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Markets Price Politicians: Evidence from China's Municipal Bond Markets

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Abstract:

Markets not only allocate resources, but may also punish or reward politicians for economic performance. In this paper, we study China's municipal bond markets and find that bonds issued by more competent mayors enjoy lower interest rates. Our simultaneous equation estimation finds that mayors' abilities—measured by their personal contributions to their cities' economic growth—affect bond prices by pushing the investors' supply of funds outward. An increase of one standard deviation in a mayor's ability lowers investors' asking price by 0.13 percentage point, which amounts to a savings of 42 million yuan during a mayor's tenure. We also find that ability has stronger impacts in the first year of a mayor's tenure and on bonds issued by lower-rating issuers or by economically or financially less developed cities. These findings suggest that the market can play a role in promoting good governance.

Keywords: politicians' ability, municipal bonds, executive constraints

JEL classification: G12, H11, P43

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1. Introduction

One of the channels for a market to efficiently allocate resources is to reward the more competent market participants. Politicians directly or indirectly participate in the market, but no one has studied whether the market rewards more competent politicians. This paper does so by studying China's municipal bond markets. Specifically, we study whether investors give a yield premium to bonds issued by more competent mayors. We conduct this study with two aims in mind.

First, our study supplements the existing literature on China's political selection. In a democratic society, politicians' personal abilities within public service are recognized by voters and rewarded by winning elections (Besley 2005; Dal Bo et al. 2017). In a nondemocratic society, however, it is not obvious how politicians are evaluated. The political economy literature on China has focused on politicians' promotion incentives that take their performance into consideration (Li and Zhou 2005; Yao and Zhang 2015; Jia et al. 2015) but has largely ignored other constraints and incentives placed on them. Because governments in China actively participate in the market, we want to know, does the market place any discipline on government officials? Answering that question allows us to gauge how effective the market is in China amid the debate about China's state capitalism.

Second, the modern state plays a significant role in the market in every country, regardless of political system, by procuring and borrowing from the market, by subsidizing specific industries, and (in some countries) by directly owning businesses. This deep involvement has raised many concerns. One of the recognized central causes of political decay is collusion between politicians and business interests (Fukuyama 2014), and more progressive critiques often criticize the market for corrupt morality. To the extent that officials' personal abilities are a virtue for society's long-term welfare, a study of the market's ability to reward politicians would allow us to gauge whether the market helps promote good

governance.

Empirical studies have found that politicians do make a difference for economic growth. Jones and Olken (2005) find that national leaders matter for economic growth, especially in nondemocratic regimes. Yao and Zhang (2015) extend the topic to subnational leaders and find that local leaders have significantly diverse abilities to promote economic growth in China. The market should, to the extent that it is the vehicle carrying out economic activities, be able to recognize politicians' contributions. Therefore, our study provides a piece of insight for the mechanism by which politicians contribute to local growth.

The existing literature has no empirical test regarding the role of markets to reward or punish politicians, mostly because there are no proper data on markets and no convincing measures of politicians' abilities. This paper provides solutions to those two empirical challenges.

For the first challenge, we have collected data on the primary and secondary markets of China's municipal bonds (MBs). MBs are corporate bonds issued publicly by local governments' financial entities in both interbank and stock exchange markets and purchased by institutional investors, such as commercial banks and trust funds, through public tenders. The bonds are implicitly guaranteed by local governments and, hence, have been deemed as public bonds (Luo and She 2015; Bai, Hsieh, and Song 2016; Liu, Lyu, and Yu 2017). But they are never risk free. Parallel to the stock market, where stock prices react to chief executive officers' managerial abilities (Trueman 1986), one naturally expects that MB yields also price in politicians' ability. Specifically, more capable mayors boost local growth and, thus, reduce the default risk of the MBs they issue. Investors do their due diligence before they buy MBs. Mayors' profiles and performances are likely to be part of the materials they need to evaluate. Therefore, investors develop knowledge about mayors' abilities to develop the local economy.

For the second challenge, we define and measure politicians' abilities as in Yao and Zhang (2015). Applying the decomposition method of linked employer-employee data (Bertrand and Schoar 2003; Abowd and Kramarz 2006), we define the ability of a politician

by the individual fixed effect in a city-year growth regression after controlling city fixed effects, time fixed effects, and local economic conditions. That is, we define ability by a politician's contribution to local economic growth. Local officials move frequently between localities in China. This institutional feature provides a chance for us to compare politicians' abilities across cities.

Our baseline analysis focuses on the primary markets of MBs. In our simultaneous estimation, we find that a mayor's ability significantly reduces investors' asking price of an MB after controlling bond-specific features, city economic conditions, issuer fixed effects, and month fixed effects. A one standard deviation increase of a mayor's ability will reduce investors' asking price by 0.13 percentage point, which is equivalent to 5.3 percent of the average MB yield spread over the risk-free rate of central government bonds. However, a mayor's ability has no significant impact on the municipal government's demand for funds. In equilibrium, mayors' abilities reduce MB yields by 0.095 percentage point, or 3.8 percent of the average MB yield spread. Judged by the large amount of MBs (with more than 8 trillion yuan outstanding at the end of 2019), this effect is not small. We also find that ability has stronger impacts in mayors' first year of tenure and on MBs with lower ratings or issued by economically or financially less developed cities. Our main results are robust when we control more variables, including mayors' political connections to their superiors, when estimating the ability. We also replace the estimated ability by various types of average growth rates and replicate the study on the secondary market. We find similar results.

In the existing literature, the paper that is most closely related to ours is Henry (2000). He finds that the equity market reacts positively to a country's liberalization reform. Our paper provides direct evidence on how the market rewards politicians. In addition, our paper contributes to the study of political risks in the MB market. Duyvesteyn, Martens, and Verwijmeren (2016) and Huang et al. (2014) empirically identify government defaults as a factor that affects MB prices. We add to this line of literature by bringing in the abilities of municipal leaders.

We organize the rest of the paper as follows. Section 2 introduces the institutional

background of MB issuance in China. Section 3 develops a framework for our structural estimation, explaining the structural links between bond yields and mayors' abilities. Section 4 describes the data sources, key variables, some descriptive evidence, and the empirical strategy. Section 5 presents the main empirical results for the impacts of mayors' abilities on bond yields, and Section 6 explores the heterogeneous effects to buttress our main results. Section 7 provides further robustness tests for the measure of mayors' abilities. We conclude the paper in Section 8.

2. Background

According to the revised Budget Law of 2014, local governments in China can run deficits in their budgets. However, most local governments had already begun to raise debts before 2014. In addition to regular government bonds approved by the central government, local governments borrowed directly from markets. Before 2009, local governments relied heavily on bank loans; since then, the MB market has developed rapidly to supplement local financing. To avoid the sudden economic downturn from the 2008 global financial crisis, the Chinese government introduced a 4 trillion yuan stimulus package. To speed up its implementation, the central government implicitly relaxed the restrictions placed on local governments' bond financing.[4] Local governments could issue corporate bonds through government-owned financial companies called local government financial vehicles (LGFVs). Local governments often transferred assets, usually land, to their LGFVs to buttress the latter's creditworthiness. Consequently, LGFV bonds are widely viewed as MBs.

To issue an MB, a local government (representing one of its LGFVs) needs to get approval from the National Development and Reform Commission (NDRC). A proposal submitted to the NDRC specifies the amount of issuance and its purpose. After obtaining the NDRC's permission, an investment bank will underwrite the bond's issuance and sell it to

[4] See People's Bank of China and China Banking Regulatory Commission, *Guidance on further strengthening the adjustment of credit structure and promoting steady and fast development of national economy*, March 2009.

market investors. Bond sales take the form of open tendering in which market investors bid both yields and amounts of purchase. The primary holders of the bonds are institutional investors, including commercial banks, trust funds, and insurance companies. In 2014, the shares of bonds held by those types of investors were 31.0 percent, 24.8 percent, and 21.4 percent, respectively (Ang, Bai, and Zhou 2018). As part of their due diligence, investors need to check the economic conditions of the issuing city, including the track records of its key officials, and the projects being financed. In China's political setup, every local government has two chief officials: the mayor who is the head of the executive branch and the party secretary who controls the party branch. The party secretary takes full responsibility of decision making, while the mayor oversees implementation, particularly economic affairs. Therefore, investors have legitimate reasons to consider the mayor's long-term performance (referred to as "ability" in this paper) when they evaluate the default risk of an MB.

Compared to bank loans, MBs account for a smaller share of local government debts. At the highest point in 2013, MBs accounted for 26 percent of local government debt (Huang, Pagano, and Panizza 2019). However, the absolute value of MBs has become a staggering number. As shown in Figure 1, the average monthly issuance of prefectural-level city (henceforth, city) governments, which was less than 5 billion yuan before 2009, reached 200 billion yuan in March 2016. As of December 2016, 271 of the 333 prefectural cities had issued at least one municipal bond. Issuance slowed down after 2016 because the central government began to tighten regulations on MBs as part of deleveraging measures. However, issuance increased dramatically again in 2020 to help combat the economic downturn caused by COVID-19. In the first half of the year, 2.2 trillion yuan was issued (Ouyang 2020).

[Figure 1 is here]

In theory, MBs are corporate bonds and, thus, are subject to the default risk. In practice, when a "technical default" happens—meaning that an issuer (an LGFV) is unable to service its debt—the relevant local government always provides or arranges financial support.[5] But

[5] For example, Yunnan Province Roads Development Corporation, an LGFV, could not meet the payment

government bailout is not required by law. In fact, Chinese authorities have long aimed at removing guaranteed repayment to strengthen discipline in bond markets. In 2014, Shanghai Chaori Technologies Inc., a private company, announced the first-ever default in the domestic bond market. Amstad and He (2019) document that since 2014 several central and local state-owned enterprises also defaulted. LGFVs are state-owned enterprises, so their default is not beyond imagination.[6]

The market has priced in this risk. Figure 2 shows that the yield spreads between MBs and government bonds for the same length of maturity. The average yield of central government bonds between January 2008 and January 2017 was 5.6 percent. The interest rate of MBs was substantially higher and fluctuated over time. In the same period, the average spread in each month ranged from less than 2 percentage points to around 5 percentage points.

