Markets Price Politicians:

Evidence from China's Municipal Bond Markets

(Preliminary draft)

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Abstract

Markets not only allocate resources, but may also punish or reward politicians for their economic activities. In this paper, we empirically find that in China's municipal bond markets the 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 outward the investors' supply of funds, not by reducing their cities' demand for funds. An increase of one standard deviation in a mayor's ability lowers investors' bidding price by 0.13 percentage points, implying a saving of USD 6 million in a term of an average mayor. We also find that ability has stronger impacts in the first year of a mayor's tenure, and on bonds issued by cities with lower ratings or lower per-capita income.

Keywords: Politicians' ability, municipal bonds, executive constraints

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1. Introduction

It is well known that one of the channels for the market to efficiently allocate resources is to reward the more competent market participants. Politicians directly or indirectly participate in the market, but it has not been studied whether the market rewards more competent politicians. This paper takes up the task by studying China's municipal bond markets. More specifically, we study whether investors give a yield premium to the 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 ability for public services is recognized by voters and rewarded by winning elections (Besley, 2007; Dal Bo et al. 2017). In a non-democratic 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 performances into consideration (Li and Zhou, 1995; Yao and Zhang, 2005; Jia et al., 2015), but has largely ignored other constraints/incentives put on them. Because governments in China participate actively in the market, it is thus an interesting question whether the market places any disciplines on government officials. Answering this question also allows us to gauge how effective the market mechanism has become in China amidst the debate about China's state capitalism.

Second, the modern state plays a significant role in the market in every country, regardless of its political system, by procuring and borrowing from the market, subsidizing specific industries, and in some countries directly owning businesses. This deep involvement has raised many concerns. Collusion between politicians and business interests is often recognized as one of the central causes for political decay (Fukuyama, 2015), and more progressive critiques often criticize the market for corrupt morality. To the extent that personal ability is a virtue for society's long-run welfare, a study of the market's ability to reward politicians' personal ability could offer a more balanced view about the market.

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 non-democratic 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. To the extent that it is the vehicle carrying out economic activities, the market should be able to recognize politicians' contributions. Therefore, our study provides a piece of block for the mechanism by which politicians contribute to local growth.

The existing literature virtually has no empirical test of markets' role to reward or punish government officials, mostly because there are neither proper data nor a convincing measure of ability. This paper provides solutions to these empirical challenges.

For the first challenge, we have collected data on the primary markets of China's municipal bonds (MBs). MBs are issued publicly by local government financial entities in both interbank and stock exchange markets, and purchased by institutional investors such as commercial banks and trust funds through public tendering. These bonds are implicitly guaranteed by local governments, and hence have long been deemed as public bonds (Luo and She, 2015; Bai et al., 2016; Liu et al., 2017). Parallel to the stock market where stock prices react to CEOs' managerial ability (Trueman 1986), it is natural to envision that MB yields also take into account officials' ability.

For the second challenge, we define and measure politicians' ability as in Yao and Zhang (2015). Applying the decomposition method of linked employer-employee data (Bertrand and Schoar, 2003; Abowd and Kramarz, 2006), the ability of a politician is defined by his individual fixed effect in a city-year growth regression after controlling city fixed effects, time fixed effects and local economic conditions. That is, ability is defined by a politician's contribution to local economic growth. Local officials are moved frequently between localities in China. This institutional feature provides a chance for us to compare ability across cities.

In our simultaneous estimation, we find that mayors' ability significantly reduces the yield of MBs, after controlling the features of the bond, city economic conditions, issuer fixed effects and calendar month fixed effects. A one standard deviation increase of a mayor's ability will reduce the bidding yield of the investors by 0.13 percentage points, equivalent to 12 percent of the standard deviation or 5.3 percent of the mean of the yield spread over the risk-free rate of treasury bonds. However, a mayor's ability has no significant impact on the government's demand of funds. On the equilibrium, mayors' ability reduces bond yield by

0.095 percentage points, or 3.8 percent of the standard deviation of the yield. Judged by the large amount of MBs (with over 8 trillion yuan outstanding by the end of 2019), this is no small effect. We also find that ability has stronger impacts in mayors' first year of tenure, and on MBs with lower ratings or issued by less developed cities. Our main results are robust when we control more variables, including mayors' political connections to their superiors.

In the existing literature, the paper that is closest to ours is Henry (2000). He finds that the equity market reacts positively to a country's liberalization reform. Our paper provides more direct evidence for the market to reward politicians. In addition, our paper makes a contribution to the study of political risks in the MB market. Duyvesteyn et al. (2016) and Huang et al. (2014) empirically identify government defaults as a factor affecting MB prices. We add to this line of literature by bringing in the ability of municipal leaders.

The rest of the paper is organized as follow. Section 2 introduces the institutional background of MB issuance in China. Section 3 develops a framework for our structural estimation, which explains the linkages between bond yields and local politicians' ability. Section 4 describes the data source, key variables and suggestive evidence. Section 5 presents the main empirical results of the impacts of politicians' ability on bond yields. Section 6 explores the heterogeneous effects of politicians' ability on bond yields. Section 7 provides further robustness tests. Section 8 concludes the paper.

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 that were approved by the central government, local governments borrowed directly from the market. The largest source of borrowing was commercial banks. But since 2009, other commercial sources have become more significant. One of them has been the commercial bond market. To avoid the sudden economic downturn brought by the 2008 global financial crisis, the Chinese government introduced a 4-trillion stimulus package. As a move to speed up its implementation, the central government implicitly relaxed the restrictions put on local governments' bond

finance.[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. Till today, none of the LGFV bonds has been defaulted. In a few cases in which bonds incurred difficulty of repayment, their local governments stepped in and rescued them. Therefore, LGFV bonds are widely viewed as "municipal bonds" by market investors. This is why in this paper we directly call them "municipal bonds" (MBs).

