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Robert Dekle and Andrew Tsang

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Chinese Local Bond Spreads, Monetary Policy and "Misallocation"

Robert Dekle[*]
University of Southern California

Andrew Tsang
Hong Kong Institute for Monetary Research

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Abstract

We examine the impact of Chinese monetary policies on excess local bond yields (the spreads over Chinese government bonds), on local bonds issued by Chinese local government entities. We find that an expansion in M2 generally raises the excess yields on bonds issued by local government entities, and the impact is amplified for bonds issued by the local governments. This last category is considered as as having a high degree of existing resource misallocation. Our estimation results confirm that excess yield on local bonds can be an indicator of market risk of local government debts and the financial efficiency of local governments.

Keywords: Chinese local bonds, local government, money policy, misallocation
JEL classification: G12, E50, H81

*Email addresses: Dekle: dekle@usc.edu, Tsang: ahctsang@hkma.gov.hk,

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1. Introduction

This paper performs a series of quasi-empirical experiments to answer three inter-related questions in the Chinese economy. Assume for the moment that the expansion in Chinese money supply (M2) is exogenous. What is the impact of this increase in the quantity of money on the misallocation of resources, the riskiness of Chinese local government debt, and the spread in Chinese local government bond yields (over Chinese sovereign bonds)? The answer is that the increase in monetary expansion induced liquidity raises the misallocation of resources; increases the riskiness of Chinese local debt; and raises the spread in local bond yields. While these and related questions have been raised in several recent papers, this is the first paper to relate all three questions in one empirical setting. The objective of this paper is not to develop a model of Chinese bond spreads and monetary policy, but to develop reasonable estimates relating to bond spreads, monetary policy, and resource misallocations across provinces in China.

Total borrowing by the Chinese government comprises over 50 percent of Chinese GDP (Asian Development Bank, 2015). In China, unlike in industrialized countries, local government debt is larger than central government debt. Borrowing by Chinese local governments is about 30 percent of Chinese GDP. The size of Chinese local government debt is over US$3 trillion, which makes it one of the largest debt loads in the world.

Global investors are concerned about Chinese local government debt not only because of the size of the debt, but also because of the risks. As China's economic growth slowed after 2009 and again after 2015, many local governments chose debt-fuelled spending to attack the problem and stimulate their local economies. Much of this spending was in construction and land development, and there is a view that consequent land price appreciations were not always underpinned by economic fundamentals (Wu, Gyourko, and Deng, 2015). If land prices collapse, the return on these local government investments would be small or negative, and local governments would have trouble paying back their debt. There are also other cases in which Chinese local governments either directly or indirectly engaged in investment projects that yield small or negative economic rates of return (Hsieh and Song, 2015).

Among the components of the Chinese local government debt, only the local bonds issued by the local government entities, including the bonds issued by the local governments and local SOEs, are traded on the exchanges and can be evaluated based on market information. Other debt, such as local government borrowing from Chinese commercial banks, is hidden from public view. In this paper, we focus on the risk in the Chinese local bond market, specifically on the rise in the risk of local bonds in response to a change in Chinese monetary policies.

We measure the rise in the riskiness of the Chinese local bond market by the increase in the interest rates spread of local bonds over Chinese sovereign bonds of similar maturity. Normally, a rise in money supply on liquidity will lower the spreads on local bonds. Local government bonds are illiquid, and a rise in market liquidity should stimulate demand in relatively illiquid bonds and lower their relative yields (Chen, He, and Liu, 2017). However, we find that the excess yields on Chinese local bonds increase whenever there is an increase in money supply. We relate this monetary-policy-induced rise in risk to the "misallocation" of capital within Chinese provinces.

There is now a great deal of literature on how the "misallocation" of capital results in lower productivity (see Restuccia and Rogerson (2017)). Much of this literature uses Chinese accounting data from manufacturing censuses (Hsieh and Klenow, 2009). However, accounting data are prone to measurement errors, which may result in biases, especially when measuring changes, such as the change in the "misallocation" caused by an increase in money (liquidity) (Bils, Klenow, and Ruane, 2017). Measurement errors are magnified when taking first-differences (Pischke, 2007). It would be much better to have a market based measure of the effects of changes in capital misallocation that are immune from the measurement errors.

In this paper, we provide such a market based indicator of misallocation. We examine the excess yields of local bonds, that is, the yield to maturity of local bonds exceeding that of central government bonds. We examine how changes in M2 interacted with indicators of "misallocation" impact the excess yields of the bonds issued by public entities in that locality.

For instance, suppose there is an expansion in money supply resulting in an increase in aggregate credit. A state-owned enterprise in, say, Liaoning province may decide to issue bonds and use the proceeds to invest in an existing steel plant. The steel plant suffers from excess capacity, and the

additional investment will in expected value result in negative profits. Given that bond buyers know this fact, the buyers will demand a higher yield on these bonds, raising their excess yields. The excess yield increases because the default probability of the Liaoning-based state-owned enterprise increases.

We examine three indicators that may influence the misallocation of capital within a province. First, we use the extent of past capital misallocation in the province. Second, we use the prevalence of state-owned enterprises within the province. And third, we use the extent of political corruption within the province. For most specifications, we find that as a province's indicator of misallocation rises, the aggregate money supply jump increases the excess yields of the government related entities in the province.

Literature Review.

Two papers most clearly related to this paper are by Ang, Bai, and Zhou (2016) and Chen, He, and Liu (2017). Ang, Bai, and Zhou (2016) focus on how real estate values and political corruption affect the excess returns on "Chengtu" bonds, or local bonds collateralized by real estate. Chen, He, and Liu (2017) focus on the consequences of the 4-trillion yuan stimulus package in 2009 and its effect on the Chinese local bond market, while not being concerned on the effects of the stimulus on the excess yields of local bonds per se. While our sample includes the 2009 stimulus episode, we are also concerned with the entire period up to 2016, when Chinese monetary policy was more normalized. Another paper contributing to the important policy literature on how institutional shortfalls in the Chinese economy may result in lower future economic growth and how expansive fiscal and monetary policies may exacerbate this decline in growth is Bai, Hsieh, and Song's forthcoming paper.

This paper also contributes to the large and growing literature on misallocation in general and China specifically (Hsieh and Klenow, 2009). Recently some papers have argued that what observationally looks like misallocation may be just an artefact of the transition path owing to capital adjustment costs (David and Venkateswaran, 2017; Asker, Collard-Wexler and DeLoecker, 2014). By relating the extent of misallocation to differences in observed characteristics across provinces over the long run, we show that misallocation is not just a transitory phenomenon, but more of a structural longer-run phenomenon in China that has real costs, influencing default probabilities.

Finally, this paper relates to the international macroeconomics literature on how a sudden surge in liquidity can raise the misallocation of capital and lower future productivity (Gopinath, *et. al.*, 2017). This paper also relates to the literature on how quantitative monetary policies can affect economic efficiency and excess bond yields. China had a long history of carrying out monetary policy by targeting the supply of money and credit, rather than targeting short-term interest rates. Recently, in China, the targeting of money has been criticised since it often relies on blunt instruments to control the growth of bank lending such as explicit credit controls and moral suasion, rather than relying on price-based instruments such as interest rates. After the financial crisis, however, several industrial countries have tried more quantitatively-oriented monetary policies, and there has been concern about how these new policies are distorting the allocation of capital (Kurtzman and Zeke, 2017). Our paper finds that in China, if prior institutions are predisposed to misallocate capital, then a rise in money supply will worsen the misallocation of capital.

The rest of this paper is organised as follows. Section 2 describes the development and data sources of Chinese local bonds. Section 3 summarizes the Chinese monetary policy tools. The linkage between monetary policy, misallocation and bond spreads is discussed in Section 4. Section 5 discusses the empirical framework, while the panel regression results are presented in Section 6. Section 7 concludes.

2. Chinese Local Bonds

Chinese local bonds issued by local government entities can be divided into local state-owned enterprise (LSOE) bonds and local government (LG) bonds directly issued by the local governments. The local state-owned enterprise bonds can in turn be divided into local construction (or “Chengtu”) bonds and other local state-owned enterprise bonds.

Local SOEs (LSOE) are companies that are at least partially owned by the local governments and engage in businesses that provide private goods to the market such as mining, finance, automobiles and clothing. Our data set includes all SOEs not owned by the central government, and Chengtu bonds. These firms can issue bonds as well as borrow directly from the banks.

Chengtu bonds are issued by local government financing vehicles (LGFV) through which Chinese municipalities raise funds to add to the budget transfers they receive from the central government. These bonds must be collateralised by local government assets such as land use rights, toll highways, and subway systems. LGFVs may be started to finance specific projects such as constructing industrial zones or building a road, or to finance an unspecified set of infrastructure projects. LGFVs may also be started to finance social services projects such as education, healthcare, and poverty programs in municipalities. Chengtu bonds expanded substantially from 2010 in response to the change in regulations to combat the global financial crisis, which saw the central government encourage local governments to establish and borrow through LGFVs.

To curtail rampant infrastructure spending and land price appreciations in recent years, the central government, starting from 2010, passed laws to prohibit local governments from guaranteeing Chengtu borrowing from all sources, including from bond issuance. Local governments were required to secure approval before investment in infrastructure projects. Consequently, Chengtu bond issuance started to decline from 2015.

LGFV and LSOE bonds are not explicitly guaranteed by the local or central governments. There is uncertainty whether LGFV and LSOE bonds are even implicitly insured by the governments, although there have been many cases where failing LSOEs received capital injections from the governments. While the central government has also in the past been willing to step in with new budget laws and debt swap programs to ease the LGFV debt burden, the central government has announced with increasing urgency that this support will not continue.