[Figure 2 is here]

There were large geographic variations in terms of both the quantity of MBs and their yield spreads. As shown in Figure 3, coastal cities in the southeast tended to issue larger quantities, but they enjoyed lower yield spreads than inland cities. This variation shows that local factors did affect MB prices. In addition to the local economic growth prospect, the abilities of politicians might matter as well. To assess the role of politicians, we need to create a measure of ability that is comparable across cities and across time.

[Figure 3 is here]

3. A framework for empirical analysis

In this section, we develop a framework for our empirical analysis. The key idea of this paper is that investors in the MB market would like to increase their supply of funds to more competent mayors or to reduce their asking price for a given demand of fund. Reduced-form

date in June 2011, but it was later bailed out by the Yunnan provincial government (http://www.chinadaily.com.cn/bizchina/2011-07/29/content_13010196.htm).

[6] In 2020, many more state-owned enterprises defaulted their bonds and went bankrupt. This was speculated by the market as a prelude for defaults of MBs.

analysis based on the observed yield is inadequate because it may also reflect a mayor's ability to manage the city's economy and financing strategy. For example, a more competent mayor may be able to rely less on MBs to finance his city's growth, so given investors' supply, the mayor enjoys a lower MB yield. We need to create a structural model for our empirical analysis.

We start with the demand side by thinking about a municipal government (MG) that is about to issue a one-period MB in a competitive MB market. The MG is a price taker, and the mayor's decision is to decide the size of the MB, B, given its real interest rate r. The purpose of this borrowing is twofold. One is to facilitate growth in the city, and the other is to meet emergent spending on unexpected shocks, such as natural disasters and epidemic outbreaks. Let the latter part be denoted by B_0 and the former part be denoted by B_v. Naturally, $B = B_0 + B_v$. Let Y_1 and Y_2 be the tax revenues in the current period (the issuing period) and the next period (the repayment period), respectively. Y_1 is given when an MB is issued. In addition to B_v, Y_2 depends on the mayor's ability A and local conditions M. Y_2 is also subject to a zero-mean random shock E. In addition to contributing to revenue, higher ability indirectly affects revenue through more access to alternative financing to substitute B_v. Formally,

$$Y_2 = Y(K; A, M) + E,\ K = B_v + \alpha A,\ \alpha > 0.$$

Naturally, Y_K', $Y_A' > 0$, and $Y_K'' < 0$. In addition, we assume that K and A complement each other. That is, $Y_{KA}'' > 0$.

We assume that B_0 is predetermined. The mayor decides B_v to maximize the city's expected net return of borrowing

$$\pi = \mathbb{E}Y_2 - (1 + r)B_v.$$

Given the revenue in the current period Y_1, the mayor's task is equivalent to maximizing

$$\pi/Y_1 = \mathbb{E}c - (1 + r)b_v,$$

where $c = c^e + \varepsilon$, in which $c^e = Y_2/Y_1$ is the expected growth rate, $\varepsilon = E/Y_1$ is the random shock to the growth rate, and $b_v = B_v/Y_1$ is the amount of variable debts normalized by the current revenue. Let $F(\varepsilon)$ be the cumulative distribution function for ε. It is easy to

see that c^e increases in A.

The solution to the maximization problem is straightforward. Let ${b_v}^d = B(r; A, M)$ be the solution to b_v. Define $b^d = b_0 + {b_v}^d$, where $b_0 = B_0/Y_1$. Because b_0 is invariant to the mayor's decision, it is easy to get

$$\frac{\partial b^d}{\partial r} = \left(\frac{1}{\mathbb{E}Y_K''}\right)\frac{1}{Y_1} < 0, \tag{1}$$

and

$$\frac{\partial b^d}{\partial A} = -\left(\alpha + \frac{\mathbb{E}Y_{KA}''}{\mathbb{E}Y_K''}\right)\frac{1}{Y_1}. \tag{2}$$

It is an expected result for a demand function that b^d declines in r. The impact of ability on b^d is undetermined because ability both substitutes (by increasing *K*) and complements (by the complementarity between *A* and *K*) debts to increase revenue. This is different from the positive correlation between fund supply and mayors' abilities that we will soon discuss.

On the supply side, we adopt the model for the relationship between yields of MBs and their default risks from Capeci (1994). We extend the model by adding mayors' abilities. To start, we assume that investors are risk neutral. Each investor submits a quantity of fund that he or she is willing to supply and a corresponding offering price. Because investors are risk neutral, their bids can be linearly added up. As a result, we can treat all investors as one bidder whose asking price depends on the amount of purchase. In equilibrium, the amount of fund supply equals the fund demand of MGs. Therefore, the remaining task of the bidder is to set the offering price for the given quantity of MBs.

Specifically, investors (as a whole) compare the expected return of an MB with the expected (weighted) average real interest rate of other assets in the market, *R*. The MG has other spending commitments (such as social assistance and social security), S, which is a higher payment priority than MBs. Therefore, an MG will default on its MB when

$$Y_2 - S < (1 + r)B. \tag{3}$$

If default happens, investors receive the remaining fiscal revenue after paying the senior obligations. Therefore, their expected return is $max\{\mathbb{E}Y_2 - S, 0\}$.

Consistent with the demand side, we normalize default condition (3) by Y_1 to get

$$c - s < (1 + r)b,$$

where $s = \frac{S}{Y_1}$. When the growth rate c is no less than $\underline{c} \equiv s + (1+r)b$, investors receive all their returns $(1+r)B$. When c is between $\underline{c}$ and s, investors take $Y_2 - S$. When c is lower than s, investors lose the entire principal. Given normalized quantity b, the investors' asking price of an MB, r, then is determined by the following nonarbitrage condition:

$$Pr(c > \underline{c}) \cdot (1+r)b + Pr(s < c \leq \underline{c}) \cdot \mathbb{E}[c - s | s < c \leq \underline{c}] + Pr(c < s) \cdot 0 = (1+R)b,$$

which is equivalent to

$$[1 - F(\underline{c} - c^e)](1+r)b + [F(\underline{c} - c^e) - F(s - c^e)]\mathbb{E}[c - s | s < c \leq \underline{c}] = (1+R)b.$$

When we solve the above equation, we then get the investors' asking price r^s as a function of b, as well as R, the mayor's ability A, and local conditions M. Formally, $r^s = r(b; R, A, M)$. It is straightforward to show that $\frac{\partial r^s}{\partial b} > 0$, which is a standard feature of supply. In addition, given b, we have

$$\frac{\partial r^s}{\partial A} = \frac{\partial r^s}{\partial c^e}\frac{dc^e}{dA} = -\frac{dc^e}{dA}[1 - F(\underline{c} - c^e)]^{-1}[F(\underline{c} - c^e) - F(s - c^e)]b^{-1} < 0. \quad (4)$$

That is, investors are willing to take a lower yield on the MB issued by a more competent mayor given its normalized quantity b.

Finally, the equilibrium values of b and r, b^* and r^*, are determined by the market clearing condition. They are functions of the mayor's ability A, local conditions M, emergency borrowing b_0, and the expected average interest rate in the market R. Figure 4 shows an illustration. The total effects of the mayor's ability on b^* and r^* are undetermined because the impacts on the demand curve are not determined. Given the demand curve, though, we clearly see that b^* increases and r^* decreases in the mayor's ability because the latter moves the supply curve outward.

[Figure 4 is here]

4. Data and Empirical Strategies

4.1 Data for officials and the measure of ability

Data for mayors and other politicians are from the Chinese Officials Database collected

by the China Center for Economic Research (hereafter CCER-COD). CCER-COD documents detailed bio data for virtually all officials at or above municipal levels during 1994–2017. For more details, see Yao et al. (2020).

We follow the method developed by Yao and Zhang (2015) to measure politicians' abilities. This method involves estimating the following city-year growth equation:

$$growth_{(i)ct} = \omega_i + \beta_1 \ln GDPpc_{ct} + \beta_2 \ln pop_{ct} + \tau_t + \theta_c + \varepsilon_{(i)ct} \quad (5)$$

The left-hand side variable $growth_{ict}$ is the real GDP growth rate of city c in year t under the tenure of politician i. After controlling GDP per capita (log) and population (log), together with year fixed effects τ_t and city fixed effects θ_c, politician i's fixed effect ω_i is his or her ability. The key challenge is to disentangle ω_i from θ_c. Because the variables share the same city-year cell, they are not readily identifiable. Yao and Zhang (2015) show that they can be identified relative to their respective means in a connected sample—that is, a sample in which every city has had at least one official moving in from or moving out to another city. One of the unique features of China's political system is that officials are frequently shuffled between cities. Thus, such connected samples do exist. To increase the size of the largest connected sample, we mix mayors and party secretaries together. The largest connected sample for 1994–2017 contains 2,741 mayors and party secretaries (more than 80 percent of the population) in 272 cities. We estimate Equation (5) with that sample. When we perform the estimation, we stack mayors and party secretaries to preserve the size of the largest connected sample.[7] Because ω_i can only be estimated relative to its mean, we subtract the mean after ω_i is estimated. Figure 5 presents the distribution of the estimated ability, which is close to a normal distribution.

[Figure 5 is here.]

Essentially, our measure of ability is estimated from a politician's average growth rate during his or her tenure in one or more cities. It then begs this question: Why do we not

[7] Yao and Zhang (2015) also estimate a system of equation with separate equations for mayors and party secretaries. The results are comparable to those obtained by the method introduced in the text.

directly use the average growth rate? The reason is that Equation (5) controls city and time factors that may confound mayors' contribution to local growth, so our measure of ability contains less noises than the average growth rate. Yao and Zhang (2015) have discussed and tested the potential problems raised by the estimated ability and found that they do not pose serious threats to their baseline results. We will not repeat all their robustness exercises in this paper. Rather, in Section 7, we will conduct some of the more significant checks to show that our baseline results are also robust.