To issue an MB, a local government (representing one of its LGFVs) needs to get the approval from the National Development and Reform Commission (NDRC). A proposal is submitted to NDRC that specifies the amount of issuance together with its purpose. After getting NDRC's permission, an investment bank will underwrite the bond's issuance and sell them to market investors. Bond sale takes the form of open tendering where market investors bid both yields and amounts of purchase. The primary holders of these bonds are institutional investors, including commercial banks, trust funds, and insurance companies. In 2014, the amounts of bonds held by those types of investors were, respectively, 31.0 percent, 24.8 percent, and 21.4 percent (Ang, Bai, and Zhou, 2018), and the rest was held by other smaller types of investors. Therefore, local governments play the role of demand and the investors play the role of supply in terms of the fund generated by the MB market.

Compared to bank loans, MBs play a smaller role in local governments' commercial debt finance. At the highest point (2013), MBs accounted for 26% of local governments' debt finance (Huang et al., 2019). However, the absolute value of MBs has become a staggering number. As shown by Figure 1, the average monthly issuance of prefectural-level city (henceforth, just city) governments before 2009 was less than 5 billion yuan, while it reached 200 billion yuan by 2016. As of December 2016, 271 of the 333 prefectural cities had issued at least one municipal bond, and the outstanding MBs issued by these city governments reached 3.3 billion yuan. Issuance declined after 2016 because the central government began to tighten up control as part of the move to lower the leverage in the economy.

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

[Figure 1 is here]

The risk associated with MBs is tricky. In theory, they are corporate bonds and thus defaults are possible. There have been several cases in which the MB issuer declared "technical default" (meaning it could not meet the repayment date). However, every one of them was rescued by the corresponding local government.[5] But government bailout is not required by law, so in the end MBs are not as safe as government bonds that are explicitly guaranteed by government revenues. The market has priced in this gap. Figure 2 shows that the yield spread between MBs and government bonds for the same length of maturity. The average interest rate of government bonds between January 2008 and January 2017 was 5.60 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 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 by Figure 3, Coastal cities in the southeast tended to issue larger quantities, but enjoyed lower spreads than inland cities. This variation shows that local factors did affect MB prices. In addition to the prosperity of local economic growth, the ability of city officials might matter as well. But in order to assess the role played by officials, we need to come up with a measure of ability that enables us to compare officials across cities and across time.

[Figure 3 is here.]

3. A theoretical 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 markets value city mayors' personal ability to develop the

[5] For example, Yunnan Province Roads Development Corporation could not meet the payment date in June 2011, but later was bailed out by the Yunnan provincial government (http://www.chinadaily.com.cn/bizchina/2011-07/29/content_13010196.htm).

local economy. To implement this idea, we need to prove that reduced yield spreads have to come from the supply side of the fund market. However, the observed yield spreads might also reflect mayors' better ability to manage their cities' economy and financing strategy. For example, a more competent mayor may be able to rely less on the high-cost MBs to finance his city's growth, so his city's demand for MB funds declines, which in turn suppresses the interest rate of its MBs. Reduce-form regressions are not able to take care of this possibility and identify the true effects coming from the supply side. We need to come up with 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 the 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 two folds. One is to facilitate growth in the city, and the other is to meet emergent spending on unexpected shocks such as natural disasters and outbreaks of epidemics. 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_2 be the tax revenues in the next period (repayment period). In addition to B_v, Y_2 depends on the mayor's ability A and local conditions M. It is also subject to a random shock $\mathbb{E}$ that has a mean of zero. In addition to contributing to revenue, higher ability enables the mayor to find substitutive resources for B_v. Formally,

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

Naturally, Y_K', $Y_A' > 0$, and $Y_K'' < 0$. In addition, we assume that K and A compliment 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

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

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

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

where $c = c^e + \varepsilon$, in which $c^e = Y(K; A, M)/Y_1$ is the expected growth rate and $\varepsilon = \mathbb{E}/Y_1$ is the random shock to the growth rate, and $b_v = B_v/Y_1$ is the debt 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 show that

$$\frac{\partial b^d}{\partial r} = (1/\mathrm{E}Y_K'')\frac{1}{Y_1} < 0, \text{ and} \tag{1}$$

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

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 ability's role on the supply side that we will soon see is positive.

On the supply side, we adopt Capeci (1994)'s model for the relationship between yields of MBs and their default risks. We extend the model by adding the mayor's ability. To start with, suppose that investors are risk neutral. Each investor submits a quantity that he is willing to buy and a price that he is willing to offer. Because investors are risk neutral, their bids can be linearly added up. As a result, we can treat the investors as if they were just one bidder. The task of this bidder would be deciding the prices he would be willing to pay for the quantity offered by the MG.

To be specific, the 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 necessary fiscal expenditure or other debts ahead of this one), S, which is in higher payment priority than its MBs. Therefore, an MB will be defaulted when

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

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

After normalized by Y_1, the default condition (3) becomes

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

where $s = S/Y_1$. When the growth rate c is no less than $\underline{c} = s + (1 + r)b$, investors get 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, they get no payment at all. Given its normalized quantity b, the yield rate of an

MB, *r* then is determined by the following non-arbitrage condition:

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

which is equivalent to:

$$[1 - F(\underline{c} - c^e)](1+r)b + [F(\underline{c} - c^e) - F(s - c^e)]\mathrm{E}[c - s | s < c \leq \underline{c}] = (1+R)b. \quad (4)$$

Solving this equation we then get the investors ask 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

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

That is, investors are willing to take a lower yield rate 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^*, say, 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 gives it an illustration. The total effects of the mayor's ability on b^* and r^* are undetermined because its impacts on the demand curve are not determined. Given the demand curve, though, it is clear 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 Sources

Data for mayors and other politicians are from the CCER's Chinese Officials Database (COD, Yao et al., 2020). COD records detailed bio data for virtually all officials at or above municipal levels in the period 1994 – 2017. Data for MBs are from WIND that records detailed information about each MB, including its yield rate, quantity of issuance, maturity, issuance date, city of issuer, and issuer's rating, etc. 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. MBs issued by provincial governments or county-level city governments are excluded.