The Budget Law of 1994 made it illegal for local governments to run budget deficits, but to combat the 2009 global financial crisis, the central government started to allow local governments to use all sources of funds, including bank borrowing, land sales and budgetary revenues to fund local investment projects. Gradually, local governments were also allowed to issue bonds. Initially, these bonds were issued by the central government (by the Ministry of Finance) on behalf of the local governments, but since 2011, specific local governments have been allowed to issue their own bonds. Again, whether these bonds are explicitly guaranteed under all states of nature by the central government is unclear. Presumably, the state of the central government guarantees is stronger for LG bonds issued before 2014. Since 2015, the central government has required that LGFV bonds issued

for social welfare purposes or to supply public goods must be classified as LG bonds instead of Chengtu bonds. This requirement also contributed to the relative decline in the issue of Chengtu bonds relative to the issuance of local government bonds starting in 2015.

Close to 45 percent of Chinese local bonds are traded on the interbank exchanges, where the dominant participants are the Chinese commercial banks. Thus, most of the local bonds reside on the balance sheets of the Chinese commercial banks. The rest of the stock of local bonds are traded on the listed exchanges of Shanghai and Shenzhen and on the Over the Counter (OTC) market.[1] Participants in these markets include Chinese commercial banks and insurance companies and institutional investors, including foreign investors.

Chinese Local Bonds and Sovereign Risk

Given that the financing of Chinese local governments increasingly depends on local bonds, much attention has been recently paid to Chinese local bonds, especially to Chengtu bonds. The entire stock of Chinese local bonds accounts for more than half of the stock of total Chinese local government debt.[2] The bulk of local government debt is in the form of bank loans, mostly from Chinese commercial banks.

The scale of local government debt is huge. Unlike in other major countries, where central government debt is larger than local government debt, in China local government debt is higher, comprising over 30 percent of national GDP, compared with central government debt which comprises a little over 20 per cent of GDP.

Since commercial banks and their affiliates, such as trust companies, are also the largest holders of Chinese local bonds, a collapse in Chinese local government finances would have severely negative aggregate consequences on the Chinese economy, through their effect on commercial bank balance sheets. Since commercial loans to Chinese local governments are not traded and priced to market, we can only indirectly infer the aggregate distress on the Chinese commercial banking system from a Chinese local bond collapse, by observing the risk in the Chinese bonds that are traded on the

[1] In China, transactions on the OTC market can be conducted at the counter of commercial banks. There are very few bonds traded in the OTC market. In our sample, only 9 local bonds are traded over the counter.
[2] In 2013, among the local government debt, around 10% from LG bonds, and 20% from LSOE bonds (including Chengtu bonds), according to the information from Asian Development Bank, 2015 and WIND. According to the latest estimate by Chen, He and Liu (2017), the share of local bonds has increased to more than half of local government debt in 2016.

exchanges. Widening spreads on the Chinese local bonds may serve as an early warning signal of rising Chinese sovereign market risk.

Chinese Local Bonds: Data Sources

Market prices and yields to maturity (YTM) exist only for the local bonds traded on the interbank, listed, and OTC markets. We obtain data for bonds traded on the markets from WIND, a commercial data service widely used by financial market participants. As noted by Ang, Bai and Zhou (2016), market liquidity in the Chinese local bond markets was low until 2007. Therefore, we choose our sample to cover the relatively liquid period from 2007 to end-2016. The WIND data only include bonds that have not yet reached maturity. Matured bonds are excluded from the sample.

Table 1 depicts the outstanding stock of Chinese local bonds by year (from WIND). Of the state-owned firms, only those that accessed the bond markets to borrow are included in our sample.[3] In the interbank and exchange markets, Chengtu bonds started to become larger than LSOE (non-Chengtu public-owned firms) bonds by 2010. By 2012, trade in Chengtu bonds dominated the LSOE bonds. Trade in bonds issued by LSOEs have remained small players on the bond markets.

Starting in 2012, trade in general obligation bonds issued by local governments grew rapidly. This expansion of LG bonds mostly reflects the loosening of regulations by Beijing to allow local governments to issue bonds directly to finance their local operations. Initially, only the provinces with strong local budget positions such as Shanghai, Guangdong, Shandong and a few others issued their own bonds. Gradually, the scheme that allowed local governments to issue bonds directly has been widened. The expansion of LG bonds also reflects the fact that local governments that used to issue bonds through LGFVs have switched to issuing them directly.

The outstanding balances and the remaining maturity lengths of Chinese local bonds by province in end-2016 are summarised in Table 2. Coastal provinces with high provincial GDPs such as Jiangsu and Zhejiang tend to have large amounts of SOE bonds traded on the markets. In all provinces, Chengtu bonds comprise the bulk of the SOE bonds. The balances in local government bonds are

[3] The sample includes all enterprise bonds issued by local SOE and those Chengtu bonds (issued by Urban Construction Bond) classified as company bonds in WIND.

also higher in the provinces with high GDPs. All provinces have at least some local government bonds outstanding. In our sample, the average remaining maturity of local bonds is about 5 years.

We are primarily interested in the "Excess Yields" of local bonds, defined as the spread between the "Yield to Maturity (YTM)" of the local bonds and the yield on central government bonds. Among other variables, the prices and the calculated yields to maturity are available daily for each bond. For each bond, we average the YTM over every month. We subtract from this monthly YTM, the monthly yield on 5-year central government bonds to obtain the excess yields for each local bond.[4]

The excess yields for all the local bonds traded on the interbank and listed exchanges have the wide variation in the excess yields (Chart 1). From the 10th to the 90th percentiles, the excess yields range from 1 to 4 percentage points. This suggests that market participants are not viewing Chinese local bonds as substitutes for Chinese sovereign bonds and those local bonds are not homogeneous. Moreover, market participants view central government guarantees of the local bonds as imperfect. Chinese local bonds earn different rates of return, depending on their risk characteristics.

Chart 2 shows the excess yields of the local government general obligation bonds traded on the three markets. Despite being backed by the tax and revenue generating capacity of the local governments, there is still substantial variation in the excess yields (of about 1 percent) across provinces. Some rich provinces such as Shanghai have had until a few years ago, negative excess yields, owing to their strong financial position, even relative to the central government. Given that since 2015, the local government bonds have started replacing bonds issued by LGFVs, it is important to include the local government bonds in the estimation sample, to capture the risk faced by the provinces and China overall.

For the excess yields of the local SOE bonds, which includes the Chengtu and other LSOE bonds, the median spread of these bonds relative to the 5-year Chinese sovereign bond reached their highest point in 2012, as trading in these bonds expanded and the risk associated with these bonds became more widely known (Chart 3). The variation in the excess yields of the SOE bonds is typically significantly above 4.5 percent.

[4] We calculate excess yields off the 5-year government bond, since as noted above, the maturity of local bonds centre at around 5 years.

3. Recent Chinese Monetary Policy Regimes

The People's Bank of China (PBoC) uses multiple monetary policy instruments. These policy instruments include changing the central bank lending and commercial bank reserve requirement ratios, the setting of bank deposit and lending rates, the establishment of annual quantitative targets for credit and money (M2) growth, and more recently, the setting of short-term money market instruments such as the 7-day Repo rate.

Traditionally, the PBoC has been highly reliant on administrative and quantity based policy tools. Until 1998, the PBoC strictly controlled total credit growth of the entire commercial banking system. In 1998, the PBoC officially switched to controlling M2 growth, which, given the level of bank reserves, is akin to controlling total credit growth. At the beginning of each year, the PBoC, in concert with the central government, plans the rate of M2 growth for the coming year. The PBoC then adjusts the rate of M2 growth quarterly, in response to new information, primarily to inflation and GDP, but also to other indicators. Recently, open market operations have been the primary instrument used in adjusting M2.[5]

In addition to official controls on the growth of M2, post-1998 the PBoC has continued to rely on quantitative lending quotas to commercial banks. These quotas were implicit, and were known as "window guidance" (Chen, Funke, Lazer, and Tsang, 2017). In practice, in addition to implicit PBoC lending quotas to commercial banks, this guidance also included "moral suasion" or applying pressure to banks to adjust their lending, both in the aggregate and to specific sectors, so that PBoC money supply and credit goals are met.

Much attention has been paid to the PBoC's recent gradual moves to more market oriented monetary policies. Since 2013 and 2015, the PBoC has in principle allowed commercial banks to set their own lending and deposit rates. In 2013, the PBoC provided liquidity on a short-term basis through repurchase agreements, thereby making the 7-day Repo interest rate the de facto indicator of the PBoC's monetary stance.

[5] In carrying out its open market operations, the PBoC purchases and sells short-term central government bonds and bills issued by the PBoC. Central bank bills were issued by the PBoC in 2002 to deal with the inadequate supply of government bonds at the time. In addition, high quality bonds issued by SOEs and by private corporations are sometimes used in open market operations.

Still, it is the view of some that the PBoC has continued to exercise quantitative controls on money supply and credit. Under the guise of macro prudential policies, since 2011, the PBoC — after reviewing a wide range of criteria such as capital adequacy, asset growth, and liquidity of the banking system — has been putting a sharp brake on the growth of bank credit and loans.

Chart 4 depicts the year-on-year growth rates in nominal money supply and in nominal credit. At the onset of the international financial crisis in early 2009, both money and credit grew sharply for about a year. The growth in money and in credit slowed during 2010 and decreased sharply in 2011. The sharp slowdown in M2 growth in 2011 reflects the PBoC's (and the Chinese government's policy) of curtailing the rapid increase in property prices by cutting back credit. The trend growths in M2 and in total credit have returned to "normalcy" (that is, what prevailed pre-2008) since 2011.