4.2 Bond and economic data

We obtained data for MBs from WIND, which records detailed information on each MB, including its yield, quantity of issuance, maturity, issuance date, city of issuer (LGFV), and issuer's rating. We can directly identify an MB with a specific marker "whether the bond is a municipal investment bond (Cheng-tou-zhai)" recorded by WIND. We restrict our sample to bonds issued by prefecture-level municipal governments from January 2008 to December 2016. The number of officials in this sample is considerably smaller than the sample we used to estimate Equation (5). We exclude MBs issued by provincial governments or county-level city governments.

Our empirical analysis unit is individual bonds. Not all cities issued bonds in every year. We match each MB with the corresponding mayor who worked in the city at the time of the issuance. There are also cities that have issued MBs but are not in the largest connected sample introduced in the previous subsection. After matching the bond sample with the largest connected sample, we have 4,154 MBs issued by 1,025 LGFVs under 541 mayors in 239 prefectural-level cities during 2008–2016.

The average yield of the MBs was 5.60 percent, and their average spread over the government bond rate was 2.51 percent. The average issuance was 929 million yuan (around US$130 million), 0.38 percent of local gross domestic product (GDP), and 5.12 percent of local fiscal revenue. The mean maturity was 4.45 years. Around 11 percent of bonds had additional guarantees or credit enhancements by other companies. Bonds issued by AAA-

rated issuers were relatively rare—only 7.6 percent of the total. The shares from issuers with an AA+, AA, AA-, and lower rating were 25.7 percent, 55.1 percent, 8.2 percent, and 3.5 percent, respectively. In general, an issuer with an AAA or AA+ rating is viewed as low risk and would be more trusted by investors.

City-level economic data in this paper are drawn from the CEIC database, which reports each city's annual economic and demographical data. Table 1 reports the summary statistics of the variables used in our analysis.

[Table 1 is here]

Figure 6 presents suggestive evidence for the impact of mayors' abilities on MB yields. In the figure, we calculate the mean of bond yields in each mayor tenure and divide the sample of mayors into two groups by their ability (using the median as the cutoff). To control for regional variations, we first regress MB yields on provincial dummies and then add the residuals back to the average yield. The figure clearly shows that the yield distribution of bonds issued by high-ability mayors almost uniformly shifts left compared with the distribution of bonds issued by low-ability mayors. This result provides a hint for our simultaneous regression analysis.

[Figure 6 is here]

4.3 Empirical strategy

As we stated before, we want to answer this key question: Does a mayor's ability affect investors' asking price? The theoretical framework presented in Section 3 suggests the following simultaneous equation system at the bond level:

$$q_{ij(k)t} = \gamma_1 r_{ij(k)t} + \gamma_2 W_{jt} + \gamma_3 A_k + X_{ij(k)t}\Gamma + v_{ij(k)t}, \quad (6)$$

$$r_{ij(k)t} = \beta_1 q_{ij(k)t} + \beta_2 Z_{it} + \beta_3 A_k + X_{ij(k)t}\mathrm{B} + u_{ij(k)t}. \quad (7)$$

In the equations, the subscripts *i*, *j*, *k*, and *t* represent bond, city, mayor, and month, respectively. Then, $\boldsymbol{q_{ij(k)t}}$ is the quantity of bond *i*, scaled by local GDP in the year of

issuance,[8] and issued by city *j* in month *t* during mayor *k*'s tenure; $\boldsymbol{r_{ij(k)t}}$ is the corresponding bond yield. The first equation is the MG's demand function, and the second equation is the investors' supply function. Therefore, $\boldsymbol{\gamma_1}$ should be negative, and $\boldsymbol{\beta_1}$ should be positive.

The two equations share several sets of common variables. The first set has one variable, mayor *k*'s ability $\boldsymbol{A_k}$. According to our theoretical framework, it reduces investors' asking price, so $\boldsymbol{\beta_3}$ is expected to be negative. This key result is the one we will pay attention to the most. In contrast, its impact on the MG's borrowing is undetermined. That is, the sign of $\boldsymbol{\gamma_3}$ is not determined. The second set, $\boldsymbol{X_{ij(k)t}}$, contains other variables that affect both demand and supply of funds. The variables fall into four categories. The first category has one variable: the average yield of government bonds with the comparable maturity.[9] Government bonds are risk-free assets, which provide the benchmark for the market (a key component of $\boldsymbol{R}$ in the theory). The second category includes bond-specific variables: maturity, whether having a guarantee or credit enhancement offered by other companies, and a set of dummies that indicate the rating of the issuer (ratings below AA- are the omitted group). The third category contains variables that describe the issuing city's local economic conditions, including outstanding bond borrowings/GDP, fiscal revenue (log), GDP per capita (log), and annual growth rate. The last three variables are lagged by one year. The last category contains two sets of dummy variables: one for months and the other for issuers (LGFVs). The monthly dummies allow us to control for nationwide macroeconomic fluctuations, and the issuer dummies allow us to control for time-invariant issuer characteristics. LGFVs are often specialized in different businesses, such as road building, industrial park development, and financial investment. Therefore, controlling issuer fixed effects allows us to place some control on the kinds of projects that the raised funds financed. Because one city may have more than one issuer, this control is stricter than controlling city fixed effects.

To identify the demand-supply system specified by Equations (6) and (7), each equation

[8] We will later replace GDP by fiscal revenue.

[9] When there is no government bond with exactly the same maturity, we find the government bond with the closest maturity.

needs at least one variable that can be reasonably excluded from the other equation. Specifically, the demand function needs a variable, denoted by $\boldsymbol{W_{jt}}$ in Equation (6), that affects the MG's borrowing decision but not the investors' pricing decisions. And the supply function needs a variable, denoted by $\boldsymbol{Z_{it}}$ in Equation (7), that affects the investors' asking price but not the MG's borrowing decision.

For the MG's demand function, the exclusion variable is an indicator of floods in the last year. If a city experiences twice-higher monthly precipitation than the 1900–2017 historical average in any month of the last rainy season (June to August), the variable *floods* equals one, and zero otherwise. Data for the monthly precipitation in each city are from Matsuura and Willmott (2018). The original data records global monthly precipitation in $\boldsymbol{0.5 \times 0.5}$ degree grids from 1900 to 2017. The area of a prefectural-level city may fully or partially cover several $\boldsymbol{0.5 \times 0.5}$ degree grids on the map.[10] To measure the precipitation of a city, we take the weighted average precipitation of all grids that intersect with the city, where the weight is the area of the intersected part of the grid and the city.

The variable *floods* affects a city's decision of borrowings but not necessarily the investors' decision of pricing. Floods are exogenous shocks that bring damages to infrastructure and endanger people's lives. However, the MG may not have contingent funds ready to repair the damaged infrastructure or to give people relief and may have to borrow from the market ($\boldsymbol{B_0}$ in our theoretical framework section). However, the impacts of floods on the economy do not last for long (except for rare and large floods), so the city's ability to repay debt is not likely to be impaired. As a result, floods are not likely to affect the investors' pricing decisions. Table 2 shows the results of regressions that regress a city's GDP growth rate on *floods* in the previous year. *Floods* has no effect on the growth rate.

[Table 2 is here]

For the investors' supply function, we explore the inter-bond variations in the investors' responses to alternative financial products in the market. Supposedly, the demand for MBs

[10] The geographical range of 0.5 degree along longitude corresponds to 55 km, and in China, the range of 0.5 degree along latitude corresponds to 40–50 km. The median area of a prefectural city is about 10,000 square km, which corresponds to four to five 0.5×0.5 degree grids.

would decline when there were more other financial products in bond markets. Here we use the amount of corporate bonds issued by all non-LGFVs in a month to capture the alternative investment opportunities for investors. To match this country-level variable to individual MBs, we turn to the ratings of MB issuers. When there were more non-LGFV bonds in the market, the demand for MBs would decline, but the decline would be uneven—issuers with a higher rating face less pressure. Hence, we use the interaction between non-LGFV corporate bond issuance and an individual MB's rating as the exclusion variable for the investors' supply function. Our identification assumption is that the ratings per se affect both the investors' pricing decisions and the MGs' borrowing decisions (a city of a lower rating would naturally tend to borrow less), but their interaction with non-LGFV bonds only capture the investors' diverse responses to the general market conditions. With the ratings already appearing in Equations (6) and (7), the interaction term becomes a reasonable exclusion variable.

In the equation system, $\boldsymbol{v_{ij(k)t}}$ and $\boldsymbol{u_{ij(k)t}}$ are two zero-mean random variables that are correlated and assumed to have a joint normal distribution. We will estimate the system by the three-stage least squares (3SLS) method.

5. Main results for the impacts of mayors' abilities

5.1 Results of simultaneous estimation

In this subsection, we present and discuss the empirical results of the equation system presented by Equations (6) and (7). To make the coefficients easy to interpret, we convert the ability into z-scores by subtracting the mean and dividing the difference by the standard deviation in the regression sample.

[Table 3 is here]

Table 3 presents the results. The first two columns show the results of the 3SLS estimation. First, the coefficients of issuance and yield have the expected signs. Consistent

with a demand function, higher yields significantly reduce MGs' demand. A larger issuance encourages investors to ask for higher prices although the estimated coefficient is not statistically significant.