The unit of our empirical analysis will be individual bonds. Not all cities issued bonds in every year. We match the city and the year of issuance of an MB with the mayor of which the ability can be calculated by the method in the previous section. After matching the bond data with the politician data, there are in total 4,154 MBs issued by 1,025 LGFVs under 541 mayors in 239 prefectural level cities during 2008 – 2016.

The average yield and yield spread of these MBs are 5.60 and 2.51 percentage points respectively. It is worth noting that the variation of yield spread is lower than yield, as the component of macroeconomic change in MBs yield is captured by the treasury rate. The average amount of MBs is 929 million yuan (around 130 million dollars), and on average one MB is 0.38% as the share of local GDP or 5.12% as the share of fiscal revenue. The mean maturity of MBs is 4.45 years. Around 11% of the bonds have additional guarantee or credit enhancement by other commercial firms. 7.6% of the bonds issued by AAA rating issuers, while 25.7%, 55.1%, 8.2% and 3.5% issued by AA+, AA, AA- and lower rating issuers respectively. In general, an issuer with AAA or AA+ rating is viewed as low-risk issuer, which would be more trusted and rewarded by the market investors.

City-level economic data in the paper are draw from the CEIC database that reports each city's annual economic and demographical data. Table 1 reports the summary statistics of the key variables.

[Table 1 is here.]

4.2 Measuring ability

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

$$Growth_{ict} = \omega_i + \beta_1 lnGDPpc_{ct} + \beta_2 lnPop_{ct} + \tau_t + \theta_c + \varepsilon_{ict} \qquad (5)$$

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 effect τ_t and city fixed effect θ_c, politician i's fixed effect ω_i is his ability. The key challenge to disentangle ω_i from θ_c. Because they 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, i.e., 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 being shuffled between cities. Such connected samples thus exist. The largest connected sample for the whole period 1994 – 2017 contains 2,741 mayors and city party secretaries (PSs) in 272 cities. We estimate Equation (5) on this sample. When doing the estimation, we stack mayors and PSs just for the purpose to preserve the size of the largest connected sample.[6] Because ω_i's can only be estimated relative to their mean, we subtract their mean after they are estimated. Figure 5 presents the distribution of the estimated abilities. It is close to normal.

[Figure 5 is here.]

Yao and Zhang (2015) have discussed the potential problems possessed by the measure of ability. One of the most serious problems is that ω_i's only pick up idiosyncratic shocks happening to economic growth in particular cities during the officials' tenure years. We will follow Yao and Zhang (2015) to provide a placebo test to rule out this possibility.

Figure 6 presents the distributions of MB yield rates by mayors' ability. In the figure, we divide the sample into two groups according to mayors' ability using the median as the cutoff. Considering the inequality of regional development across provinces, before comparison, we first regress MB yield rates on provincial dummies to get the residuals and then add them back to the average rate across provinces (5.597). The figure clearly shows that the distribution of high-ability mayors almost uniformly shifts towards the left compared with the distribution of low-ability mayors. This result gives us confidence for our simultaneous regression analysis.

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

[Figure 6 is here.]

4.3 Empirical strategy

The key question we want to answer is: whether a mayor' ability affects investors' bidding prices. 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, respectively, bond, city, politician, and month. Then, $q_{ij(k)t}$ is the quantity of bond *i*, , scaled by local GDP in the year of issuance, issued by city *j* in month *t* when politician *k* was in office, and $r_{ij(k)t}$ is the corresponding interest rate. The first equation is the MG's demand function, and the second equation is the investors' supply function. Therefore, γ_1 should be negative, and β_1 should be positive.

The two equations share several sets of common variables. The first set has one variable, politician *k*'s ability A_k. According to our theory, it reduces investors' bidding rates. So β_3 is expected to be negative. This is the key result that we will pay attention to. In contrast, its impact on the MG's borrowing is undetermined. That is, the sign of γ_3 is not determined. The second set, $X_{ij(k)t}$, contains more variables that affect both demand and supply of funds. They fall into four categories. The first category has one variable, the average interest rate of government bonds with the comparable maturity.[7] Government bonds are risk-free assets, so this rate provides the benchmark for the market. The second category includes variables describing the features of individual bonds. They are maturity, whether having a guarantee or credit enhancement by other commercial firms, and rating of the issuers (rating below AA- is the omitted group). The third category contains variables describing the issuing city's local economic conditions including outstanding bond borrowings/GDP, fiscal revenue, GDP per-

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

capita, and annual growth rate. The last three variables are lagged by one year. Lastly, the fourth category contains two sets of dummy variables, one for month and the other for issuer. The monthly dummies allow us to control for nationwide macroeconomic fluctuations, and the issuer dummies allow us to control time-invariant issuer characteristics. As one city may have more than one issuer, LGFV, controlling issuer fixed effects is even stricter than controlling city fixed effects. With these two sets of dummies, our system of equations is able to avoid unobserved time-specific and city-specific characteristics.

To identify the demand-supply system specified by Equations (6) and (7), each equation needs at least one variable that can be reasonably excluded from the other equation. Specifically, the demand function needs a variable, denoted by W_{jt} in Equation (6) that affects the MG's borrowing decision, but not the investors' bidding decisions, and the supply function needs a variable, denoted by Z_{it} in Equation (7) that affects the investors' bidding decisions, but not the MG's borrowing decision.

For the MG's demand function, the exclusive variable we choose is an indicator of floods constructed from precipitation data. The data source is *Terrestrial Precipitation: 1900-2017 Gridded Monthly Time Series* by compiled by Matsuura and Willmott (2018). It records monthly precipitation globally by 0.5×0.5 degree grids for the period 1900 to 2017. It is worth nothing that the range of 0.5 degree in China is equivalent to 40-50 kilometers and the median area of prefectural cites is around 100 square kilometers, thus the area of a typical city equals the area of four to five 0.5×0.5 degree grids. For each city each month, we calculate the weighted average precipitation of the grids that a city covers, where the weight is the area of the part of a grid covered by the city. Then we construct the variable *floods* that equals one if a city in the previous raining season experienced twice-higher monthly precipitation than the 1900 – 2017 historical average, and equals to zero otherwise.