As Chart 4 shows, actual growth in M2 is sometimes way off from the M2 growth targeted at the beginning of the year. Between April 2009 and January 2010, the actual growth in M2 was much higher than the M2 growth targeted for the coming year in January 2009. This of course is the result of the PBoC's aggressive response to the global financial crisis. As the crisis dissipated for China, the PBoC sharply cut back on M2 growth. Nominal credit behaves very similarly to nominal M2.

4. Monetary Policy, Misallocation, and Rising Bond Spreads

Our empirical work is guided by recent studies that show how a financially constrained commercial bank helps facilitate the financing of capital by entities. In theory, intervention in financial markets by the central bank affects the quantity and distribution of assets of the commercial banks (Gertler and Karadi, 2011; Kurtzman and Zeke, 2017). As part of the change in the distribution of assets from an increase in central bank injection of reserves, commercial bank loans to non-financial institutions such as firms and local public entities increase.

Our bond market data covers three local public entities that raise funds in the Chinese bond markets: the local governments, the local government financing vehicles, and the other local state-owned enterprises. The funds raised from the bond markets, together with commercial bank borrowing by

these three entities, are used to fund local real investment projects such as land development, housing, factories, bridges and roads.

Figure 1 outlines the scheme linking changes in M2 with the bond issuance by the three local public entities and their local real investment projects. Suppose that the PBoC increases M2 by performing open market operations, buying short-term bills from commercial banks for an increase in reserves. When the PBoC injects reserves into the commercial banking system, lending by commercial banks to local governments could increase. While abbreviated from Figure 1, Chinese commercial banks can also lend directly to local government financing vehicles and local state-owned enterprises. In addition, commercial banks can open accounts on behalf of clients and lend to “trust” companies and other non-bank financial institutions.

Besides the increased lending, the commercial banks use their increased reserves from the PBoC monetary injection to buy bonds from the local government, LGFVs and other local SOEs on the exchanges. As noted above, trust companies, other non-bank financial institutions and foreign financial institutions participate in these bond markets as well.

The local government, LGFVs, and other local SOEs use part of the proceeds from bank borrowing and the issuing of bonds to fund investment projects. How should the funds be allocated to different investment projects? For efficiency, in a perfectly competitive private market setting, the return on capital investments should be equalised among projects. If the marginal productivity of capital is higher in project 1 compared to project 2, then capital should be allocated to project 1 until the returns to capital in the two projects are equated. If they are not equated, then there is some inefficiency and capital is misallocated.

There is now a huge amount of literature on how the misallocation of capital and other resources causes efficiency and productivity to be lower than otherwise (see Restuccia and Rogerson, 2017). There are many reasons why capital and other resources may be misallocated, Including the tax code and regulations; market frictions such as those in the capital market; discretionary behavior by the government that penalize specific firms and reward others — so-called “crony capitalism”; or a combination of the above and more.

Given that these are local government entities, profit maximization may not be their primary criterion for choosing investment projects. Their goal may be to increase social welfare, such as maintaining social stability, which may be compromised if there is widespread unemployment. For example, during the global financial crisis, the goal of local government was to maintain jobs in the locality. The goals that are not oriented towards profit maximisation, combined with a multitude of regulatory constraints and capital market imperfections, imply that an increase in M2 in China may lead to misallocation of capital. Given that it is difficult to pin down what is causing the increase in the misallocation of capital when money supply increases in China, we examine three indicators that may affect misallocation within a province: 1) the past misallocation of capital in the province; 2) the prevalence of state-owned enterprises in a province; 3) and the extent of public corruption in a province.

We need to relate how the misallocated investment by the local government entities results in widening bond spreads. If central government guarantees of Chinese local bonds were perfect, then there will be no spreads between the bonds. The existence of cross-bond and cross-provincial spreads implies imperfect guarantees of the bonds.

In the sovereign debt literature, widening bond spreads are related to a rising risk of default. For example, in Aguiar and Gopinath (2006), when a country's debt rises, default probabilities increase and interest rates rise in tandem. It is straightforward to write sovereign debt models where a negative TFP shock — a rise in misallocation -- will result in increasing bond spreads. Of course, the underlying assumptions of sovereign debt models differ from the situation in Chinese provinces. In sovereign debt models, countries are cut off from further borrowing if they default, but it is unclear what punishments provinces face if they fail to pay back bond holders.

In China, for example, in the 2016 bankruptcy of Dongbei (North-eastern) Special Steel, the second largest local SOE in Liaoning province, the main reason for its collapse was excess capacity and overproduction. Finally, there were defaults in a series of at least nine bonds issued by the corporate.[6] After near a year of negotiation between creditors and bankrupt Dongbei Special Steel, an agreement on restructuring has been reached. Under the agreement, Dongbei Special Steel will fully repay every unsecured creditor holding (including the bond holders) no more than RMB500,000. Creditors holding

[6] "China's Dongbei Special Steel defaults for the ninth time in 2016, restructuring looms", Reuters, September 26, 2016. http://www.reuters.com/article/us-china-debt-dongbei/chinas-dongbei-special-steel-defaults-ninth-time-in-2016-restructuring-looms-idUSKCN11W16K

more debt than this amount can choose to receive either repayment in cash with 22.09% of debt principal or a debt-for-equity swap.[7]

Here, we make the reasonable assumption borrowing from the sovereign debt literature that a rise in provincial bond spreads reflect the increasing probability that the government bonds issued in the province will default, and that the default probabilities rise as the local governments make more "misallocated" investments.[8]

5. Empirical Framework

We adopt the "difference-in-difference" framework in a panel data setting to estimate how the extent of "misallocation within a province will influence the impact of M2 changes on the excess returns of local bonds (LB).

Our baseline specification is the following:

$$ExRet_{itk} = \beta M2_t + \varphi M2_t * Mis_k + \alpha_k + u_{ikt} \quad (1)$$

where $ExRet_{itk}$ is the excess return of LB *i* in province *k* in month *t*; $M2_t$ is the growth in M2 in year *t*; Mis_k is an indicator of "misallocation" in province *k*; α_k is the unobserved fixed effect of province *k*; and u_{ikt} is an unobserved error term. We expect the sign of β to be positive. Normally, a rise in liquidity (M2) is expected to narrow the spread between a liquid bond (Chinese sovereign) and a relatively illiquid bond (Chinese local bonds), as the rise in market liquidity stimulates trading in local bonds. However, or story is that a rise in M2 stimulates Chinese bank lending relatively more to firms that have a high degree of past misallocation, which results in more misallocation, a rise in default probabilities, and an increase in excess bond yields.The main hypothesis being tested is that: φ>0. That is, the greater the index of misallocation in the province, the higher the excess returns of the bonds issued in the province.

[7] "Steel Company's Restructuring Draws Creditor Ire", Caixin, August 28, 2017. https://www.caixinglobal.com/2017-08-28/101136917.html

[8] Actual default rates are very low; only 0.44% of LSOE bonds defaulted over the 7 years in our sample. The first default in LSOE bonds occurred in 2015, and there has yet to be any defaults in LG bonds. However, default rates are rising, and these rising default rates can be seen in the rising spreads of local bonds.

For robustness, we use four measures for M2 growth. First, we simply use the nominal growth in M2. The next two measures control for the normal increase in M2 demand, owing to the rise in the cost of living and in real incomes. Since we are interested in the "bank lending" channel of monetary policy on excess yields, that is, the change in the supply of M2, we need to net out from our measure of M2, the natural increase in the demand for M2. The second and third measures respectively subtract the aggregate CPI inflation rate and the nominal GDP growth rate from the nominal M2 growth rate respectively. In rapidly growing economies, central banks raise the money supply to correspond with the rise in nominal GDP (Dekle and Pradhan, 1997).

In this paper, we are primarily interested in how provincial level misallocation affects the monetary policy response of the cross-sectional or cross-provincial excess bond returns. If the change in M2 growth is perfectly anticipated in every month, then given the usual rational expectations argument, a change in M2 growth will have no effect on excess bond yields. We find this possibly highly unlikely for China, given the opacity of government and monetary policymaking in general. However, to direct address this possibility, we take the deviation between the actual growth in nominal M2 and the targeted growth in M2 as the "surprise" component of the change in nominal M2 growth. We use this deviation as the fourth alternative regressor for M2 growth.

As a further robustness check, instead of M2 growth, we use the growth in nominal credit in total loans of the banking system. We also examine the effects of the gap between the growth in nominal credit and the target growth in nominal credit.

For the "misallocation" variables, we separately include three proxies for the extent of "misallocation" within provinces. We use the index of provincial level misallocation calculated by Jin, Li and Guo (Jin *et. al.*, 2016). They used the annual Chinese Industrial Enterprise database, a widely used Chinese census of individual firms, to calculate the variance of revenue based TFP ($Var_k(TFP_{jk})$ for all of the surveyed firms *j* within each province annually from 1998 to 2007. Jin *et. al.* (2016) then take the average from 1998-2007 of the revenue based TFPs. The idea is that if a province is already characterised by a high degree of misallocation, then a rise in liquidity in the province will mean that this increase in capital is likely to further worsen the misallocation; that is, there is persistence in a province's likelihood to misallocate resources.

From Hsieh and Klenow (2007) we know that if capital and labour were allocated efficiently among firms within a province, then TFP for all the firms within a province will be the same. The intuition is that in a market without distortions, resources, say capital, will be further allocated to high TFP firms driving down their marginal product of capital until all TFPRs are the same.

If a firm has persistently high TFP, it must mean that there are barriers for capital and labour to flow to the high TFP firms; that is, capital and labour are misallocated. There is too much capital and labor allocated to low TFP firms and too little capital and labour allocated to high TFP firms.

It can be shown that a rise in the variance of TFP will **lower** aggregate TFP in province *k* by a factor proportional to:

$$var(\log TFP_{jk}).$$

Thus, the Jin *et. al.* (2016) measure of provincial "misallocation" directly corresponds to lower TFP in the province.

