	Amount (other)
Anhui	206	218.7	60.1	114.5	15.5
Beijing	210	368.0	102.1	99.2	97.2
Chongqing	265	287.8	90.5	119.5	28.8
Fujian	293	244.3	102.3	72.2	42.0
Gansu	78	97.6	22.9	28.9	16.8
Guangdong	232	303.2	115.7	106.6	63.3
Guangxi	165	135.6	26.0	52.7	28.3
Guizhou	89	118.1	15.3	73.5	12.1
Hainan	7	9.2	0.9	7.4	0.9
Hebei	93	98.4	14.0	52.7	13.9
Heilongjiang	58	61.4	4.8	41.4	6.2
Henan	143	156.3	23.5	63.5	16.4
Hubei	198	204.7	35.9	95.3	22.7
Hunan	213	274.9	45.6	160.0	15.0
Jiangsu	997	859.0	215.7	358.5	89.6
Jiangxi	136	140.2	32.2	82.2	13.3
Jilin	36	42.9	16.1	14.6	1.5
Liaoning	151	188.2	32.6	102.1	15.3
Neimenggu	64	70.5	7.4	46.3	5.7
Ningxia	9	12.1	1.4	9.0	0.7
Qinghai	36	44.9	22.2	12.6	5.1
Shan_xi	149	176.4	43.1	48.1	16.3
Shandong	251	273.3	83.3	136.6	22.1
Shanghai	165	202.3	84.1	60.0	29.4
Shanxi	51	67.7	5.7	30.3	10.5
Sichuan	275	265.5	93.2	97.8	33.2
Tianjin	212	400.0	131.0	104.1	28.4
Xinjiang	121	97.4	14.9	49.0	15.5
Yunnan	171	173.7	50.2	58.2	21.7
Zhejiang	380	335.0	75.9	195.9	30.4

Table A3: Summary Statistics of City-Level Data

This table reports the summary statistics of key variables for city-level municipal corporate bond (MCB) issuance and economic conditions. Panel A reports the summary statistics of all variables over the full sample. Panels B and C report the summary statistics of MCB issuance over the 2004–2008 and the 2009–2015 subperiods. Dependent variables include MCB over GDP, MCB for repayment of bank loans over GDP, MCB for investment over GDP, and MCB for other purpose over GDP, all of which are scaled by the 2009 GDP. The main explanatory variable is stimulus bank loans, defined as 2009 bank loan over GDP minus its average value over the past five years. Control variables include fiscal deficit over GDP, fixed-asset investment over GDP, GDP growth, GDP per capita in RMB thousand, and Big-Four branch share, the former four of which are measured over 2008 and the last one is measured as of 2008/12/31. The sample period for dependent variables are from 2004 to 2015.

Panel A: Summary statistics of full sample

	Obs	Mean	SD	Min	P25	Median	P75	Max
$MCB_{i,t}/GDP_{i,2009}$	3900	0.008	0.024	0.000	0.000	0.000	0.004	0.330
$MCB^{repay}_{i,t}/GDP_{i,2009}$	3900	0.001	0.008	0.000	0.000	0.000	0.000	0.174
$MCB^{inv}_{i,t}/GDP_{i,2009}$	3900	0.004	0.012	0.000	0.000	0.000	0.000	0.277
$MCB^{other}_{i,t}/GDP_{i,2009}$	3900	0.001	0.004	0.000	0.000	0.000	0.000	0.083
$BL/GDP^{stimulus}_{i,2009}$	325	0.116	0.099	-0.476	0.063	0.100	0.156	0.810
$FD/GDP_{i,2008}$	325	0.119	0.154	-0.019	0.040	0.076	0.138	1.286
$FAI/GDP_{i,2008}$	325	0.559	0.192	0.124	0.440	0.525	0.660	1.307
$\Delta GDP_{i,2008}$	325	0.133	0.035	0.010	0.115	0.132	0.150	0.290
$GDP^{capita}_{i,2008}$	325	23.747	17.555	3.602	11.923	18.458	29.012	102.128
$BigFour_{i,2008}$	325	0.360	0.122	0.101	0.268	0.344	0.432	0.772

Panel B: Summary statistics of MCB issuance for the 2004–2008 subperiod

	Obs	Mean	SD	Min	P25	Median	P75	Max
$MCB_{i,t}/GDP_{i,2009}$	1625	0.000	0.001	0.000	0.000	0.000	0.000	0.020
$MCB^{repay}_{i,t}/GDP_{i,2009}$	1625	0.000	0.000	0.000	0.000	0.000	0.000	0.000
$MCB^{inv}_{i,t}/GDP_{i,2009}$	1625	0.000	0.001	0.000	0.000	0.000	0.000	0.020
$MCB^{other}_{i,t}/GDP_{i,2009}$	1625	0.000	0.000	0.000	0.000	0.000	0.000	0.002