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 create difficulties for people's life. However, the MG may not have contingent funds ready to repair the damaged infrastructure or to give people reliefs, and may

have to borrow from the market (B_0 in our theory section). However, the impacts of floods on the economy do not last for long (except rare and large floods), so the city's ability of debt repayment is not likely to be impaired. As a result, floods are not likely to affect the investors' pricing decisions. Table A1 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.

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 would decline when there were more other financial products in the bond market. Here we use the amount of corporate bonds issued by all non-LGFVs companies in a month to capture the alternative investment opportunities facing the investors. To match this general market variable to individual MBs, we turn to the ratings of their issuers. When there were more non-LGFV bonds in the market, the demand for MBs would decline, but the decline would be uneven – higher rating issuers face less pressure. Hence, we use the interaction between non-LGFV corporate bond issuance and the individual MB bond rating as the exclusive variable for the investors' supply function. Our identification assumption is that the ratings themselves 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 interactions with non-LGFV bonds only capture the investors' diverse responses to the general market conditions.

In the equation system, $v_{ij(k)t}$ and $u_{ij(k)t}$ are two zero-mean random variables that are correlated and are assumed to have a joint normal distribution. We will estimate the system by the 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 mayor's ability into z-score by subtracting the mean and dividing by the standard deviation in the regression sample.

[Table 2 is here]

The results are presented in Table 2. The first two columns are results of the 3SLS estimation. First of all, the coefficients of the yield rate and amount of issuance have the expected signs. Consistent with a demand function, higher yield rates significantly reduce MGs' demand. A larger amount of issuance induces investors to ask for higher prices although the coefficient is not statistically significant. This latter result indicates that default risks are not much dependent on the size of issuance.

The most important result pertinent to this paper is that mayors' ability has different impacts on demand and supply. It does not have a significant impact on the MG's borrowing decision, but does have a significant impact on the investors' pricing decision. That is, investors price in mayors' ability although the latter does not affect a city's decision of borrowing. The premium that the investors give to ability is not small. The coefficient of mayor ability is 0.133. As the variable is in z-score, it means that a one standard deviation of ability leads to a reduction of 0.133 percentage points in the yield, which is 12 percent of the standard deviation or 5.3 percent of the mean of the yield spread over the risk-free rate of government bonds in the sample. The average size of the MBs in our sample was 929 million yuan, and the average duration was 4.4 years. Therefore, an increase of one standard deviation in the mayor's ability would induce investors to given the city government a discount of 5.4 million yuan on each bond. On average, 7.7 bonds were issued during a mayor's term. So the market's reward to a mayor would be totaled to about 42 million yuan if his/her ability were increased by one standard deviation.

In China's political setup, every level of the government has two chief officials. In addition to the mayor, there is also a party secretary. The division of labor between them is that the party secretary takes the full responsibility, and the mayor is in charge of implementation, particularly on economic affairs. In the literature (e.g., Yao and Zhang, 2015), it is found that economic performance only matters for mayors' promotion, but not for party secretaries'. Therefore, a placebo test for the above result is to see if the party secretary' ability also matters for investors' pricing decisions. The results are presented in Table A2. No

significant effect is found for party secretaries' ability. This result gives us more confidence about our main idea, namely, investors care about and price in local officials' ability to manage the local economy.

The two identification variables are both significant and have the expected signs. Having a flood last year increases borrowings by 0.043 percent of GDP. Bonds with a rating of AAA or AA- enjoys an extra discount of 0.09 percentage points over bonds of lower ratings when the total amount of non-LGFV corporate bonds is doubled. This is a small effect, but statistically it is highly significant.

The risk-free rate of government bonds is significantly positive in the investors' supply equation and its coefficient is close to 1, consistent with the findings of classical asset pricing literature. However, it is harder to understand why it is also significantly positive in the MG's demand function. A second of pondering would give it a possible answer: MGs only care about the interest rate they will actually 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 maturity significantly increases the MG's demand by 0.044 percentage points, and guarantee reduces the MG's demand and the investors' bidding prices. As expected, issuers with higher ratings enjoy more favorable prices from the investors. Higher ratings also induce MGs to put out smaller orders given the interest rate, probably because they care more about their reputations. Among city economic conditions, bonds outstanding/GDP increases the ask prices from investors but has virtually no impact on MGs' demand, but a larger fiscal revenue in the last year does reduce it, indicating 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 tend 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, though, investors care more

about a city's fiscal revenue than its GDP because it is fiscal revenue that determines a city's ability of debt repayment. As a robustness check, we then replace GDP by fiscal revenue and use issuance/fiscal revenue to represent $q_{ij(k)t}$ in Equations (6) and (7). Table A3 presents the 3SLS results for both mayors and party secretaries. They are qualitatively the same as the 3SLS results presented in Table 2 and Table A2, respectively. In particular, the point estimate for mayors' ability is very close to that presented by Table 2.

5.3 Results of reduced-form estimation

Section 5.1 established our main result that the investors reward mayors' ability. It is also of interest to see the magnitude of impact that mayors' ability has exerted on the equilibrium quantity and interest rate of MBs. This amounts to estimate the reduced-form equations coming out the system of Equations (6) and (7). Columns (3) and (4) in Table 2 present the results.

Mayors' ability is shown to have a positive effect on the equilibrium quantity of issuance although statistically that effect is highly insignificant. We found in the last subsection that the MG's demand function is elastic and mayors' ability push out the investors' supply function. So in theory higher ability posed by a mayor should enable him to issue a larger quantity of MBs. Our newly found result can only be explained by certain noises associated with the quantity of issuance that we are unable to identify and correct.

In contrast, mayors' ability does have a significantly negative effect on the equilibrium yield rate. The point estimate is 0.095, which means that an increase of one standard deviation in ability reduces the equilibrium yield rate by 0.095 percentage points. This is smaller than the discount that investors would give because the MG's demand function is elastic. However, economically the effect is still substantial: an increase of one standard deviation in a mayor's ability would save the city 30 million yuan on all the MBs issued in his/her term.