For our second proxy for "misallocation", we use the share of a province's GDP accounted for by *State-owned* enterprises in 2007 (Fan, Wang, and Zhang, 2007). In China, market inefficiencies are higher in provinces with a high output share of state-owned enterprises, who do not necessarily respond to market signals. In a model calibrated to the Chinese economy, Dekle and Vandebroucke (2012) show that as the state-owned share of the economy contracted, China became more efficient in its allocation of resources. A rise in the state-owned enterprise-provincial output ratio should *raise* the local bond excess yields.

For our third indicator for "misallocation", we use a measure of public corruption. We compile a list of individual officials in graft investigations published on the CCDI (China Central Commission for Discipline Inspection) website. We simply use the sum of those investigated officials between November 2012 and December 2016 as our measure of the quantitative severity of local political risk.[9] We find, for example, that during this period Hubei province had the most investigated officials with 63. Beijing was third with 51 investigated officials.

[9] Ang, Bai, and Zhou (2016) show in that this measure of provincial level corruption interacted with the level of real estate investment within the province raises the excess bond yields for Chengtu bonds, which are mostly used for construction. The

Note that importantly, all unobserved fixed effects are controlled for in our estimation. That is, suppose that a culture of inefficiency and poor public management are causing state-owned firms in province *i* to have to pay high excess returns on their bond borrowing. The fixed effects estimator adopted here controls for these provincial differences that impact the provincial excess returns that persist over time, making our coefficient estimates β and φ unbiased.

There are two remaining concerns about the consistency of the estimates. First, M2 is affected both by the supply of liquidity from the PBoC and the demand for M2. In rapidly growing economies such as China, the demand for M2 automatically increases with the growth in nominal GDP. M2 is a national monetary aggregate. It does not vary by province. The interprovincial variation comes solely through the interaction of M2 with an indicator of interprovincial variation in misallocation, Mis_k. Deflating nominal M2 by nominal GDP or the CPI, as we have done, may partially control for this growth in demand if nominal M2 grows proportionately with nominal GDP or the CPI in the long run.[10] However, if there is rapid technical progress in the payments system such as with electronic money, then demand for M2 may move in more unpredictable ways.

We thus use an instrument that captures only the supply component in the movement of M2. We instrument for M2 with an indicator for "window guidance" or "moral suasion" by the PBoC. As mentioned, the PBoC engages in tactics to directly raise the total growth or contraction in loans by the commercial banking sector by applying pressure or by using a variety of unconventional monetary tools, such as changing reserve requirement ratios (Chang, *et. al.*, 2017).

Following the narrative approach of "Romer-and-Romer", Chen, Funke, Lazer, and Tsang (2017) created indicators of the PBoC's willingness to apply "moral suasion". They then classified the indicators into five discrete categories ranging from the most restrictive to the most expansive. This approach relies on reading the PBoC's Quarterly Monetary Report, and taking statements such as "drop all commercial lending restrictions" and "strongly encourage bank lending" to mean that commercial banks are being pressured to lend. Statements such as "strongly discourage lending" because of the "overheating real estate" sector are taken to mean the banks are pressured to cut

idea is that in provinces with a high amount of real estate activity, corrupt local officials channel more than the efficient amount of funds to real estate activity, leading to increased risk for the bonds backed by local real estate collateral.

[10] That is, nominal M2 is cointegrated with nominal GDP or the CPI with coefficient (1,1).

back lending. The authors show that these indicators are correlated with commercial bank loan and M2 growth. [11]

Another concern is the endogeneity in the supply of M2 by the PBoC. Like all central banks, the PBoC responds counter cyclically to economic shocks. Suppose there is some aggregate shock that lowers the GDP of province *k*, and raises the bond spreads in province *k*. If this negative shock is correlated with a decline in aggregate GDP, then the PBoC may respond counter cyclically by expanding the money supply. We may see a positive relationship between the level of misallocation in province *k* and in the expansion of M2, when this relationship is driven by the initial negative GDP shock.

We address this concern in two ways. First, to capture the provincial shocks that the PBoC may be responding to, we add additional control variables to (4). We add provincial GDP, provincial real estate investment (divided by provincial GDP), and the number of people that died of natural disasters in the province during that month. In addition to GDP growth, the Chinese government has been especially concerned about excessive real estate investment, believing that they are driven by speculation. Since local bonds are sometimes collateralized by real estate, a rise in real estate investment in addition to possibly directly raising excess yields, owing to increased risk, may also induce a monetary response by the PBoC. Also, natural disasters cause local property damage, possibly leading to changes in bond excess returns, and the response by the PBoC. We proxy the severity of the natural disaster by the number of people who died in the disaster in that month. Finally, while not necessarily affecting monetary policy, we include the budget surplus of the provincial government (divided by provincial GDP) as an additional control variable, since a deficit prone province is more likely to have difficulties paying off its bond borrowing, affecting its credit worthiness. [12]

The second way we address the possible endogeneity of M2 is by taking a measure of M2 that is purged from countercyclical effects. We take the estimate of "exogenous" M2 from Chen, Ren, and Zha (2017). Chen, Ren, and Zha estimate a regime-switching model where M2 depends on Chinese

[11] The authors estimate that the correlation between these indicators of "window guidance" and actual total loan growth of commercial banks is 0.29. The authors also find that the indicators strongly Granger-causes bank lending.

[12] Chinese provincial GDP, real estate investment, and government budget surpluses are from China Data Online. The provincial data are only available yearly, so we assume identical monthly values over the year. The number of deaths per province is from EM-DAT, the International Disaster Database. From EM-DAT, the date of the natural disaster occurring to the Chinese province is available. We assume that all deaths occurred in the month that the disaster happened.

aggregate CPI inflation and GDP and perform an in-sample forecast using the model. The residual between this forecast and the actual M2 process is by construction, orthogonal to Chinese CPI inflation and real GDP. We use this residual, "exogenous" M2, as a regressor in one of our specifications.

Finally, economists specialising in bond pricing have found that the liquidity of the bond affects its price, and its excess yield. They often use the daily bid-asks spreads of the bonds as a control for bond liquidity. While we are mostly concerned with only the long-run cross provincial properties of local bond excess yields and not their daily price fluctuations, we control for the liquidity of each bond by including its Age (since their issue date) and the Issue Amount as proxies. Konstantinovsky, Ng, and Phelps (2016) have shown that the age and the issue amounts of the bonds — commonly used proxies for bond liquidity — influence their pricing.

6. Results

This section presents the estimation results based on the model discussed in the previous section. Starting from the relationship between local bond excess yields and M2 growth, the empirical results confirm that higher growth in M2 raises the excess yields on local bonds on average for all provinces (column 1, Table 3). Arithmetically, excess yields can rise when the yield to maturity of the local bonds increase or the yields on 5-year central government bonds decline. Preliminary estimates using our data show that an increase in M2 raises both the 5-year central government bond yield and the yields to maturity of the local bonds, with the increase in the yields to maturity of the local bonds being much higher. Thus, in our findings below, the positive impact of an increase in M2 growth on excess yields is a result of large increases in the yields to maturity of the local bonds.

In Table 3, column (2), as hypothesized, we find that in provinces with a higher level of misallocation (from 1998-2007), a rise in M2 raises local excess yields. As expected, a rise in the fraction of *SOE firms* in the province raises the excess yields in the bonds in that province (column 3). We would expect the degree of corruption, as proxied by the number of convicted officials, will raise the excess yields in that province, but we find the coefficient insignificant (column 4).

The estimated relationship between local bond excess yields and real M2 growth are shown in Table 4. The real M2 growth is defined as nominal M2 growth deflated by nominal CPI growth to take account of the increase in money demand caused by the increase in the cost of living. The pattern in the coefficients is the same as in Table 3. When real money supply rises, an increase in a province's level of misallocation raises the excess yields of that province. As expected, a rise in the fraction of SOE firms raises bond excess yields when money supply increases. When money supply increases, the number of convicted officials in the province does not seem to affect the provinces' excess yields on bonds.

Alternatively, we deflate nominal M2 growth by nominal GDP growth to take account of the increase in money demand caused by the increase in real income and in the cost of living. The estimated relationship between local bond excess yields and nominal M2 growth divided by nominal GDP (Table 5) are the same as those in Tables 3 and 4.

Furthermore, we examine the relationship between local bond excess yields and actual M2 growth minus the target M2 growth, and the results are presented in Table 6. The pattern of the coefficients is the same as those in Table 3-5. In provinces with a high prior level of misallocation, the "surprise" in M2 growth increases the spread in excess local bond yields.

In Tables 7 and 8, we depict the relationship between excess bond yields and nominal credit and the gap between nominal credit and the target growth in nominal credit. The pattern of coefficients in Tables 7 and 8 are similar to the patterns in Tables 3-6. In provinces with a high level of misallocation, an increase in total bank loans raises excess local bond yields. Among different money supply and credit indicators, the models using the gap between the growth in nominal credit and the target growth in nominal credit produce the slightly higher values of R-squared. In addition, the impact of public corruption is significant only in these models.

We next instrument for real M2 growth by using the narrative indicator for "moral suasion" by the PBoC (as explained in Section 5). The results are presented in Table 9, which are consistent with the results when we use the other three indicators of M2 growth. Again, in provinces with a high level of initial misallocation, a rise in real M2 raises the excess yields of local bonds. A rise in money supply raises the excess yields on local bonds issued in provinces with a greater likelihood of misallocation.

In Table 10, we include some other control variables that may directly influence both the expansion of real M2 supply and the excess yields. The coefficients on real M2 growth interacted with provincial misallocation and the fraction of SOE firms remain the same as before. That the coefficients on M2 growth are robust to additional controls suggest that the possible endogeneity of M2 (due to countercyclical monetary policies) does not bias the estimates.