Panel C: Summary statistics of MCB issuance for the 2009–2015 subperiod

	Obs	Mean	SD	Min	P25	Median	P75	Max
$MCB_{i,t}/GDP_{i,2009}$	2275	0.014	0.030	0.000	0.000	0.000	0.019	0.330
$MCB^{repay}_{i,t}/GDP_{i,2009}$	2275	0.002	0.011	0.000	0.000	0.000	0.000	0.174
$MCB^{inv}_{i,t}/GDP_{i,2009}$	2275	0.007	0.014	0.000	0.000	0.000	0.011	0.277
$MCB^{other}_{i,t}/GDP_{i,2009}$	2275	0.001	0.006	0.000	0.000	0.000	0.000	0.083

Table A4: The First-Stage Regression of the IV Estimation

This table reports the first-stage result of 2SLS regressions. $LateTerm_{2009}$ equals 1 if a province governor was not in the first two years of his or her tenure as of 2009, and 0 otherwise. Control variables include fiscal deficit scaled by GDP, fixed asset investment scaled by GDP, GDP growth, GDP per capita, and Big-Four branch share, the former four of which are measured from 2007Q4 to 2008Q3 and the last one is meausred as of 2008Q3. Heteroscedasticity-consistent standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The effective first-stage F-statistic proposed by Olea and Pflueger (2013) is also reported.

	$BL/GDP_{2009}^{stimulus}$
$LateTerm_{2009}$	0.036*
	(0.020)
$FD/GDP_{i,07Q4-08Q3}$	0.348**
	(0.161)
$FAI/GDP_{i,07Q4-08Q3}$	0.118
	(0.095)
$\Delta GDP_{i,07Q4-08Q3}$	-0.562
	(0.480)
$GDP_{i,07Q4-08Q3}^{capita}$	0.002**
	(0.001)
$BigFour_{i,2008Q3}$	0.101
	(0.153)
$F_{1st-stage}^{effective}$	3.100
Observations	30
Adj. R^2	0.259

Table A5: Documents Issued by the State Council in 2009 on Economic Development
This table lists all eight documents issued by the State Council in 2009 that are related to stimulating economic development and dealing with financial crisis. The date of release, the document number, and the document title are presented.

Date	No.	Title
2009/2/10	4	Notice of the State Council on Doing a Good Job in Employment under the Current Economic Situation
2009/3/13	8	Notice of the State Council on Issuing the Adjustment and Revitalization Plan of the Logistics Industry
2009/3/23	13	Opinions of the State Council on the Assignment of Key Work among Departments for the Implementation of the Report on the Work of the Government
2009/5/25	26	Notice of the State Council on Approving and Relaying the Opinions of the National Development and Reform Commission on Key Work for Deepening the Reform of the Economic System in 2009
2009/5/27	27	Notice of the State Council on Adjusting the Capital Ratios for Fixed Asset Investment Projects
2009/9/22	36	Several Opinions of the State Council on Further Promoting the Development of Small- and Medium-sized Enterprises
2009/9/29	38	Notice of the State Council on Approving and Relaying the Opinions of the National Development and Reform Commission and Other Departments on Curbing Overcapacity and Redundant Construction in Some Industries and Guiding the Sound Development of Industries
2009/10/10	55	Opinions of the General Office of the State Council on Coping with the Global Financial Crisis and Maintaining Steady and Properly Rapid Economic Development in the Western Area of China