As robustness checks, we replace yield rate by yield spread as the dependent variable in Column (4) of Table 2 (the interest rate of government bonds is dropped). The magnitude and significance of the coefficient of mayors' 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 sale, 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 the level of education, whether a graduate from a top university, and whether having working experience in the economic field. The third set is variables indicating 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. Adding those three sets of controls, either separately or jointly, the coefficient of mayors' ability remains significantly negative and its magnitude is not much different from that reported by Column (4) of Table 2.

6. Heterogeneous effects

In this section, we present several sets of results for the heterogeneous effects created by mayors' ability. Those results are intended to reinforce our main results found in the last section.

6.1 Age and tenure

Age is an important factor for officials' political career because China's political system implements a strict retirement rule. For city-level officials, the retirement age is 60. The chance of promotion becomes virtually zero after a mayor or city party secretary reaches age 57. Studies have found that the incentive of city officials diminishes significantly after that age (Yao and Zhang, 2015; Xi, Yao, and Zhang, 2018). Being aware of this, market investors would be less enthusiastic about a mayor's ability to develop the local economy. Tenure may also affect investors' evaluation, but for different reasons. The regular tenure of an official is five years, corresponding to the cycle of the party's congress. There are political business cycles, and city officials are found to take riskier projects to boost growth toward the next party congress (Xi et al., 2018). Therefore, investors have reasons to value less mayors' ability when they are at their late years of the current tenure. One is that the borrowings would be used for riskier projects that are less able to generate repayment. The other is that the

projects would not be finished by the time the current mayor finishes his/her term and the new mayor would not honor the old debts.[8] To save space, we only study the heterogeneous impacts of ability on the equilibrium yield rate. To do that, we add to Column (4) of Table 2 the interaction terms between a mayor's ability and his age and tenure, respectively. Columns (1) and (2) in Table 3 present the results. To save space, only the results related to mayors' ability are presented.

[Table 3 is here.]

In Column (1), mayors are divided into four groups by age: younger than 56, 56 and 57, 58, and 59 or beyond. Age 56 and age 57 are the transition period in a mayor's career so we group them together. The results are very telling. For mayors younger than 56, ability has a strong effect on the equilibrium yield rate. Its impacts on older mayors are reduced. The gap is not statistically significant between age 56 and age 58, but is significant for age 59 or beyond. Therefore, the market does price in mayors' retirement prospects.

In Column (2), mayors are identified by their term of tenure, 1st year, 2nd year, and 3rd year or beyond. The market gives first-year mayors a significant reward to their ability. This reward is reduced for mayors in their later years of tenure. The gap is insignificant for 2nd year mayors, but significant for mayors in their 3rd year or beyond. That is, the market significantly reduces its reward to ability when mayors are in their late years of tenure.

6.2 Ratings

Our theory suggests that higher ability of mayors reduces the default risk of the MBs he/her city issues. That is, it serves as a substitute for the credit worth of MB. Therefore, it is natural to envision that MBs with lower ratings would benefit more from higher ability of mayors.[9] To test this hypothesis, we divide MBs in our sample into three categories according to their issuers' rating: (i) AAA or AA+ (33%), (ii) AA (55%), and (iii) AA- or below (12%).

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

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

Treating the third group as the omitted group, we interact the dummies with the other two groups with mayors' ability respectively. The results are reported by Column (3) of Table 3. Ability offers a significant cut of interest rate for the least rated group. While there is no statistically significant gap between the middle group and the least rated group, the group of the highest rating receives a significant penalty relative to the least rated group.

6.3 Income and market liberalization

In general, the role of politicians affecting the economy is smaller in countries/regions with higher income because affluence is often associated with better self-organization of the market and society themselves. Mapped to our case, this means that LGFVs are operating in more complete markets, and mayors' ability would be rewarded less in more affluent cities than in poorer cities.

Column (4) of Table 3 reports the results when mayors' ability is interacted with log per-capital GDP of a city. While ability itself is still significantly negative, the interaction term is significantly positive. According to the two point estimates, the impact of mayors' ability 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 four folds. So this is a large effect.

Mayors' role also depends on the development of the local financial market. With a more developed financial market, the LGFVs are able to 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. Therefore, MB investors have reasons to discount the role played by competent mayors in cities with more developed financial markets.

The last column of Table 3 reports the results when we interact mayors' ability with total social financing/GDP. Total social financing is an official statistic that includes all liquidities created by financial institutions. It is an indicator for the depth of financial markets. It is also added to the regression as a stand-alone variable. While Total social financing itself is

insignificant, its interaction term with mayors' ability is highly significant and positive.

In sum, the heterogeneous effects found in this section are consistent with our theoretical argument that mayors' ability enhances the credit worth of the MBs their cities issue. Market investors discount the role of ability for mayors in their later careers or later years of their current terms, because their incentive is distorted at that stage and undermines the role of their ability. 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 impact of mayors' ability on the credit worth 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 abilities thus estimated may be incidental in the sense that they either reflect cities' intrinsic growth potentials in specific periods of time or merely pick up heteroscedastic shocks 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 give support to those connected to him. In that case, officials' fixed effects may pick up their connections to the party secretary. 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 taking into account personal connections in the growth equation. The second challenge is less a problem in our case because our largest connected sample is large enough to get close to the universe of the city officials in our sample period. We will thus not deal with it.

7.1 A placebo test for abilities being incidentally measured

Early in Section 5, we found that the ability of party secretaries is not rewarded by the market. This result is already a placebo test because mayors manage local economic

development while party secretaries are in charge of political stability. To further address the issue of abilities being incidentally measured, we offer another placebo test by randomly permuting mayors' terms within a city. Specifically, we randomize the terms of 1994-2017 for each city, and randomly assign an official to each term period. We then estimate a new set of "abilities" for those counterfactual mayors. If abilities we have estimated are only incidental and thus are not intrinsic to individual mayors, then we should still find a significant correlation between the "abilities" of the counterfactual mayors and the yield rate.