The most important result is that mayors' abilities have different impacts on demand and supply. It does not have a significant impact on MGs' borrowing decisions but does have a significant impact on investors' pricing decisions. The coefficient of the z-score ability is 0.133. This number suggests that a one standard deviation increase of ability leads to a reduction of 0.133 percentage point in the yield, which is 12 percent of the yield's standard deviation or 5.3 percent of the mean of the yield spreads over the risk-free rate of government bonds. The average size of the MBs in our sample is 929 million yuan, and the average duration is 4.4 years. Therefore, an increase of one standard deviation in a mayor's ability would reduce debt services by 5.4 million yuan on each bond. On average, 7.7 bonds were issued during a mayor's tenure. A mayor would save around 42 million yuan on debt services if his or her ability increases by one standard deviation.

The two identification variables are both significant and have the expected signs. Having a flood the previous year increases borrowing by 0.043 percent of GDP. Bonds with a rating of AAA or AA- enjoy an extra discount of 0.09 percentage point over bonds of lower ratings when the total amount of non-LGFV corporate bonds is doubled. This coefficient is small but statistically significant.

The risk-free rate of government bonds is significantly positive in the investors' supply equation, and its coefficient is close to 1, which is consistent with the findings of the classical asset pricing literature. However, it is harder to understand why the coefficient is also significantly positive in the MG's demand function. MGs only care about the interest rate they will pay, and the positive impact of the risk-free rate is just incidental. We will soon see that, in the market equilibrium, the MG's demand does decline with the risk-free rate.

Among the bond-level controls, one year longer in maturity significantly increases MGs' demand by 0.044 percentage point, and having a guarantee reduces MGs' demand and investors' asking price. As expected, issuers with higher ratings enjoy lower yields from

investors. Higher ratings are also negatively correlated with the size of issuance. Among city economic conditions, bonds outstanding increases investors' asking price but has virtually no impact on MGs' demand. A larger fiscal revenue in the previous year is negatively correlated with MGs' demand, which indicates that one of the purposes of government borrowing is to supplement the shortfalls of government revenue. In addition, a more affluent city tends to borrow less and a faster-growing city tends to borrow more. Investors also give a discount to faster-growing cities.

5.2 Fiscal revenue replacing GDP

We have used GDP to normalize MB issuance. It is possible, however, that investors care more about a city's fiscal revenue than its GDP because fiscal revenue determines a city's ability to repay debts. As a robustness check, we then replace GDP by fiscal revenue and use the ratio issuance/fiscal revenue to represent $\boldsymbol{q_{ij(k)t}}$ in Equations (6) and (7). Columns (1) and (2) of Table A1 present the 3SLS results. They are qualitatively the same as the 3SLS results presented in Table 3. In particular, the point estimate for mayors' abilities is very close to that presented by Table 3.

5.3 Results of reduced-form estimation

Section 5.1 established our main result that investors reward mayors' abilities. We are also interested in the magnitude of impact that mayors' abilities have exerted on the equilibrium quantity and yield of MBs. This amounts to estimating the reduced-form regressions of Equations (6) and (7). Columns (3) and (4) in Table 3 present the results.

Mayors' abilities have a positive but statistically insignificant effect on the equilibrium quantity of issuance. We show in the previous subsection that MGs' demand function is elastic and that mayors' abilities push outward the investors' supply function. So in theory, higher ability should enable a mayor to issue a larger quantity of MBs. We can only explain

this newly found result as certain noises associated with the quantity of issuance that we cannot identify and correct.

In contrast, mayors' abilities do significantly cut the equilibrium yield. The point estimate is 0.095, which means that an increase of one standard deviation in ability reduces the yield by 0.095 percentage point. This is smaller than the discount that investors would give because MGs' demand function is elastic. However, economically, the effect is still substantial: an increase of one standard deviation in a mayor's ability would save 30 million yuan on debt services during his or her tenure in the city.

As a robustness check, we replace the yield by the yield spread over central government bonds as the dependent variable in Column (4) of Table 3 (we drop the yield of central government bonds). The magnitude and the significance of the coefficient of a mayor's ability change little. We also add several sets of extra controls to the column. The first set is city-level variables, including revenue from land sales, city fixed asset investment, and foreign direct investment (all are in logarithm form and lagged for one year). The second set is mayors' own characteristics, including level of education, whether a graduate from a top university, and whether having work experience in the economic field. The third set is variables that indicate mayors' personal connections to the provincial party secretary, including whether sharing the same birthplace, whether graduating from the same university, and whether having worked in the same city. When we add those three sets of controls, either separately or jointly, the coefficient of a mayor's ability remains significantly negative and its magnitude is not much different from that reported by Column (4) of Table 3. To save space, we do not report regression tables for these results.

6. Heterogeneous effects

In this section, we present several sets of results for the heterogeneous effects created by mayors' abilities under the simultaneous estimation framework. Those results are intended to reinforce our main results found in the previous section.

6.1 Age and tenure

Age is an important factor for a politician's career because China's political system implements a strict retirement rule. For city-level officials, the retirement age is 60 years old. The chance of promotion becomes virtually zero after a mayor or city party secretary reaches 57 years old. Studies have found that the incentive of city officials diminishes significantly after that age (Yao and Zhang 2015; Xi, Yao, and Zhang 2018). Aware of this issue, market investors are less enthusiastic about an older mayor's ability to develop the local economy. Tenure may also affect investors' pricing decision, but for different reasons. The regular term of an official is five years, which corresponds to the cycle of the party's congress. There are political business cycles, and city officials take riskier projects with high uncertainty in future cash flows to boost growth toward the next party congress (Xi, Yao, and Zhang 2018). Projects would not be finished by the time the current mayor finishes his or her term, and the new mayor would not honor the old debts.[11] Therefore, investors have reasons to value mayors' abilities less when the latter are in the final years of their tenures.

Columns (1) and (2) in Table 4 present the results on the heterogeneous effects of age and tenure. To study the heterogeneous impacts of ability on MB yields, we add the interaction terms between a mayor's ability and his or her age and tenure to Columns (1) and (2) in Table 3, respectively, and we simultaneously estimate the supply and demand equations. To save space, we only show the investors' supply functions in Table 4, and we present only the coefficients related to mayors' ability.

[Table 4 is here]

In Column (1), mayors are divided into four groups by age: younger than 56, 56 and 57, 58, and 59 or older. We group ages 56 and 57 together because they are the transition period in a mayor's career. The results are very telling. For mayors younger than 56, ability has a strong effect on the equilibrium yield. Its impacts on older mayors are reduced. The gap is not

[11] Although default is less likely, the new government often delays its debt payment.

statistically significant between ages 56 and 58, but is significant for 59 or older. Therefore, the market does price in mayors' retirement prospects.

In Column (2), mayors are identified by the year of their terms: first year, second year, and third year or beyond. The market gives first-year mayors a significant reward for their ability. This reward is reduced for mayors in their later years of tenure. The gap is insignificant for second-year mayors, but significant for mayors in their third year or beyond. Because the average tenure of a mayor is between three and four years, third- and fourth-year mayors are more likely to be laterally rotated or even promoted. That is, the market significantly reduces its reward to ability when mayors are in their late years of tenure.

6.2 Bond ratings

Our theoretical framework suggests that the higher ability of mayors reduces the default risk of MBs. That is, a mayor's ability serves as a substitute for the credit worthiness of an MB. Therefore, it is natural to envision that MBs with lower ratings would benefit more from higher-ability mayors.[12] To test this hypothesis, we divide MBs in our sample into three categories according to their issuer's rating: (a) AAA or AA+ (33 percent), (b) AA (55 percent), and (c) AA- or below (12 percent). Treating the third group as the omitted group, we interact the dummies of the other two groups with the key variable, *Mayor's ability*. Column (3) in Table 4 shows the results. Ability offers a significant cut of yields for the least-rated group. While there is no statistically significant gap between the middle group and the least-rated group, yields of the highest-rating MBs are significantly less sensitive to mayors' abilities.

6.3 Income and financial development

[12] Similar results have been found in the insurance market for MBs; the net benefit of insurance increases as an MB's underlying credit worthiness declines (Kidwell et al. 1987; Nanda and Singh 2004).

In general, the role of politicians affecting the economy is smaller in countries or regions with higher income because affluence is often associated with better self-organization of the market and society. Mapped to our case, this means that mayors' abilities would be rewarded less in more affluent cities than in poorer cities. Column (4) in Table 4 gives the results when the variable *Mayor's ability* is interacted with log GDP per capita of a city. While ability is still significantly negative, the interaction term is significantly positive. According to the two point estimates, the impact of mayors' abilities will decline by 40 percent if a city's GDP per capita is doubled. In China, the gap of income between cities can easily reach three- to fourfold. So, the impact of mayors' abilities varies significantly across cities.

A mayor's role also depends on the development of local financial markets. With a more developed financial market, LGFVs can find more local financial resources to supplement their borrowings from the MB market so their projects would be less likely to fail. In addition, the development of financial markets critically depends on the rule of law, and a more developed financial market is often associated with better rule of law. MB investors have reasons to discount the role played by competent mayors in cities with more developed financial markets.

The last column in Table 4 shows the results when we interact the variable *Mayor's ability* with the ratio total social financing/GDP. Total social financing is an official statistic that sums up total volume of funds provided by banks and nonbank financial institutions to the real economy. The ratio of total social financing over GDP is an indicator for the depth of financial markets. In addition to its interaction term with *Mayor's ability*, we also add it to the regression as a stand-alone variable. While total social financing/GDP itself is insignificant, the interaction term is significant and positive.

In sum, the heterogeneous effects found in this section are consistent with our theoretical argument that mayors' abilities enhance the credit worthiness of the MBs their cities issue. Market investors discount the role of mayors' abilities when mayors are later in their careers or are in the later years of their current terms because mayors' incentives are distorted at those stages.. Investors also rightly reward ability less on MBs with better ratings or issued by more

affluent or financially more developed cities because all three factors reduce the impacts of mayors' abilities on the credit worthiness of MBs.