Also, a higher level of provincial GDP lowers excess bond yields, which is not surprising. Provinces that have a positive shock to growth would have an easier time to pay back their debt, lowering their excess bond yields. The size of real estate investment is insignificant. Surprisingly, a rise in natural disaster deaths in the province lowers excess bond yields. This is perhaps because in the aftermath of a large scale natural disaster, the central government often makes announcements reaffirming their commitment to help financially the disaster-affected areas, making market participants believe that the local bonds are guaranteed.

We may expect that provinces with higher provincial surpluses will enjoy a lower cost of financing. The positive coefficient on the provincial surplus variable in Table 10 may thus seem counterintuitive. However, as it is well-known, the Chinese central government engages in massive fiscal transfers among the provinces, and with such transfers, the provincial surplus position of poorer provinces may be overstated by the transfers. In fact, in the data, provincial per capita GDP and provincial budget surpluses are highly negatively correlated; that is, poorer provinces have larger budget surplus/GDP ratios. That higher budget surpluses result in higher excess returns may reflect the fact that poorer provinces have higher excess bond yields (as it is the case).

In Table 11, as our monetary growth variable, we use the exogenous component of M2 growth as estimated in Chen, Ren, and Zha (2017). Since their data are available only until the end of 2015, our sample period here is shorter than in the earlier estimates. We find again that in provinces with a higher level of initial “misallocation”, a rise in M2 results in widening excess return spreads. The coefficient on the interaction variable with the fraction of SOEs has the wrong sign, and the coefficient on convicted officials is insignificant.

As a final robustness check, in Table 12, we restrict our sample to only Chengtu bonds without option embedded features. Chengtu bonds (issued by local government financing vehicles) have recently

attracted much attention. Until about 2015, these bonds were used for local government construction projects to stimulate the economy and were considered poor credit risks. We drop bonds with option features such as call provisions, since these provisions may affect yields. Dropping non-Chengtu bonds and firms with option provisions cuts the sample down considerably.

We find that again, in provinces with a higher level of initial misallocation, a rise in M2 results in widening excess returns. The coefficient on the interaction variable with the fraction of SOEs and on the number of convicted officials have insignificant signs. (To save space, we do not depict the coefficients on “Age” and the “Issue Amount”.)

In sum, we find that in all the specifications here, an expansion in M2 in provinces with a high level of existing misallocation leads to widening excess yield spreads in those provinces. In most specifications, in provinces with a high share of SOEs, an expansion in M2 leads to widening excess yields. In most specifications, an expansion of M2 in provinces with a high number of convicted officials does not affect the excess yields.

7. Conclusion

In this paper, we provide what is perhaps the first market price based measure of the costs of “misallocation” within Chinese provinces. We show in a panel “difference-in-difference” framework that the expansionary monetary policy would increase the excess yields of local government bonds.

Specifically, for the provinces with historically high accounting measures of misallocation or with high proportions of state-owned enterprises, a rise in aggregate money supply leads to widening excess yields on bonds of the local public sector. We interpret the widening excess yields as the market requiring a higher risk premium on the bonds of the local government entities invested in projects that are misallocated. Our results are robust to many specification checks.

Table 13 provides by province, local government expenditures allocated to infrastructure spending and local state-owned enterprises. Local government expenditures on SOEs include only paid-in capital. It does not include local government guarantees — both implicit and explicit — on local

enterprise borrowing. Thus, while local government exposures to insolvent local SOEs may appear small in terms of paid-in capital, the actual exposure through loan guarantees could be quite large.

Our estimation results show that local bond yields play an important role in indicating the riskiness of overall Chinese local government borrowing. Traded local bonds are priced by the market, in contrast to other local government debt such as borrowing from banks.

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Table 1: Amount of Outstanding of Chinese Local Bonds by Year (RMB billion, year-end figures)

	A) Local SOE Bonds		B) Local Government Bonds
		of Which Chengtu Bonds	
2007	64.2	n.a.	n.a.
2008	94.7	5.7	n.a.
2009	168.9	62.2	n.a.
2010	365.5	228.1	n.a.
2011	671.3	469.6	n.a.
2012	1,496.3	1,198.8	420.6
2013	2,457.4	2,061.1	1,045.5
2014	3,777.7	3,312.6	2,245.5
2015	4,578.0	4,057.0	12,110.7
2016	6,469.4	5,895.1	27,138.9

Source: WIND.
Note: n.a. means data not available.

Table 2: Amount of Outstanding and Remaining Maturity of Chinese Local Bonds by Province (End 2016)

	A) Local SOE Bonds				B) Local Government Bonds	
			of Which Chengtu Bonds			
	Amount of Outstanding (RMB billion)	Average remaining Maturity (months)	Amount of Outstanding (RMB billion)	Average remaining Maturity (months)	Amount of Outstanding (RMB billion)	Average remaining Maturity (months)
Anhui	269.6	51.6	256.1	53.7	811.6	65.6
Beijing	244.8	50.3	209.4	54.3	2,207.2	50.6
Chongqing	310.6	46.4	306.1	47.2	567.8	68.3
Fujian	187.5	52.0	181.7	52.6	844.9	70.2
Gansu	42.2	51.3	40.6	52.7	294.7	64.3
Guangdong	265.1	66.5	207.7	62.0	1,257.6	66.5
Guangxi	125.6	50.1	112.4	50.2	640.4	68.3
Guizhou	241.2	59.6	234.1	60.4	1,370.3	66.7
Hainan	50.2	44.2	14.4	40.8	164.7	70.0
Hebei	130.9	52.7	113.1	53.6	900.8	59.1
Heilongjiang	98.9	43.9	96.3	44.1	512.6	65.7
Henan	183.2	48.7	157.9	49.9	964.5	66.4
Hubei	253.1	60.3	241.7	61.4	946.3	65.3
Hunan	461.3	59.0	444.1	60.3	1,358.8	64.8
Inner Mongolia	104.1	46.7	90.3	49.7	1,010.8	68.1
Jiangsu	973.9	47.9	938.0	48.7	2,204.1	66.2
Jiangxi	207.5	53.9	200.7	54.8	613.3	66.2
Jilin	49.1	43.5	47.9	43.1	375.6	69.9
Liaoning	267.8	49.1	250.2	50.6	1,159.4	66.8
Ningxia	26.2	49.3	12.1	67.1	191.5	68.3
Qinghai	14.6	43.2	12.0	41.8	205.7	66.5
Shaanxi	126.7	45.7	103.3	46.8	746.8	66.1
Shandong	396.2	50.9	340.1	51.2	1,611.2	67.3
Shanghai	117.4	39.7	83.5	42.1	943.5	62.3
Shanxi	116.7	51.5	69.0	46.9	399.4	69.6
Sichuan	254.3	53.2	248.8	53.9	1,342.6	67.3
Tianjin	187.8	53.9	176.6	56.1	488.1	69.0
Tibet	10.9	80.7	10.9	80.7	4.7	67.6
Xinjiang	130.9	48.6	119.4	49.0	489.8	66.9
Yunnan	152.3	41.0	140.3	41.7	926.7	66.2
Zhejiang	469.0	49.4	436.8	51.6	1,583.5	64.7
Aggregate	6,469.4	51.2	5,895.1	52.2	27,138.9	66.1

Source: WIND.

Table 3: Local Bond Excess Yields and M2 Growth

This table presents the panel regression results with provincial fixed effects of Local Bond Excess Returns on M2 and M2 interacted with various provincial level misallocation measures (including Misallocation within the Province, the proportion of firms that are State-owned within the Province, and the Number of Convicted officials). Control variables include the age of the bond (number of months since issue), the amount of bonds issued, and monthly dummy variables. Panel fixed effects estimation at the provincial level. Standard errors are clustered at the province level and corresponding t-statistics are reported in parentheses. The sample period is from July 2007 to December 2016.

	(1)	(2)	(3)	(4)
M2Growth	0.16	0.16	0.29	0.19
	(10.9)	(10.6)	(5.32)	(7.34)
M2Growth*Provincial Misallocation		0.00016		
		(20.4)		
M2Growth*FractionSOE			0.012	
			(2.44)	
M2Growth*Convicted Officials				-0.00081
				(-1.45)
Observations:	300,163	289,951	291,856	300,163
R-squared:	0.022	0.017	0.123	0.0212
Month Dummy:	yes	yes	yes	yes

Table 4: Local Bond Excess Yields and Real M2 Growth

This table presents the panel regression results with provincial fixed effects of Local Bond Excess Returns on Real M2 (deflated by CPI) and Real M2 interacted with various provincial level misallocation measures (including Misallocation within the Province, the proportion of firms that are State-owned within the Province, and the Number of Convicted officials). Control variables include the age of the bond (number of months since issue), the amount of bonds issued, and monthly dummy variables. Panel fixed effects estimation at the provincial level. Standard errors are clustered at the province level and corresponding t-statistics are reported in parentheses. The sample period is from July 2007 to December 2016.

	(1)	(2)	(3)	(4)
RealM2Growth	0.063	0.059	0.14	0.078
	(8.5)	(8.5)	(4.5)	(5.82)
RealM2Growth*Provincial Misallocation		0.0001		
		(19.2)		
RealM2Growth*FractionSOE			0.0075	
			(2.5)	
RealM2Growth*Convicted Officials				-0.0051
				(-1.64)
Observations:	236,098	228,644	229,673	236,098
R-squared:	0.022	0.017	0.123	0.0226
Month Dummy:	yes	yes	yes	yes

Table 5: Local Bond Excess Returns and M2 Growth/Nominal GDP

This table presents the panel regression results with provincial fixed effects of Local Bond Excess Returns on M2 Growth-Nominal GDP Growth (M2Gr-NomGDPGr) and M2Gr-NomGDPGr times various misallocation measures (including Misallocation within the Province, the proportion of firms that are State-owned within the Province, and the Number of Convicted officials). Control variables include the age of the bond (number of months since issue), the amount of bonds issued, and monthly dummy variables. Panel fixed effects estimation at the provincial level. Standard errors are clustered at the province level and corresponding t-statistics are reported in parentheses. The sample period is from July 2007 to December 2016.