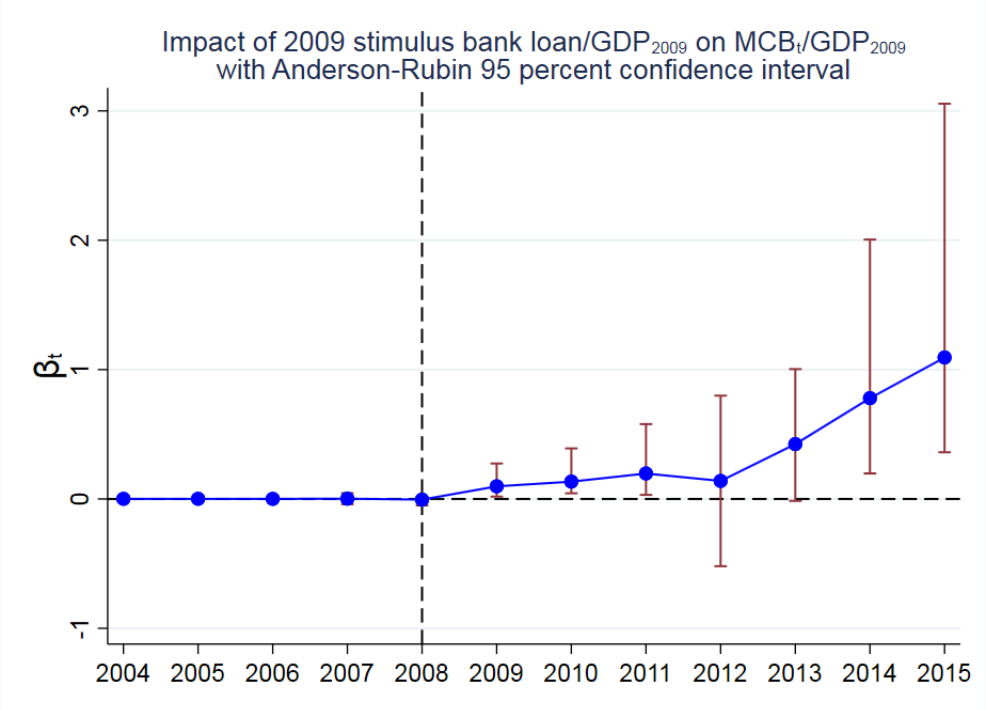

Fig. A1: Effects of Instrumented 2009 Stimulus Bank Loan on Abnormal MCB Issuance over 2009 GDP with Anderson-Rubin Confidence Intervals. This figure plots the coefficients along with the 95% AR confidence intervals for the year-by-year 2SLS regressions of abnormal MCB issuance over the 2009 GDP on the instrumented 2009 stimulus bank loan at province level. The instrumental variable $LateTerm_{2009}$ equals 1 if a province governor was not in the first two years of his or her governor tenure as of 2009, and 0 otherwise. Control variables include fiscal deficit scaled by GDP, fixed asset investment scaled by GDP, GDP growth, GDP per capita, and Big-Four branch share, the former four of which are measured from 2007Q4 to 2008Q3 and the last one is meausred as of 2008Q3.

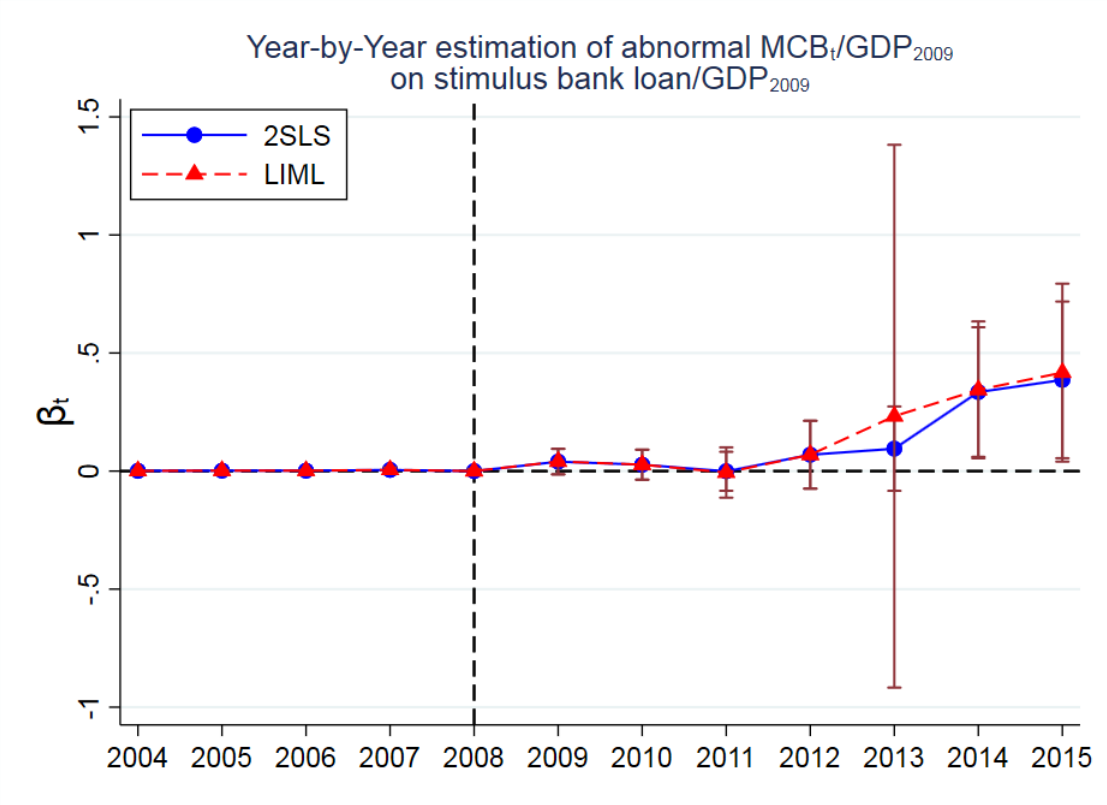

Fig. A2: Comparison of 2SLS Estimator and LIML Estimator. This figure plots the coefficients along with the 95% confidence intervals for the 2SLS and LIML estimators of abnormal MCB issuance over the 2009 GDP on the instrumented 2009 stimulus bank loan at city level. Two instrumental variables $LateTerm_{2009}$ /$LateTerm_{2009}^{mayor}$ equal 1 if a province governor/city mayor was not in the first two years of his/her tenure as of 2009, and 0 otherwise. Year-by-year 2SLS and LIML regressions are conducted with control variables including fiscal deficit scaled by GDP, fixed asset investment scaled by GDP, GDP growth, GDP per capita, and Big-Four branch share, the former four of which are measured in 2008 and the last one is measured as of 2008/12/31.