We have performed 999 rounds of permutation. In each round, we estimate the growth equation and the reduce-form regression of the yield rate. It is possible that the counterfactual "abilities" still matter for the yield rate. Our purpose is to see where the magnitude and significance of our benchmark estimate are situated. Figure 6 presents the results in two panels. In Panel A, we sort the point estimates by their magnitudes and present their 99 percent confidence intervals. Our benchmark estimate is located at the 6.3 highest percentile. In Panel B, we present the distribution of the t-statistics. The t-statistic of the benchmark estimate is located at the 2.0 highest percentile. Those results buttress our confidence that our measure of ability is not incidental.

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 indicating mayors' personal connections to the current provincial party secretary. The definitions of those variables are similar to those of Shih et al. (2012). The first dummy is whether the mayor and the provincial party secretary were born in the same city. The second dummy is whether they went to the same university. And the third is whether they had worked in the same city at the same time. Column (1) of Table 4 presents the results of the equilibrium yield rate using the new set of estimated abilities. The coefficient of ability virtually has the same magnitude as that in our benchmark results and remains statistically significant. Therefore, we conclude that our main results are robust to taking care of personal connections.

[Table 4 is here.]

7.3 Errors of estimated abilities being in the regressions of the yield rate

A final issue we need to address is that abilities are parameters that are estimated from the economic growth regression. It may contain measurement errors. If that were the case, the standard errors estimated from the system of equation and the reduced-form regressions are inconsistent. In this section, we apply the bootstrap method to correct the standard errors estimated from the reduced-form regressions.

We have two challenges when applying the standard bootstrap method, where constructing the sample by randomly picking observations from the original sample with replacement. First, we are actually doing a two-step estimation, where the first step is estimating mayors' ability from the growth equation, and the second step is the estimation of the MB prices. However, the problem is that the observations in the first step is at city-year level, while the second step is at individual bond level. Thus, we cannot re-sample the two steps together with the simple bootstrap. Second, even if we can re-sample them simultaneously, a harder problem could arise, that some politicians may not emerge in the sample, so ability cannot be estimated, furthermore, the connected sample may be broken thus other politicians' ability may not be comparable to each other.

To solve the second problem above, we use a different bootstrap method, called Wild bootstrap developed by Davidson and Flachaire (2008). This bootstrap method constructs the sample by randomly pick the original values of residuals, which can guarantee that all politicians have the same term structure as the real case. As a result, ability can be well estimated for everyone. To solve the first problem, we develop a two-step sampling strategy similar to the one proposed by Davidson and MacKinnon (2010) to simulate the data generation process. The details of the bootstrap procedure are presented in Appendix 2. Column (2) of Table 4 presents the results of the equilibrium yield rate with wild bootstrap standard errors. Comparing those results with the benchmark results of Column (4) in Table 2, we find that the statistical significance of ability is increased.

8. Conclusion

In this paper, we have found that in China's municipal bond markets investors reward more competent mayors who have brought faster economic growth. Politicians' ability is recognized by voters and rewarded with winning elections in a democratic regime (Besley, 2007; Dal Bo et al. 2017). In a non-democratic regime, however, it is not obvious how politicians are evaluated in the absence of a formal voting system that is able to reflect people's preferences. In the context of China, performance-based promotion is often believed to be one of the important discipline devices. This paper complements the existing literature by adding the market as another device. In addition to contributing to the literature of China's political selection, this result provides a piece of evidence that the market preserves independent functions despite of the interventions from Chinese authorities.

The results of this paper suggest that the positive role of the market may have been under-estimated in recent years when its functions are increasingly being shadowed or even replaced by other social and political objectives. Our results remind us that the market, in addition to being the fundamental institution for resource allocation, can reward (constrain) government officials in a way that is not achievable by popular vote. For one thing, the market can give instant rewards (punishments) to politicians while elections happen every few years. Conventional wisdom regards governance belonging to the realm of politics; this paper, however, shows that the market can also make a contribution for good governance.