7. Robustness Checks for the Measurement of Ability

We obtained mayors' abilities by estimating their fixed effects in the city growth equation. This estimation faces several challenges. The most serious challenge is that the estimated ability may be incidental in the sense that it either reflects cities' intrinsic growth potentials in specific periods or merely picks up heteroscedastic shocks that cities received when individual mayors served there. Another challenge is that our estimation relies on the largest connected sample, which was created by lateral moves of officials. However, those moves are not random because they are often signs of future promotion. The third challenge is that city officials have heterogeneous personal connections to the provincial party secretary who may support affiliated mayors. In that case, politicians' fixed effects in the growth regression may pick up their connections to the party secretary. The last challenge is that there is an econometric issue associated with our estimation strategy. Using the estimated ability in other regressions may introduce biases to its coefficients and standard errors. Yao and Zhang (2015) have dealt with each of those challenges. Here we will provide a test for the first challenge and deal with the third challenge by considering personal connections in the growth equation. We find that the second challenge is less of a problem because our largest connected sample is large enough to get close to the universe of the city officials in our sample period. Thus, we will not deal with it. For the fourth challenge, we will replace the estimated ability by several types of average growth rate to address the bias issue. We will also replicate the study on the secondary market and conduct a placebo test on party secretaries.

7.1 Permutation of tenures

To address the issue of ability incidentally measured, we perform a placebo test by

randomly permuting mayors' tenures within a city. Specifically, within each city, we randomly split 1994–2017 into sub-periods with their number equaling the number of actual tenures of mayors who served in the city in our sample periods. We then randomly assign a mayor to each sub-period. That is, we randomize mayors' tenures within a city. In effect, we have created a set of counterfactual mayors. We then estimate a new set of "abilities" for those counterfactual mayors by the "tenures" they have been assigned to, and we combine those mayors with bonds issued during those tenures. If the ability we estimate is only incidental to the respective sub-periods that individual mayors have served and, thus, not intrinsic to individual mayors, then we should still find a significant correlation between the "ability" of the counterfactual mayors and the yield of bonds issued in their fake "tenures."

We have performed 999 rounds of permutation. In each round, we estimate the growth equation, Equation (5), and the same reduced-form regression of yields as Column (4) of Table 3. It is possible that the yield is still correlated with the counterfactual ability. Our purpose is to see where the magnitude and significance of our original estimate are situated. Figure 7 presents the results in two panels. In Panel A, we sort the 999 point estimates together with our original estimate by their magnitudes and present their 99 percent confidence intervals. Our original estimate is located at the 6.3 highest percentile. In Panel B, we present the distribution of the t-statistics. It is close to normal with the mean between –1 and 0. The t-statistic of our original estimate is located at the 2.0 highest percentile. Those results buttress our confidence that our measure of ability is not incidental.

[Figure 7 is here]

7.2 Personal connections

To address the concern of personal connections, we re-estimate the city growth equation by adding a set of dummy variables that indicate mayors' personal connections to the current provincial party secretary. The definitions of those variables are similar to those in Landry, Lü and Duan (2018). The first dummy is whether the mayor and the provincial party secretary

were born in the same city, and the second dummy is whether they went to the same university. The third dummy is whether they had worked in the same city at the same time. Column (1) of Table 5 presents the results of the equilibrium yield using the new set of estimated ability. The coefficient of ability, –0.091, has virtually the same magnitude as our baseline estimates, –0.095 in Column (4) of Table 3, and remains statistically significant. Therefore, we conclude that our main results are robust to taking care of personal connections.

[Table 5 is here]

7.3 Growth rates replacing ability

The ability we have used in the system of equations and other regressions are parameters estimated from the growth equation. Yao and Zhang (2015) deal with this issue by conducting a joint estimation. But to ensure accurate estimates for ability, the sample we have used for the city growth equation is much larger than the sample we have used for the system of equations. Therefore, a joint estimation is not possible. Here we adopt an alternative approach to replace the estimated abilities by the growth rates that we have used to estimate them. The ability estimated from Equation (5) controls the city and time factors that may confound mayors' contributions to local growth. Directly using the growth rates will introduce noises into our estimation. But if we still obtain significant results, then we can be more assured that our results with the estimated abilities are robust.

We adopt three types of average growth rate: (a) career average, which is the mean of annual GDP growth rate in all the years when the current mayor served as either a mayor or a city party secretary in the current city or other cities; (b) current city average, which is the average GDP growth rate in the mayor's current city when the bond was issued; and (c) observed average, which is defined the same as the current city average but excludes the years after bond issuances. To make the growth rates comparable across years and provinces, we have subtracted the provincial mean in each year before we calculate the averages. The idea

of the career average is very close to our measure of ability that considers a mayor's economic performance in his or her career as a city leader. The current city average takes out a mayor's performance in other cities, so it is more relevant to the yields of MBs issued in the current city. The third average takes care of the concern that a mayor's performance after an MB was issued did not enter investors' calculations when they decided on the purchase of that MB.[13]

The results are presented in Columns (2)–(4) of Table 5. The coefficients of the three average growth rates remain significant although their magnitudes become smaller and their statistical significance is weaker than the ability coefficient. This probably reflects that these averages contain more noises than the estimated ability. However, to the extent that they avoid the mechanical correlation that possibly exists in the regressions involving the estimated ability, the present exercise does buttress our baseline results.

7.4 Secondary markets

Until now, we have been studying the investors in the primary market of municipal bonds. To provide further support to our baseline results, we turn in this subsection to the secondary markets to see whether bond prices in those markets respond to the ability of current mayors. After an MB is issued, the current mayor may be moved to another city, promoted, or retired, and the next mayor will inherit debt services. If the market responds to the ability of the original mayor, we reasonably assume that it also responds to the ability of the succeeding mayor who is now responsible to service the debt.

The sample of bonds is a subsample of our original sample because we cannot find data for the bonds issued privately to specific investors. In total, we study 2,769 bonds, which is 67 percent of our original sample. The secondary MB market is illiquid and the median length between two MB trades is 15 days. On average, each bond is traded 65 times within the time

[13] If a new mayor took office in the second half of a calendar year and issued bonds before the end of the year, this mayor's average growth rate is zero, the sample mean. There were 263 such bonds, 6.3 percent of all observations in our sample.

window of our data, which allows us to take trade as our unit of analysis. In total, we have a sample of 175,672 observations. Each trade is matched to the mayor who was in office at the time of the trade.

Column (5) of Table 5 presents the results for the equilibrium yields in the secondary market. Instead of controlling the issuer fixed effects, we have controlled bond fixed effects. We can then estimate the within-bond effect for mayors' abilities, which also means that the quantity of the bond is already taken into consideration in this specification. It turns out that the effect is still highly significant, although its size is half of the baseline estimate. The latter result makes sense because we are now estimating the within-bond effect. Overall, the bond fixed effects place a strong control on the nature and characteristics of specific bonds, particularly the type of projects they were financing. As a result, the estimated effect reflects a pure value created by more competent mayors in the secondary market.

7.5 Party secretaries as a placebo test

The literature (for example, Yao and Zhang 2015) finds that economic performance only matters for mayors' promotion but not for party secretaries' promotion. That is, the upper-level party branch evaluates mayors and city party secretaries by different criteria; economic performance is important for mayors but not for party secretaries. Therefore, we conduct a placebo test for our baseline result to see if party secretaries' abilities also matter for investors' pricing decisions. We replicate Table 3 for party secretaries and present the results in Table A2. We find no significant effect for party secretaries' abilities. We also replace GDP by fiscal revenue to normalize debts, but we still do not find significant results for party secretaries (see Columns (3) and (4) in Table A1). The findings reinforce our baseline results that investors care about and price in local officials' abilities to manage the local economy.

8. Conclusion

In this paper, we try to answer this question: do market investors reward more competent politicians who bring faster economic growth to cities? Combining data from China's municipal bond markets and data on officials from CCER-COD, we find that mayors' abilities are a significant factor in determining MB yields. Our simultaneous equation estimation finds that this effect solely comes from investors' evaluation of mayors' abilities. We have conducted heterogeneous and robustness analyses to support our baseline results. In addition to contributing to the literature on China's political selection, our paper makes a broader contribution to the literature on governance.

The received wisdom among social scientists is that institutions are more important than the quality of officials for good governance. However, institutions are incomplete, just like any other social contract. Even under the best-designed institutions, officials have sizable discretionary power. As a result, their quality matters and, in critical junctures, often plays a critical role. While the market is often a source of corrupt politicians (see, for example, Chen and Kung 2019), this paper shows that the market also recognizes and rewards more competent ones. This may not immediately eliminate incompetent politicians, but in the long run, it creates more opportunities for more competent politicians to emerge. As revealed by several studies reviewed in the introduction, more competent politicians are more likely to be promoted in the Chinese political hierarchy. The municipal bond market plays a role in revealing individual mayors' abilities and, for that, contributes to good governance.

Our results, though, may be specific to China's unique political system; it remains a question whether the market also rewards or punishes politicians in a democracy. The hard part is how to come up with a uniform measure for politicians' personal abilities. This paper takes advantage of one of the unique features of China's political system, namely, lateral moves of officials, and we are able to devise a ranking for all the officials in different localities. Lateral moves are rare in a democracy. Researchers need to find other ways to measure politicians' abilities in democracies.