	(1)	(2)	(3)	(4)
(M2Gr-NomGDPGr)	0.11	0.11	0.22	0.14
	(10.1)	(9.63)	(5.8)	(3.1)
(M2Gr-NomGDPGr)*Provincial Misallocation		0.0001		
		(19.2)		
(M2Gr-NomGDPGr)*FractionSOE			0.01	
			(2.73)	
(M2Gr-NomGDPGr)*Convicted Officials				-0.0008
				(-1.62)
Observations:	236,098	228,644	229,673	236,098
R-squared:	0.022	0.017	0.019	0.019
Month Dummy:	yes	yes	yes	yes

Table 6: Local Bond Excess Returns and the Gap between M2 Growth and the M2 Growth Target

The Peoples Bank of China announces the target growth rate of M2 in every year. We take the difference between this target growth rate and the actual monthly growth in M2. The table presents the panel regression results with provincial fixed effects that regresses the Local Bond Excess Returns on the difference between actual M2 growth and the target. Excess Returns on M2 Growth/NominalGDP and M2Growth/Nominal GDP times various misallocation measure (including Misallocation within the Province, the proportion of firms that are State-owned within the Province, and the Number of Convicted officials). Control variables include the age of the bond (number of months since issue), the amount of bonds issued, and monthly dummy variables. Panel fixed effects estimation at the provincial level. Standard errors are clustered at the province level and corresponding t-statistics are reported in parentheses. The sample period is from July 2007 to December 2016.

	(1)	(2)	(3)	(4)
ActualM2-TargetM2 gap	0.065	0.08	0.18	0.11
	(5.39)	(8.15)	(5.95)	(5.74)
ActualM2-TargetM2 gap*Provincial Misallocation		0.000078		
		(13.5)		
ActualM2-TargetM2 gap*FractionSOE			0.0074	
			(2.87)	
ActualM2-TargetM2gap*Convicted Officials				-0.00067
				(-1.61)
Observations:	235,368	228,644	229,673	236,098
R-squared:	0.026	0.017	0.019	0.0235
Month Dummy:	yes	yes	yes	yes

Table 7: Local Bond Excess Yields and Commercial Bank Credit Growth

This table presents the panel regression results with provincial fixed effects of Local Bond Excess Returns on Commercial Bank Credit Growth and Credit Growth interacted with various misallocation measure as Misallocation within the Province, the proportion of firms that are State-owned within the Province, and the Number of Convicted officials). Control variables include the age of the bond (number of months since issue), the amount of bonds issued, and monthly dummy variables. Panel fixed effects estimation at the provincial level. Standard errors are clustered at the province level and corresponding t-statistics are reported in parentheses. The sample period is from July 2007 to December 2016.

	(1)	(2)	(3)	(4)
CreditGrowth	0.14	0.14	0.26	0.17
	(9.95)	(9.59)	(3.81)	(6.26)
CreditGrowth*Provincial Misallocation		0.00028		
		(29.79)		
CreditGrowth*FractionSOE			0.0116	
			(1.78)	
CreditGrowth*Convicted Officials				-0.00075
				(-1.31)
Observations:	300,163	289,951	291,856	300,163
R-squared:	0.022	0.009	0.01	0.019
Month Dummy:	yes	yes	yes	yes

Table 8: Local Bond Excess Returns and the Gap between Credit Growth and the Target Credit Growth

We take the difference between the actual rate of commercial bank credit growth and the target rate of growth and include its level and its interaction with various measures of misallocation (such as Misallocation within the Province, the proportion of firms that are State-owned within the Province, and the Number of Convicted officials). Control variables include the age of the bond (number of months since issue), the amount of bonds issued, and monthly dummy variables. Panel fixed effects estimation at the provincial level. Standard errors are clustered at the province level and corresponding t-statistics are reported in parentheses. The sample period is from July 2007 to December 2016.

	(1)	(2)	(3)	(4)
ActualCredit-TargetCredit gap	0.52	0.51	0.6	0.36
	(10.91)	(10.6)	(10.7)	(5.67)
(ActualCredit-TargetCredit gap)*Provincial Misallocation		0.000033		
		(4.16)		
(ActualCredit-TargetCredit gap)*FractionSOE			0.0084	
			(1.73)	
(ActualCredit-TargetCredit gap)*Convicted Officials				0.0029
				(5.07)
Observations:	169,093	162,177	164,132	169,093
R-squared:	0.069	0.026	0.0089	0.039
Month Dummy:	yes	yes	yes	yes

Table 9: Local Bond Excess Yields and Real M2 Growth
(Instrumental Variables Estimates)

This table presents the panel regression results with provincial fixed effects of Local Bond Excess Returns on Real M2 and Real M2 interacted with various provincial level misallocation measures (including Misallocation within the Province, the proportion of firms that are State-owned within the Province, and the Number of Convicted officials). Control variables include the age of the bond (number of months since issue), the amount of bonds issued, and monthly dummy variables. Panel fixed effects estimation at the provincial level. Standard errors are clustered at the province level and corresponding t-statistics are reported in parentheses. The sample period is from July 2007 to December 2016. We use an instrument that ranges from -4 to 4, representing the "monetary stance" of the People's Bank of China. The instrument is borrowed from Chen, Funke, Lozer, and Tsang (2017) and ranges from -2 to 2, where -2 is "tight" and becomes looser as the index increases.

	(1)	(2)	(3)
RealM2Growth	0.062	0.14	0.059
	(8.85)	(4.45)	(8.51)
RealM2Growth*Provincial Misallocation		-0.0075	
		(-2.48)	
RealM2Growth*Fraction of SOE Firms			0.0075
			(2.48)
Observations:	236,098	229,673	228,644
R-squared:	0.023	0.018	0.021
Month Dummy:	yes	yes	yes

Table 10: Local Bond Excess Yields and Real M2 Growth
(With Provincial Level Control Variables)
(Instrumental Variables Estimates)

This table presents the panel regression results with provincial fixed effects of Local Bond Excess Returns on Real M2 and Real M2 interacted with various provincial level misallocation measures (including Misallocation within the Province, the proportion of firms that are State-owned within the Province, and the Number of Convicted officials). Control variables include the age of the bond (number of months since issue), the amount of bonds issued, and monthly dummy variables. Panel fixed effects estimation at the provincial level. Standard errors are clustered at the province level and corresponding t-statistics are reported in parentheses. The sample period is from July 2007 to December 2016. We use an instrument that ranges from -4 to 4, representing the "monetary stance" of the People's Bank of China. The instrument is borrowed from Chen, Funke, Lozer, and Tsang (2017) and ranges from -2 to 2, where -2 is "tight" and becomes looser as the index increases. Provincial level variables that vary over time include provincial GDP, the number of provincial natural disaster deaths provincial budget surplus over provincial GDP, and the amount of provincial real estate investment.

	(1)	(2)	(3)
RealM2Growth	0.0093	0.0059	0.21
	(0.71)	(0.42)	(3.38)
RealM2Growth*Provincial Misallocation		0.00006	
		(6.18)	
RealM2Growth*FractionSOE			0.019
			(3.61)
Provincial GDP	-0.000047	-0.00005	-0.00005
	(-2.36)	(-2.38)	(-2.78)
Natural Disaster Deaths	-0.000069	-0.000068	-0.00007
	(-1.85)	(-1.88)	(-1.85)
Provincial Budget Surplus	24.6	25	22.9
	(4.83)	(4.71)	(4.54)
Real Estate Investment	6.58E-08	6.03E-08	4.98E-08
	(-0.28)	(-0.26)	(0.22)
Observations:	65,071	63,469	63,698
R-squared:	0.037	0.053	0.038
Month Dummy:	yes	yes	yes

Table 11: Local Bond Excess Yields and "Exogenous M2" Growth

This table presents the panel regression results with provincial fixed effects of Local Bond Excess Returns on "Exogenous" M2 and "Exogenous" M2 interacted with provincial level misallocation (including Misallocation within the Province, the proportion of firms that are State-owned within the Province, and the Number of Convicted officials). Control variables include the age of the bond (number of months since issue), the amount of bonds issued, and monthly dummy variables. Panel fixed effects estimation at the provincial level. Standard errors are clustered at the province level and corresponding t-statistics are reported in parentheses. The sample period is from July 2007 to December 2015. "Exogenous M2" is a generated regressor from Chen, Ren, and Zha (2017).

	(1)	(2)	(3)	(4)
“Exogenous M2” Growth	0.008	0.0096	0.064	0.024
	(0.015)	(0.012)	(-1.84)	(1.18)
“Exogenous M2”*Provincial Misallocation		0.000033		
		(6.23)		
“Exogenous M2”*Fraction SOE			-0.0071	
			(-2.11)	
“Exogenous M2”*Convicted Officials				-0.00054
				(-1.23)
Observations:	77,204	75,438	77,204	77,204
R-squared:	0.28	0.28	0.28	0.28
Month Dummy:	yes	yes	yes	yes

Table 12: Local Bond Excess Yields and M2 Growth
(Including Only Chengtu Bonds without Option Embedded Features)

This table presents the panel regression results with provincial fixed effects of Local Bond Excess Returns on M2 and M2 interacted with various provincial level misallocation measures (including Misallocation within the Province, the proportion of firms that are State-owned within the Province, and the Number of Convicted officials). Control variables include the age of the bond (number of months since issue), the amount of bonds issued, and monthly dummy variables. Panel fixed effects estimation at the provincial level. Standard errors are clustered at the province level and corresponding t-statistics are reported in parentheses. The sample period is from July 2007 to December 2016.