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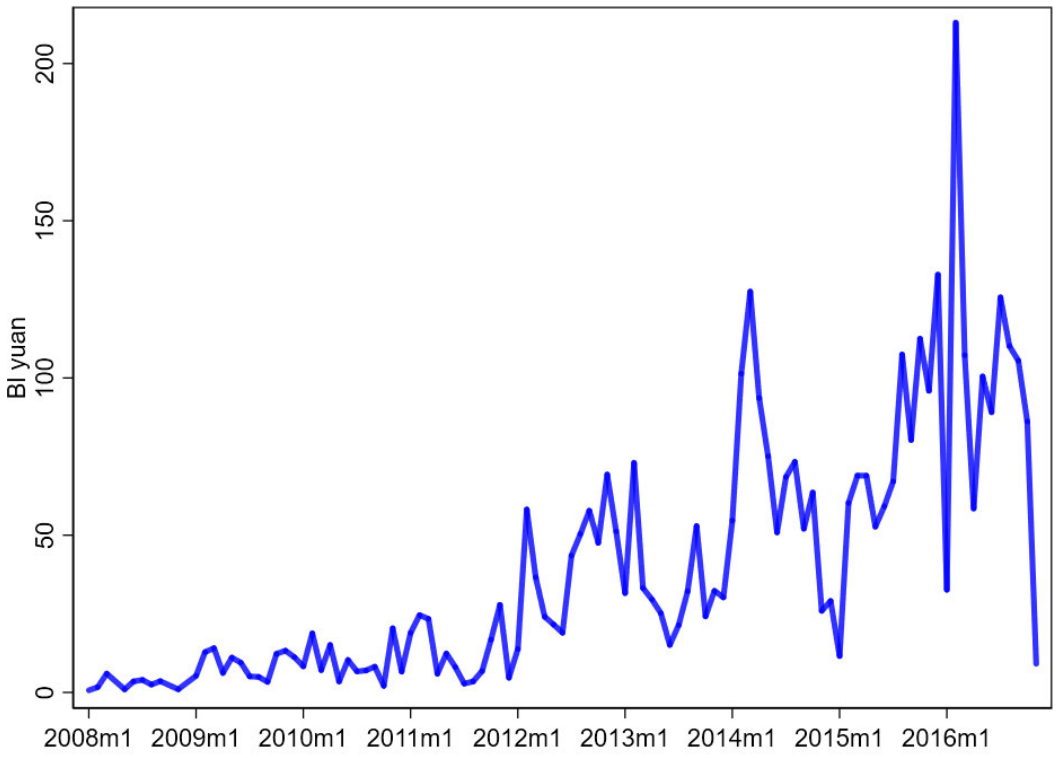
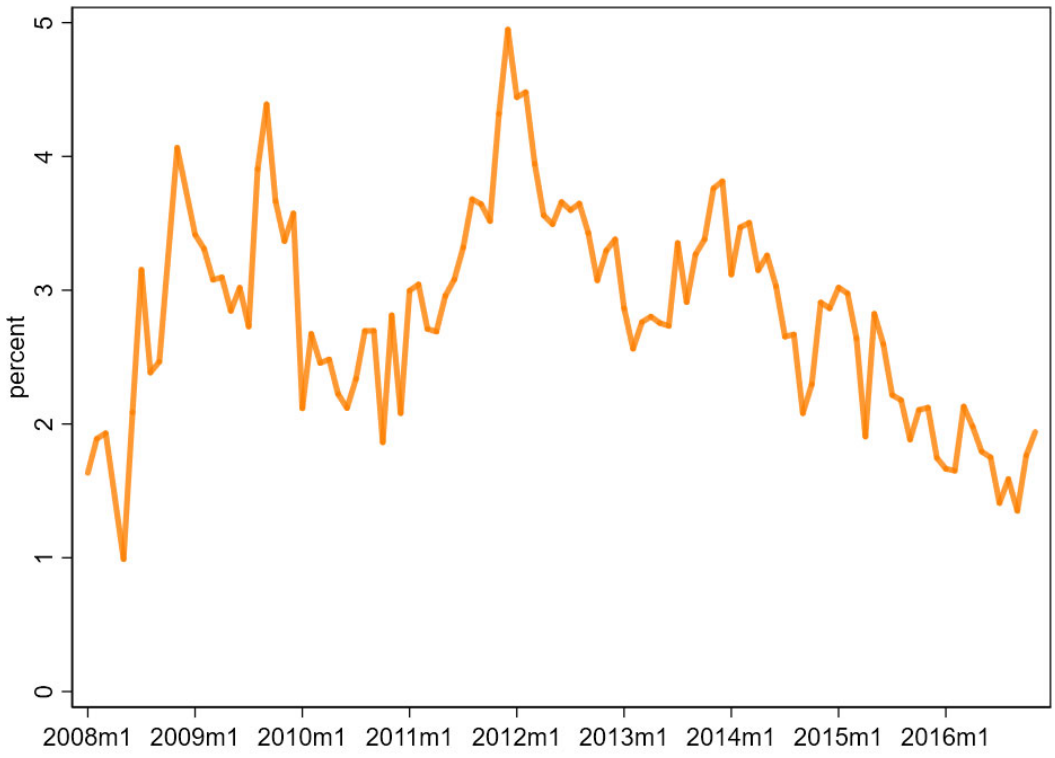
Figures

Figure 1. Monthly issuance of MBs, 2008-2016



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

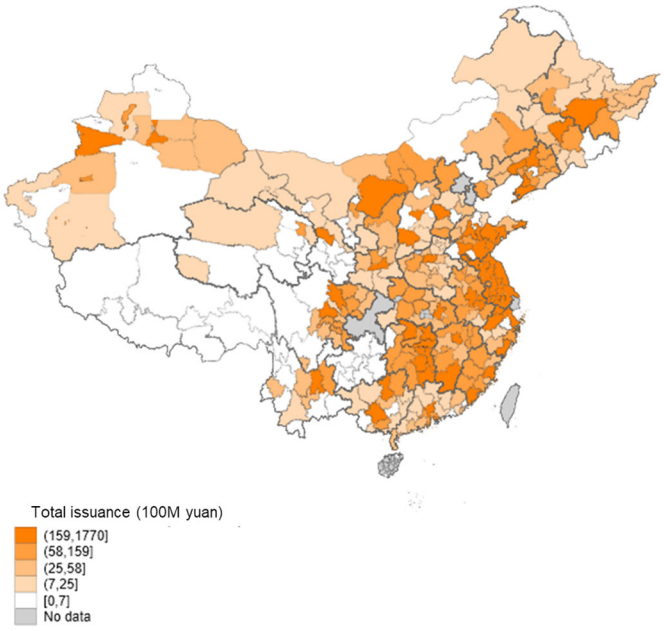
Figure 2. Average yield spread of MBs by month, 2008-2016



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

Figure 3. Geographic distribution: MBs issuance and their average yield spreads, 2008-2016