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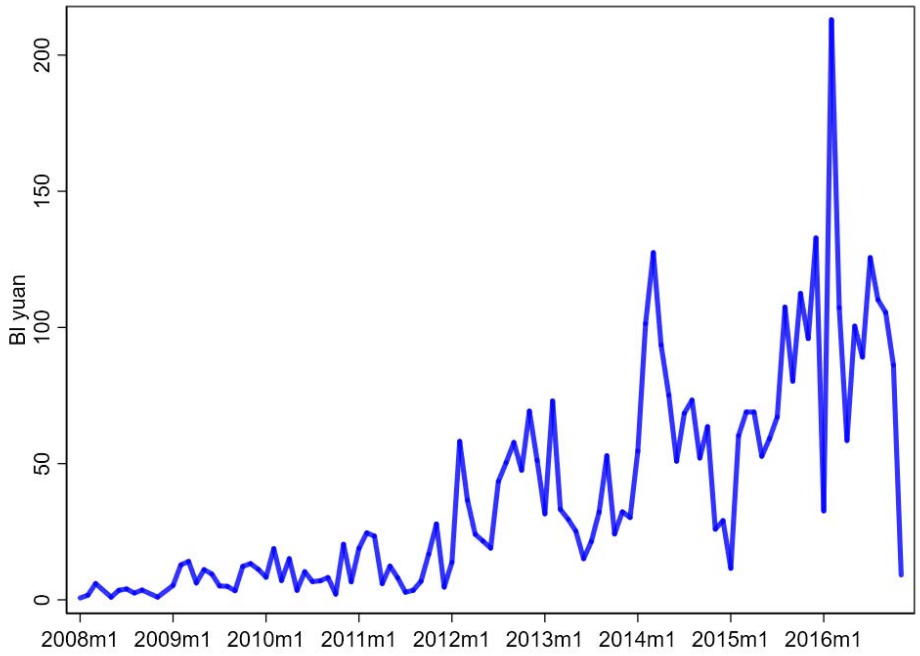
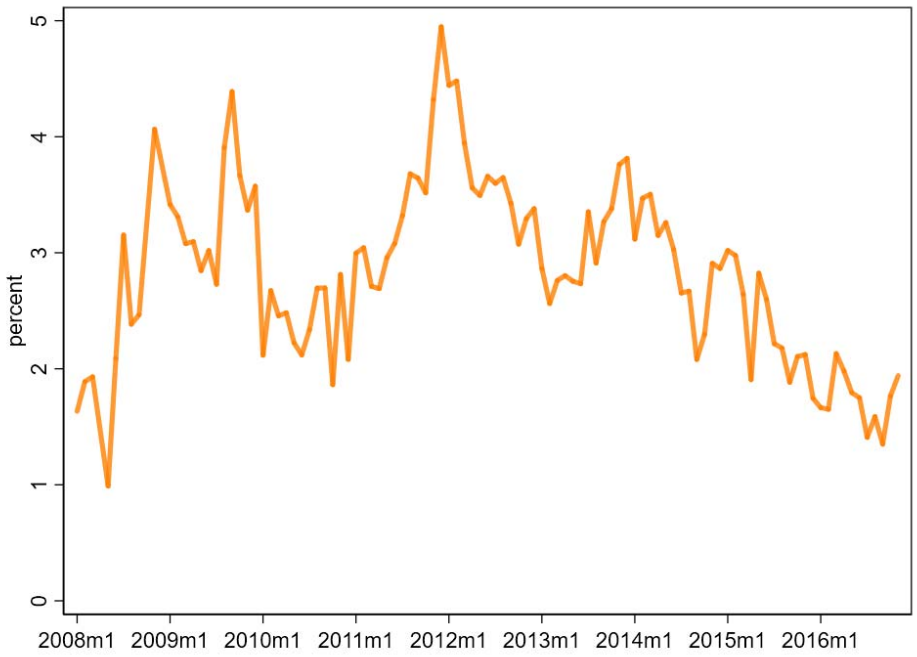
Figures

Figure 1. Monthly issuance of MBs, 2008–2016



Note: MBs issued by provincial and county-level city governments are not included.

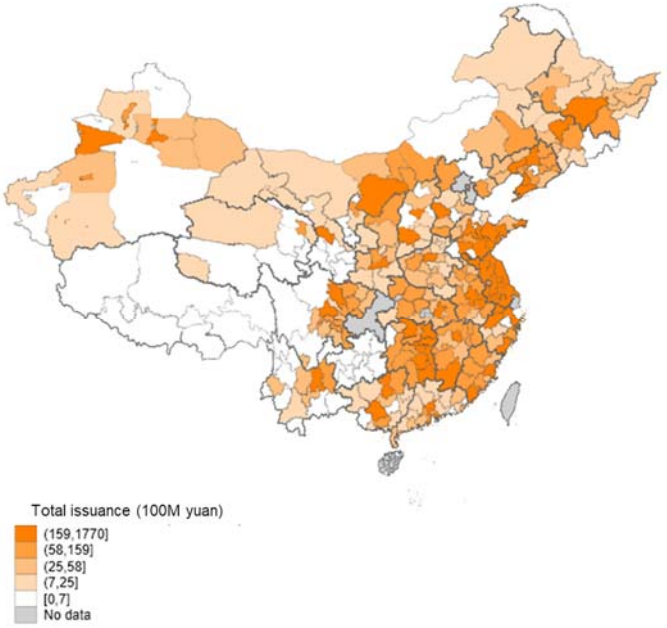
Figure 2. Average yield spread of MBs by month, 2008–2016



Note: MBs issued by provincial and county-level city governments are not included.

Figure 3. Geographic distribution: MB issuance and their average yield spreads, 2008–2016

Outstanding MBs



Average yield spreads

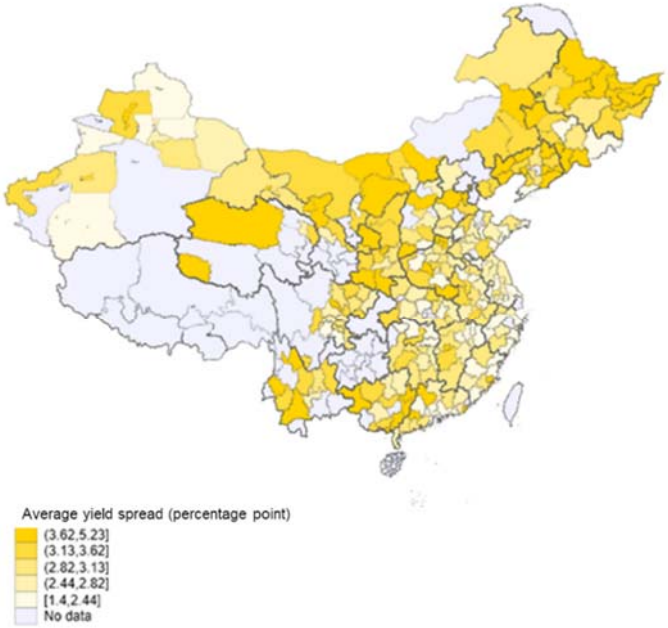
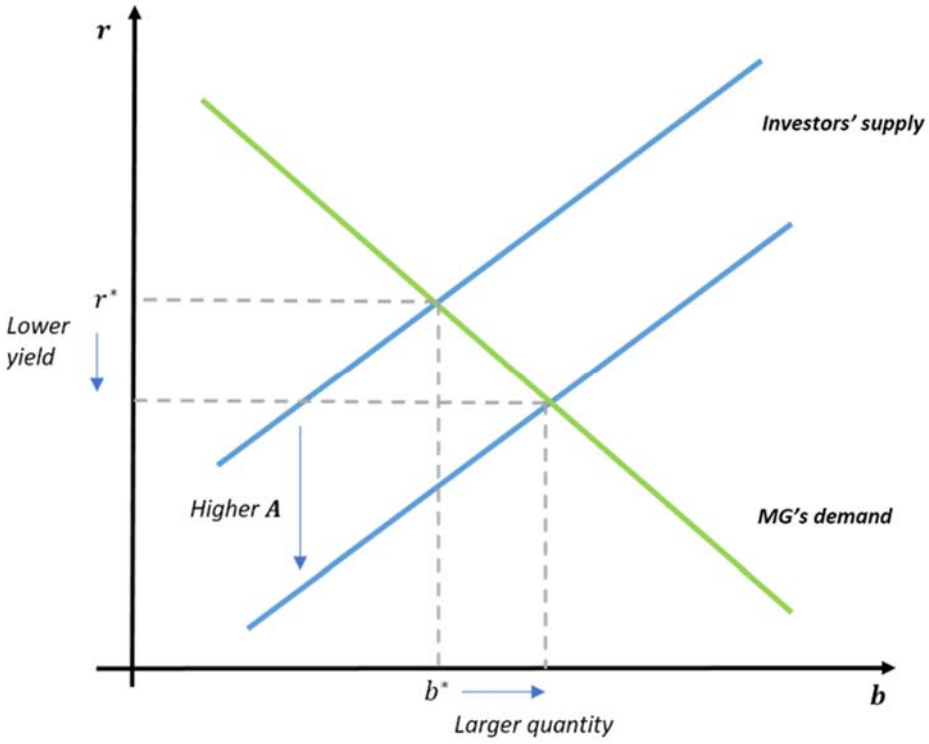
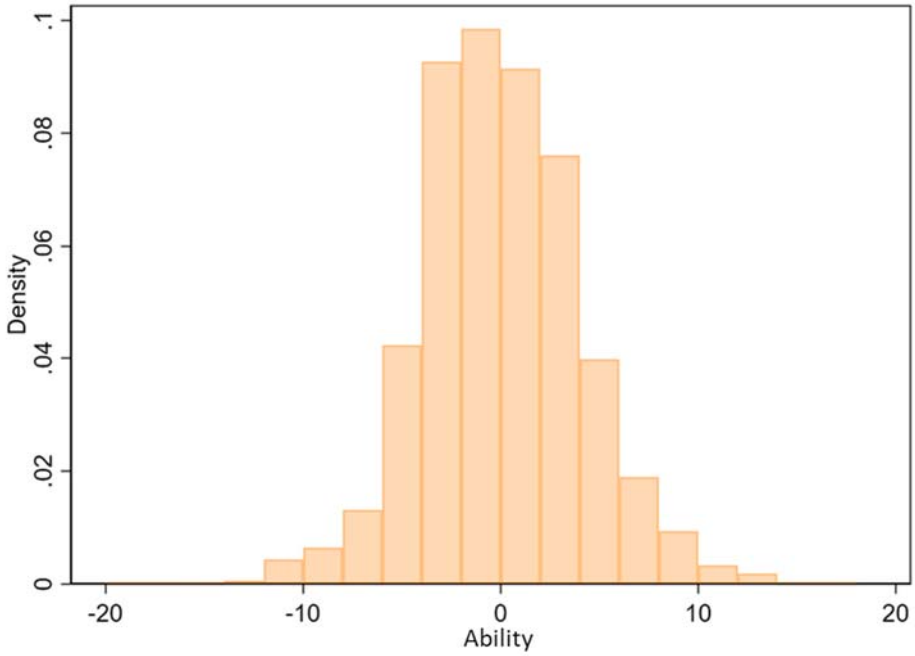