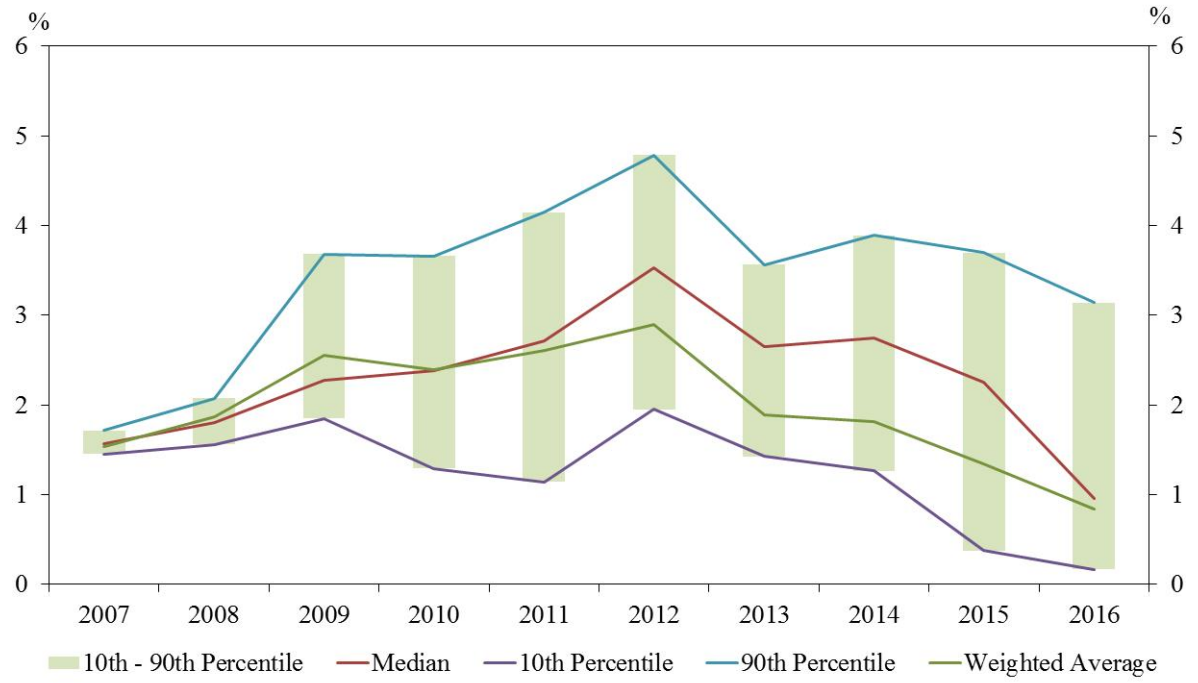
	(1)	(2)	(3)	(4)
M2Growth	0.14	0.14	0.18	0.14
	(6.13)	(6.08)	(3.89)	(3.68)
M2Growth*Provincial Misallocation		0.00017		
		(12.75)		
M2Growth*Fraction SOE			0.0042	
			(0.65)	
M2Growth*Convicted Officials				0.00016
				(0.21)
Observations:	7,310	7,310	7,248	7,310
R-squared:	0.086	0.063	0.098	0.082
Month Dummy:	yes	yes	yes	yes

Table 13: Local Government Investment on Infrastructure and SOEs (By Province, 2016 Figures)

Province	Infrastructure[1]	SOEs[2]
Anhui[3]	18.8%	2.4%
Beijing	26.3%	0.6%
Chongqing	30.4%	1.3%
Fujian[4]	32.2%	0.8%
Gansu	29.9%	0.9%
Guangdong	26.5%	1.2%
Guangxi	26.6%	0.4%
Guizhou[5]	23.3%	0.9%
Hainan	31.4%	0.3%
Hebei	29.5%	0.7%
Heilongjiang	30.7%	1.2%
Henan	25.8%	0.7%
Hubei	29.1%	0.2%
Hunan	25.9%	0.7%
Inner Mongolia	30.1%	0.1%
Jiangsu	32.7%	0.6%
Jiangxi[3]	41.3%	1.0%
Jilin	30.4%	0.1%
Liaoning	22.7%	1.2%
Ningxia	34.0%	0.3%
Qinghai	35.8%	0.03%
Shaanxi	27.2%	0.9%
Shandong	28.3%	0.6%
Shanghai	28.5%	1.0%
Shanxi[3]	38.6%	1.7%
Sichuan	29.5%	0.7%
Tianjin	20.6%	0.3%
Tibet	34.1%	0.01%
Xinjiang	58.6%	0.1%
Yunnan	30.3%	0.2%
Zhejiang	30.0%	0.4%

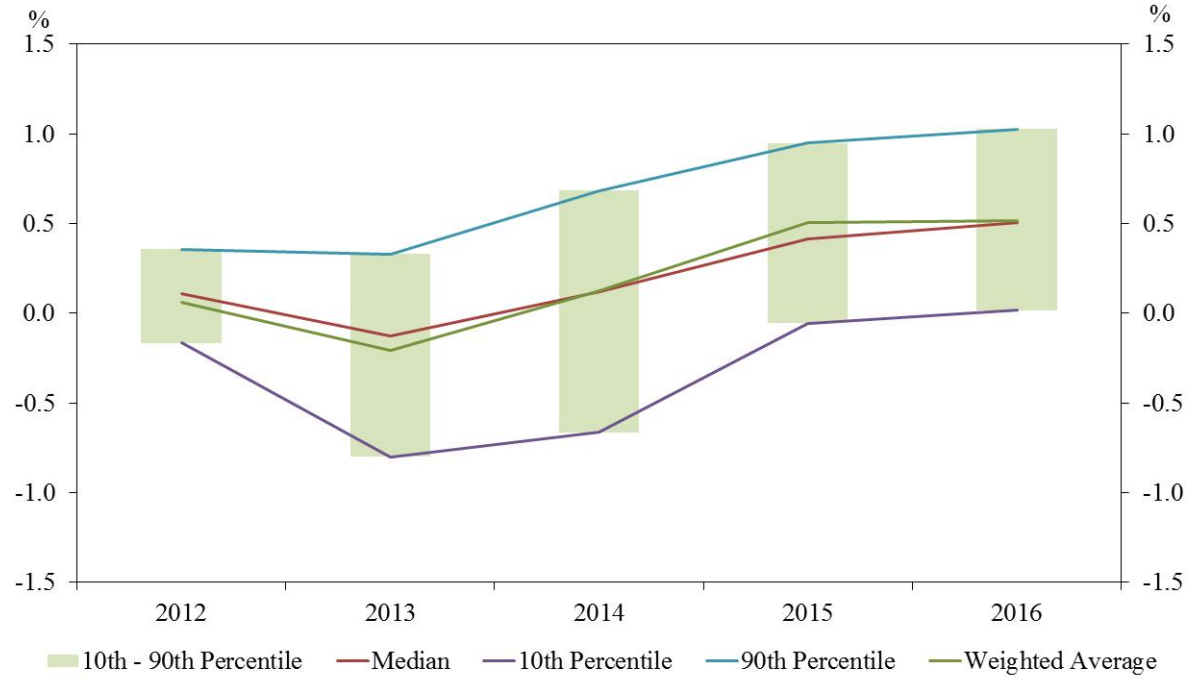
Sources: Provincial Statistical Yearbook, Reports from various Provincial Finance Bureau and WIND.
Notes: 1) The local government investment in infrastructure is proxied by the share of expenditures in infrastructure to the total government expenditures in all levels of governments at or below the provincial level. The total government expenditures include general fiscal expenditure, expenditure of local government funds and the operating expenditures of state-owned capital (i.e., the expenditure for SOEs). The expenditures in infrastructure included the fiscal expenditures on "Energy Saving and Environmental Protection", "Affairs of Agriculture, Forest and Irrigation", "Transportation" and "Resource Exploration, Power Information and Other Affairs", and a half of expenditure of local government funds (since the detailed breakdown of expenditure of local government funds are not available for most of the provinces, we assume a half of these expenditures are for infrastructure). The figures are latest available figures (2016 figures), unless specified.
2) The local government investment in SOEs is proxied by the share of the operating expenditures of state-owned capital to the total government expenditures in all levels of governments at or below the provincial level.
3) Figures for Anhui, Jiangxi and Shanxi are proxied by the figures of provincial level government only.
4) Figure for Fujian's local government investment in infrastructure is 2015 share.
5) Figure for Guizhou's local government investment in SOEs is proxied by the figure of provincial level government only.