Figure 4. Market equilibrium



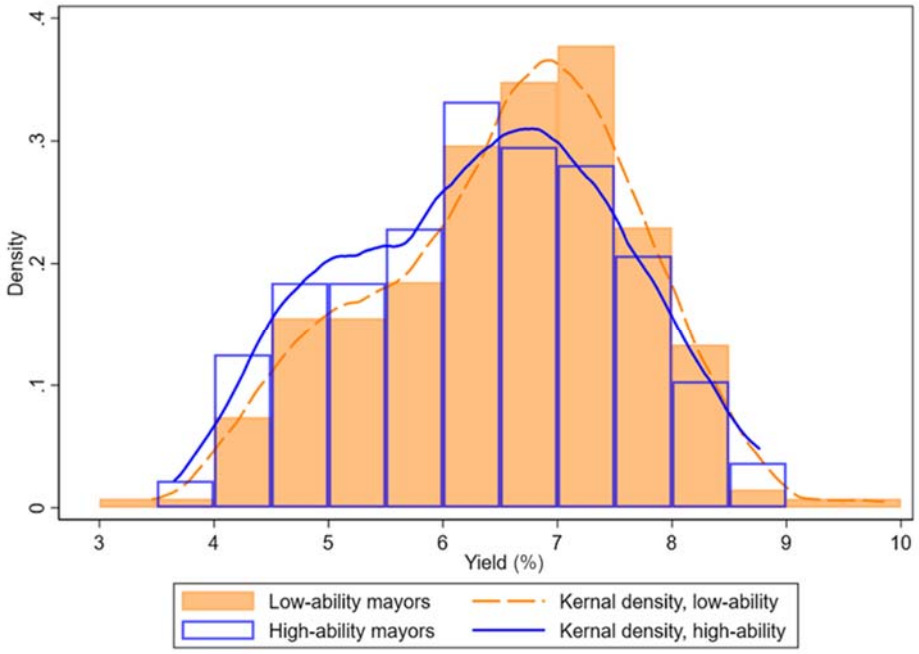
Note: Because the direction of the impact of the mayor's ability on MG's demand of funds is unambiguous, in this figure, we assume that the MG's demand curve does not move as the ability changes.

Figure 5. Distribution of politicians' abilities



Note: This figure shows the distribution of abilities in the largest connected sample of mayors and party secretaries in CCER-COD.

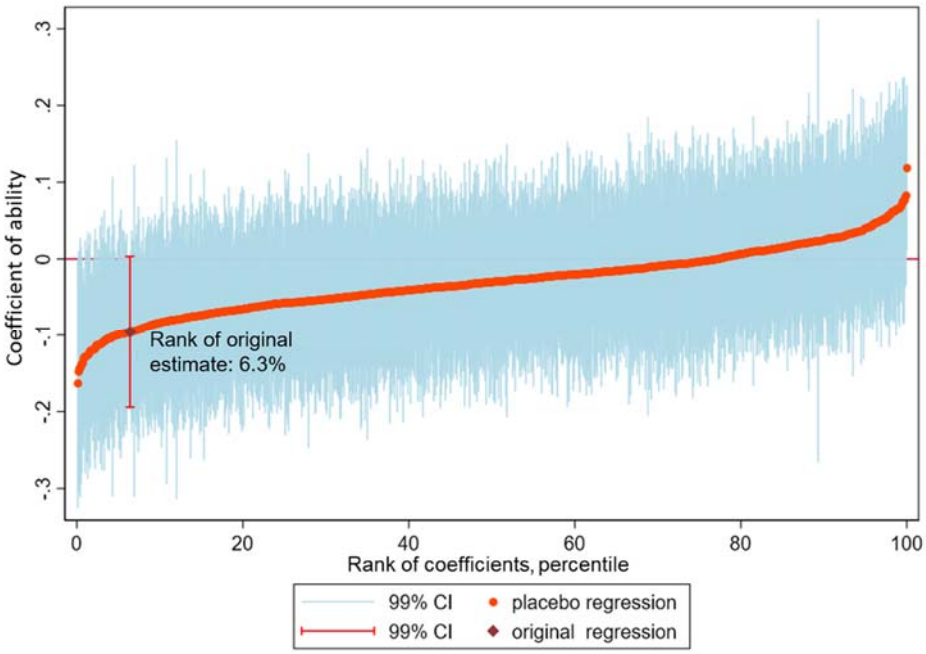
Figure 6. Distributions of bond yields by mayors' abilities



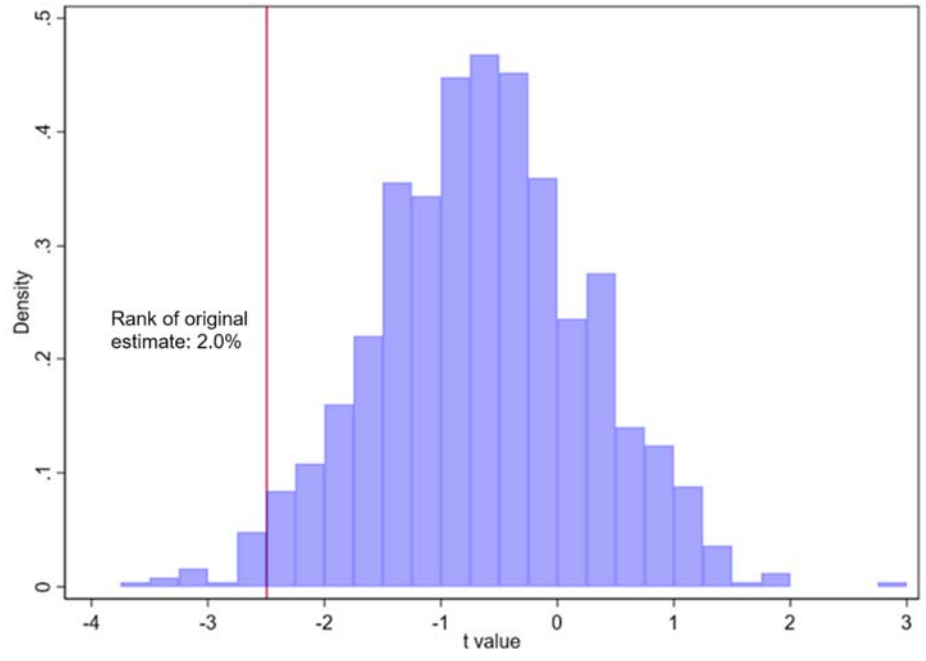
Note: The figure shows the distributions of the means of bond yields in each mayor tenure. Low-(high-)ability mayors have abilities below (above) the median. To take out the regional effects, we first regress yields on provincial dummies and add the residuals back to the average yield.

Figure 7. Results of term permutations

Panel A: Distribution of point estimates



Panel B: Distribution of t-statistics



Tables

Table 1. Summary statistics

Variable	N	Mean	S.D.	Min	Max
Bond level					
Yield (%)	4,154	5.597	1.518	1.890	10.50
Yield spread (%)	4,154	2.513	1.131	0.252	7.027
Amount (100M RMB)	4,154	9.286	6.290	0.500	75.00
% Amount as GDP	4,154	0.385	0.488	0.006	6.958
% Amount as fiscal revenue	4,154	5.122	7.970	0.055	204.7
% Outstanding bonds as GDP	4,154	4.766	3.898	0.000	19.94
Maturity (years)	4,154	4.451	2.509	0.085	20.02
Guarantee (= 1)	4,154	0.109	0.311	0.000	1.000
Issuer: AAA	4,154	0.076	0.264	0.000	1.000
Issuer: AA+	4,154	0.257	0.437	0.000	1.000
Issuer: AA	4,154	0.551	0.497	0.000	1.000
Issuer: AA-	4,154	0.082	0.274	0.000	1.000
Issuer: other ratings	4,154	0.035	0.184	0.000	1.000
Issuance of corporate bonds, current month (100M RMB)	4,154	1,143	1,294	0.000	4,465
Flood in the last rainy season (= 1)	4,154	0.206	0.405	0.000	1.000
Mayor’s tenure at the time of issuance (years)	4,154	2.535	1.369	1.000	7.000
City-year level					
GDP growth rate (%)	1,004	10.10	3.23	-8.80	20.00
GDP (100M RMB)	1,004	2,698	2,733	172	19,547
GDP per capita (1,000 RMB)	1,004	58.71	54.82	7.13	486.7
Fiscal revenue (100M RMB)	1,004	234.6	295.1	5.86	3,134
Total social financing/GDP	998	0.937	0.513	0.168	3.566
Foreign direct investment (M Dollar)	1,004	1,111	1,705	0.44	14,005
Fixed asset investment (100M RMB)	1,004	1,579	1,334	70.3	7,681
Land sales revenue (100M RMB)	1,004	129.6	166.1	0.36	1,490
Mayor's age	1,004	51.0	3.7	37.0	61.0
Connection to provincial PS: college classmates	1,004	0.134	0.341	0.000	1.000
Connection to provincial PS: same hometown	1,004	0.011	0.104	0.000	1.000
Connection to provincial PS: colleagueship	1,004	0.011	0.104	0.000	1.000
Official level					
Local leader ability (all officials in 1994–2017)	2,401	0.00	4.07	-28.08	16.70
Mayor’s ability in the regression sample	541	0.20	3.42	-8.96	10.80

Table 2. Floods and economic growth

	(1)	(2)
Dependent variable	Growth rate	Growth rate
Floods previous year	0.241	-0.014
	(0.194)	(0.179)
ln(GDP per capita)		9.812***
		(0.550)
ln(Population)		11.908***
		(1.210)
Year FE	Yes	Yes
City FE	Yes	Yes
Observations	2,151	2,151
Adjusted R-squared	0.593	0.655

Note: Standard errors in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table 3. Results of simultaneous estimation

	(1)	(2)	(3)	(4)
	3SLS		Reduced-form	
Dependent Variable	(MGs) Issuance/GDP (%)	(Investors) Yield (%)	Issuance/GDP (%)	Yield (%)
MB yield (%)	-0.433***			
	(0.156)			
MB issuance/GDP (%)		1.637		
		(1.215)		
Mayors' ability (z-score)	-0.018	-0.133***	0.023	-0.095**
	(0.024)	(0.045)	(0.021)	(0.038)
Floods (yes = 1, no = 0)	0.043**		0.025*	0.041
	(0.017)		(0.014)	(0.038)
ln(Market corp. bond issuance)		-0.090***	0.023***	-0.053***
× Issuer: AAA or AA+		(0.032)	(0.006)	(0.019)
Interest rate of gov't bonds (%)	0.438**	1.218***	-0.052**	1.133***
	(0.180)	(0.089)	(0.022)	(0.096)
Maturity (years)	0.044***	0.009	0.024***	0.048***
	(0.008)	(0.030)	(0.004)	(0.011)
Guaranteed (yes = 1, no = 0)	-0.085*	-0.280***	0.021	-0.245***
	(0.046)	(0.053)	(0.024)	(0.066)
Issuer: AAA	-0.363*	-1.070***	0.059	-0.973***
	(0.196)	(0.150)	(0.049)	(0.209)
Issuer: AA+	-0.378**	-0.792***	-0.020	-0.825***
	(0.162)	(0.104)	(0.043)	(0.185)
Issuer: AA	-0.370***	-0.769***	-0.022	-0.804***
	(0.127)	(0.085)	(0.043)	(0.178)
Issuer: AA-	-0.204***	-0.303***	-0.043	-0.372**
	(0.073)	(0.104)	(0.052)	(0.188)
Bond outstanding/GDP (%)	-0.004	0.041**	-0.013***	0.020*
	(0.005)	(0.018)	(0.005)	(0.012)
ln(Lagged fiscal revenue)	-0.625***	-0.416	-0.260***	-0.842***
	(0.148)	(0.343)	(0.088)	(0.201)
ln(Lagged GDP per capita)	-0.306**	-0.031	-0.171	-0.311
	(0.143)	(0.338)	(0.174)	(0.458)
Lagged annual growth rate	0.010*	-0.037*	0.015**	-0.012
	(0.005)	(0.021)	(0.006)	(0.014)
Month FE	Yes	Yes	Yes	Yes
Issuer FE	Yes	Yes	Yes	Yes
Observations	4,154	4,154	4,154	4,154
Adjusted R-squared			0.821	0.871

Note: Standard errors in parentheses. In Columns (3) and (4), standard errors are clustered at the mayor's tenure. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4. Heterogeneous effects of mayors' abilities on MB yields

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Yield (%)	Yield (%)	Yield (%)	Yield (%)	Yield (%)
Mayor's ability (z-score)	-0.147***	-0.163***	-0.191**	-0.377***	-0.411***
	(0.051)	(0.052)	(0.085)	(0.114)	(0.111)
Mayor's ability × Age: 56–57	0.023				
	(0.044)				
Mayor's ability × Age: 58	0.052				
	(0.056)				
Mayor's ability × Age: 59 and older	0.115*				
	(0.064)				
Mayor's ability × Tenure: 2nd year		0.042			
		(0.033)			
Mayor's ability × Tenure: 3rd+ year		0.049*			
		(0.029)			
Mayor's ability × Issuer: AA+ or AAA			0.165**		
			(0.074)		
Mayor's ability × Issuer: AA			0.051		
			(0.063)		
Mayor's ability × ln(GDP per capita)				0.151***	
				(0.057)	
Mayor's ability × Total social financing/GDP					0.264***
					(0.082)
Total social financing/GDP (%)					-0.076
					(0.148)
Month FE	Yes	Yes	Yes	Yes	Yes
Issuer FE	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes
Omitted group	Age: 55 and younger	Term: 1st year	Issuer: AA- and below		
Observations	4,154	4,154	4,154	4,154	4,154

Note: These results are from 3SLS estimation of the simultaneous equations adding the interactions of mayor's ability and other variables. Only investors' supply functions are shown. Other variables are the same as those presented in Column (2) of Table 3. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5. Alternative measures of ability

	(1) Controlling political connections	(2) Career average growth rate	(3) Current city growth rate	(4) Observed growth rate	(5) Secondary market
Dependent Variable	Yield (%)	Yield (%)	Yield (%)	Yield (%)	Yield (%)
Mayor's ability (z-score)	-0.091**				-0.045**
	(0.039)				(0.020)
Career ave. growth rate		-0.037*			
		(0.020)			
Current city growth rate			-0.038*		
			(0.020)		
Observed growth rate				-0.028*	
				(0.017)	
Month FE	Yes	Yes	Yes	Yes	Yes
Issuer/Bond FE	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes
Observations	4,154	4,154	4,154	4,154	175,672
Adjusted R-squared	0.871	0.871	0.871	0.871	0.872

Note: Standard errors in parentheses are clustered at the mayor's tenure. Other variables are the same as those presented in Column (4) of Table 3. Issuer fixed effects are controlled in Columns (1)–(4), and bond fixed effects are controlled in Column (5). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix Tables

Table A1. Issuance/fiscal revenue replacing issuance/GDP

	(1)	(2)	(3)	(4)
	3SLS		3SLS	
	(MGs)	(Investors)	(MGs)	(Investors)
Dependent Variable	Issuance/Fis. rev. (%)	Yield (%)	Issuance/Fis. rev. (%)	Yield (%)
Mayor's ability	-0.587	-0.092**		
	(0.369)	(0.037)		
Party secretary's ability			-0.399	-0.067
			(0.356)	(0.042)
Yield (%)	-6.393***		-6.422***	
	(2.434)		(2.453)	
Amount/Fis. rev. (%)		0.104		0.122
		(0.076)		(0.080)
Floods in previous year	0.678**		0.724***	
	(0.265)		(0.273)	
ln(Market corp. bond issuance)		-0.087***		-0.092***
× issuer AAA or AA+		(0.030)		(0.032)
Bond outstanding/Fis. rev. (%)	-0.007	0.003**	-0.006	0.004**
	(0.006)	(0.001)	(0.006)	(0.001)
Interest rate of gov't bonds (%)	6.89**	1.171***	6.92**	1.177***
	(2.82)	(0.068)	(2.84)	(0.072)
ln(Lagged fiscal revenue)	-11.78***	-0.199	-11.60***	-0.056
	(2.34)	(0.499)	(2.28)	(0.526)
ln(Lagged GDP per capita)	-2.25	-0.315	-2.33	-0.324
	(2.24)	(0.269)	(2.26)	(0.283)
Lagged annual growth rate	0.252***	-0.047*	0.224***	-0.056**
	(0.082)	(0.028)	(0.085)	(0.029)
Month FE	Yes	Yes	Yes	Yes
Issuer FE	Yes	Yes	Yes	Yes
Other bond-level controls	Yes	Yes	Yes	Yes
Observations	4,154	4,154	4,154	4,154

Note: Standard errors in parentheses are clustered at politician term level. Other bond-level controls are the same as those used in Table 3.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A2. Simultaneous estimation for party secretaries

	(1)	(2)	(3)	(4)
	3SLS		Reduced-form	
	(MGs)	(Investors)		
Dependent Variable	Issuance/GDP (%)	Yield (%)	Issuance/GDP (%)	Yield (%)
Party secretary's ability	-0.030	-0.068	0.013	-0.048
	(0.023)	(0.042)	(0.021)	(0.051)
Yield (%)	-0.437***			
	(0.157)			
Issuance/GDP (%)		2.008		
		(1.353)		
Floods previous year	0.045***		0.019	0.044
	(0.018)		(0.015)	(0.037)
ln(Market corp. bond issuance)		-0.098***	0.023***	-0.053***
× issuer AAA or AA+		(0.035)	(0.006)	(0.019)
Bond outstanding/GDP (%)	-0.004	0.048**	-0.012***	0.022**
	(0.005)	(0.020)	(0.004)	(0.009)
Interest rate of gov't bonds (%)	0.443**	1.235***	-0.050**	1.132***
	(0.182)	(0.096)	(0.022)	(0.095)
ln(Lagged fiscal revenue)	-0.617***	-0.279	-0.278***	-0.876***
	(0.145)	(0.385)	(0.090)	(0.186)
ln(Lagged GDP per capita)	-0.301**	0.012	-0.183	-0.329
	(0.144)	(0.360)	(0.176)	(0.438)
Lagged annual growth rate	0.010*	-0.051**	0.017***	-0.015
	(0.005)	(0.026)	(0.006)	(0.012)
Month FE	Yes	Yes	Yes	Yes
Issuer FE	Yes	Yes	Yes	Yes
Other bond-level controls	Yes	Yes	Yes	Yes
Observations	4,154	4,154	4,154	4,154
Adjusted R-squared			0.826	0.871

Note: Standard errors in parentheses. In Columns (3) and (4), standard errors are clustered at the party secretary's tenure. Other bond-level controls are the same as those used in Table 3. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.