Chart 1: Excess Yields of the local bonds (LG Bonds and LSOE Bonds) in the Secondary Market by Year



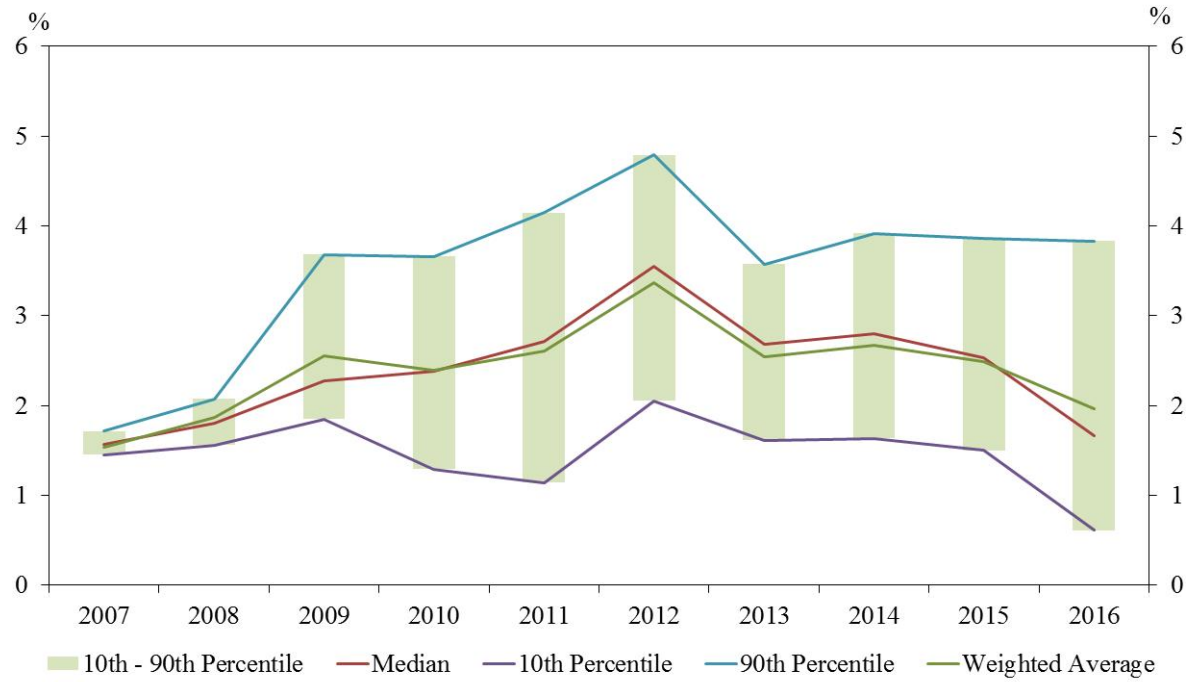
Source: Author's calculation based on data downloaded from WIND.
Note: The weighted average is weighted by the issuance amount of the bonds.

Chart 2: Excess Yields of the LG Bonds in the Secondary Market by Year



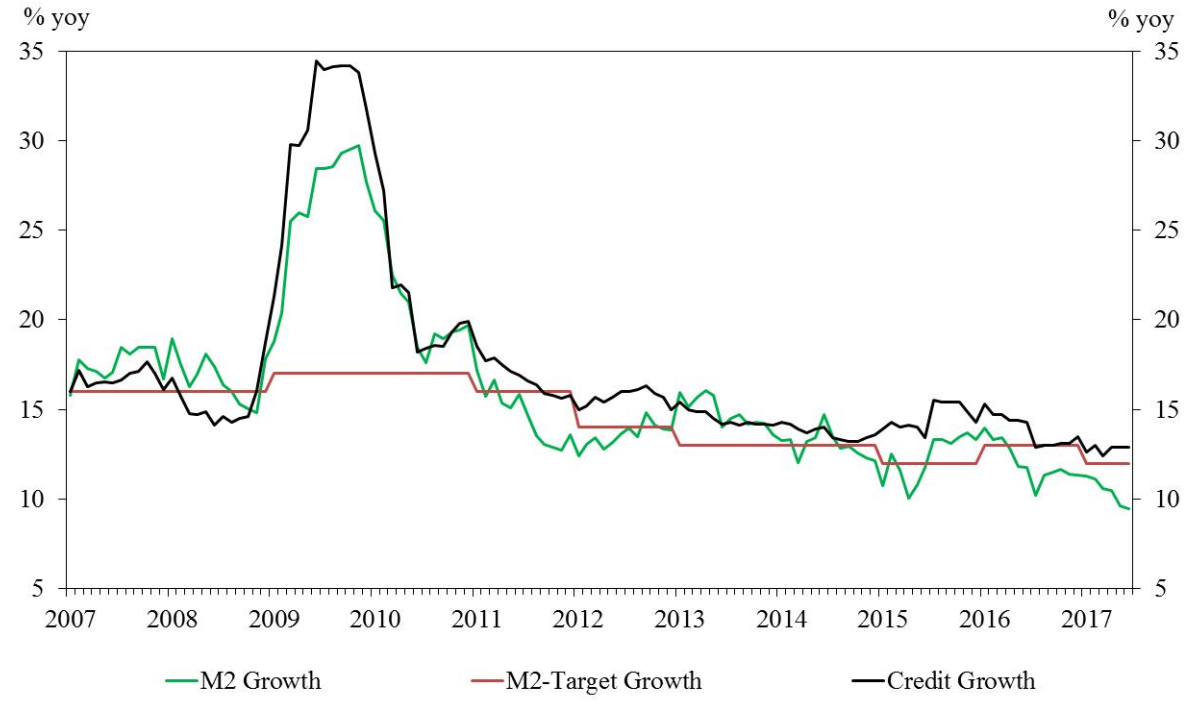
Source: Author's calculation based on data downloaded from WIND.
Note: The weighted average is weighted by the issuance amount of the bonds.

Chart 3: Excess Yields of the LSOE Bonds in the Secondary Market by Year



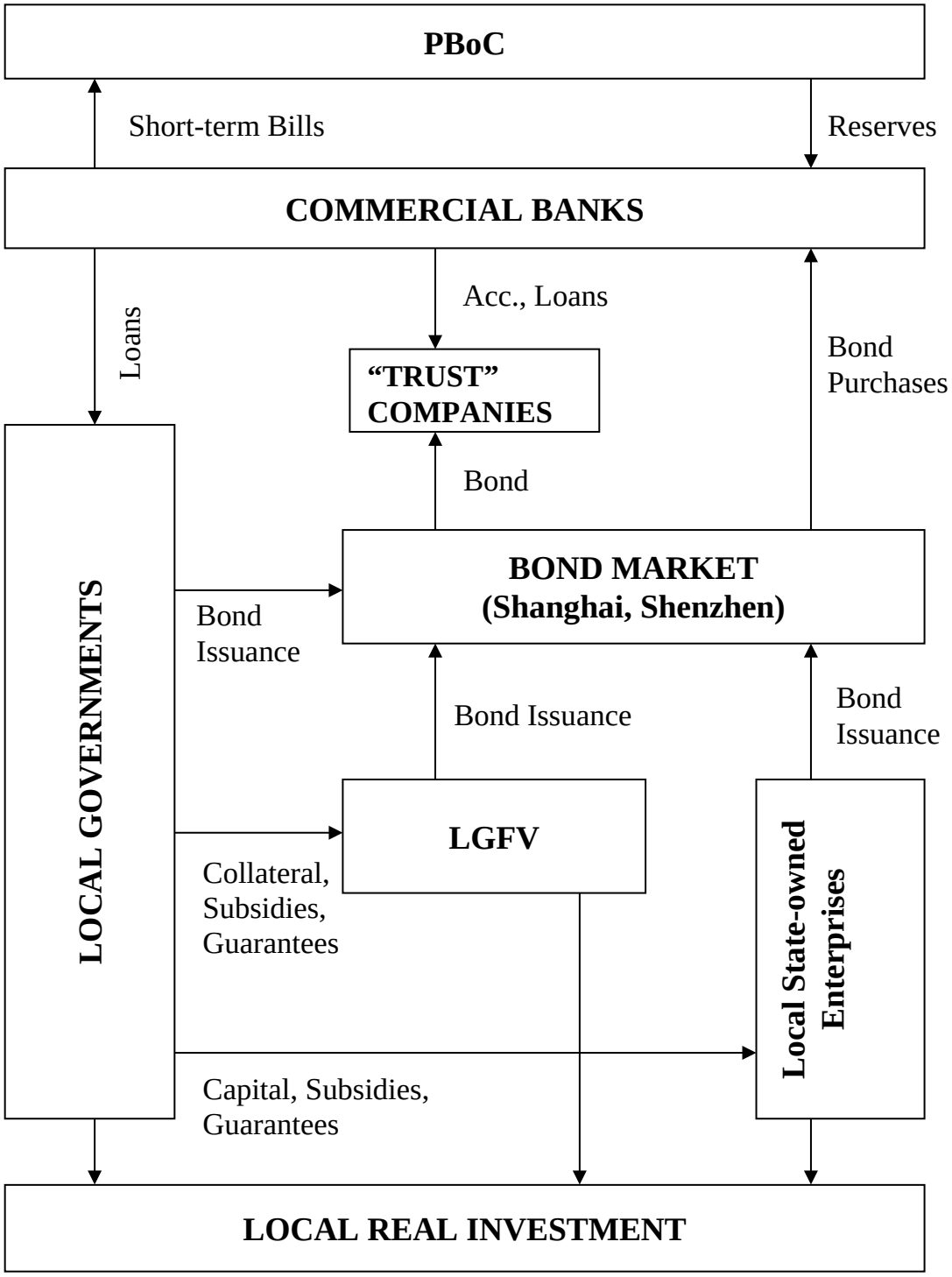
Source: Author's calculation based on data downloaded from WIND.
Note: The weighted average is weighted by the issuance amount of the bonds.

Chart 4: Growth in China's Money Supply and Credit



Sources: People's Bank of China and WIND.

Figure 1


PBoC
Short-term Bills
Reserves
COMMERCIAL BANKS
Loans
Acc., Loans
Bond Purchases
"TRUST" COMPANIES
Bond
LOCAL GOVERNMENTS
BOND MARKET (Shanghai, Shenzhen)
Bond Issuance
Bond Issuance
Bond Issuance
LGFV
Local State-owned Enterprises
Collateral, Subsidies, Guarantees
Capital, Subsidies, Guarantees
LOCAL REAL INVESTMENT