Outstanding MBs



Average yield spreads

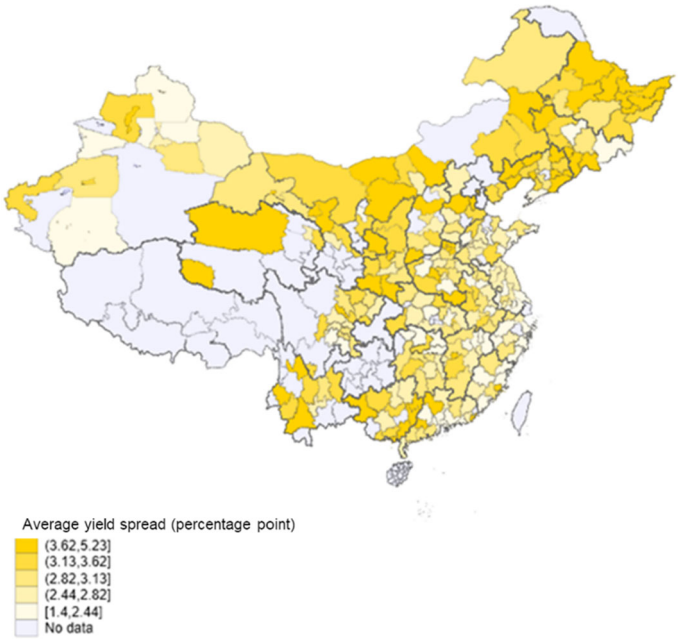


Figure 4. Market equilibrium

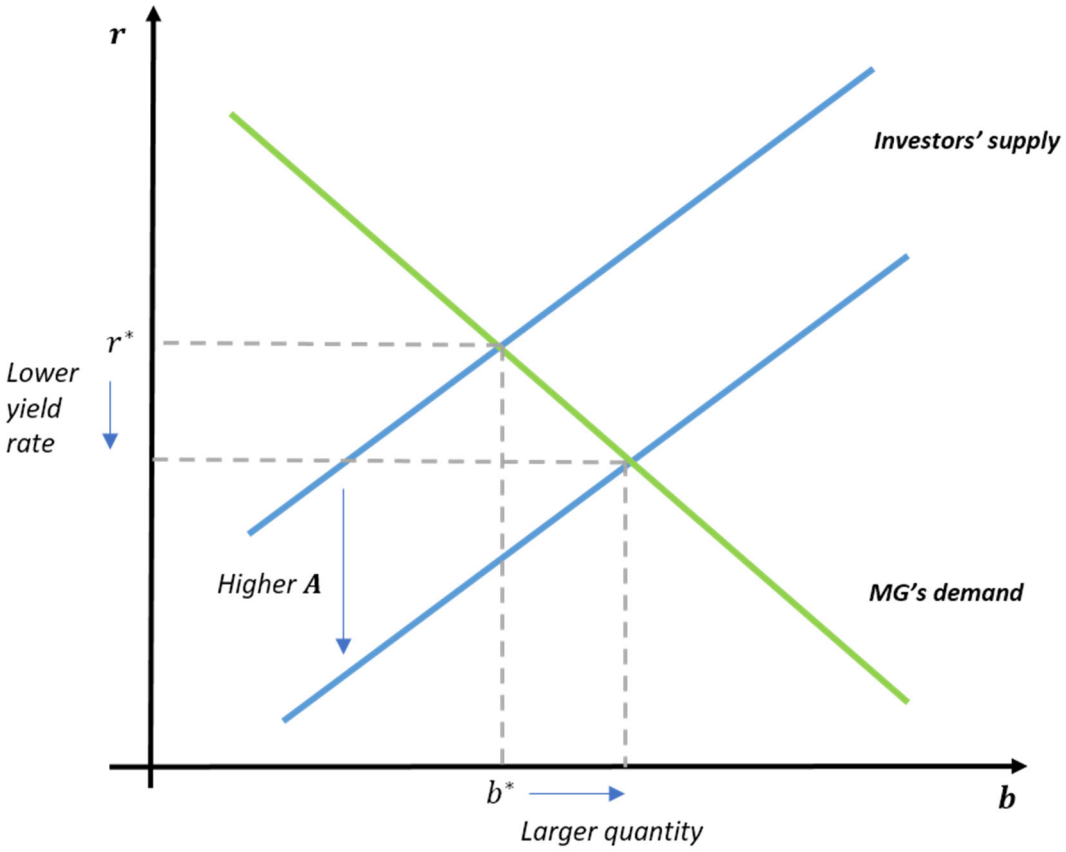
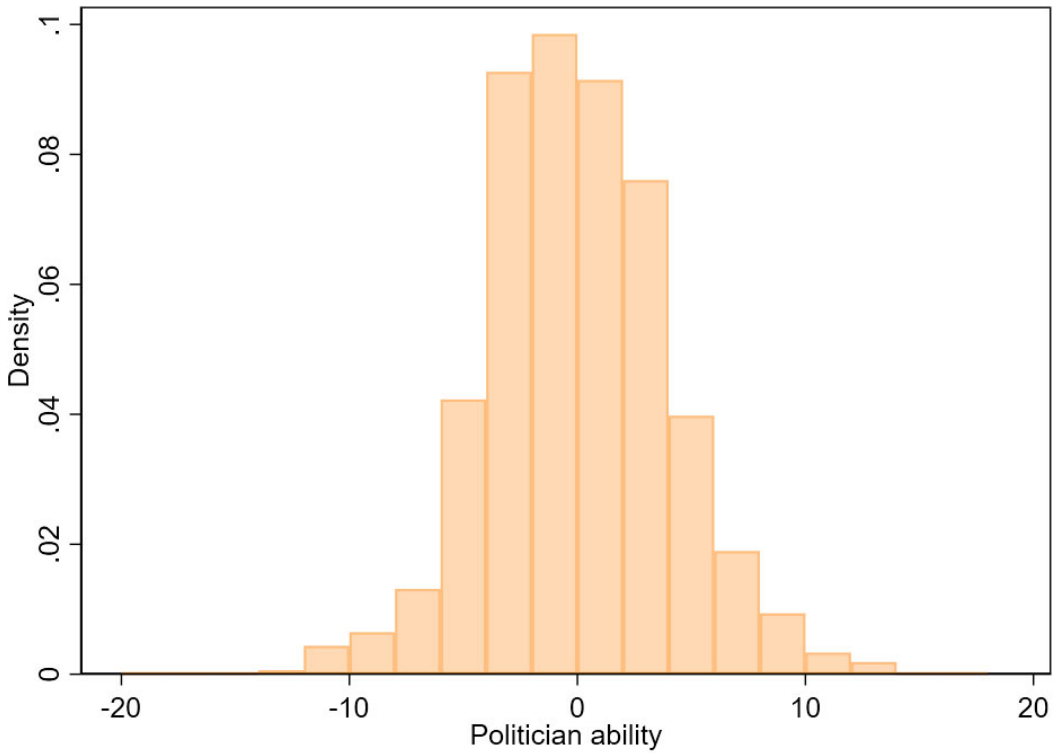
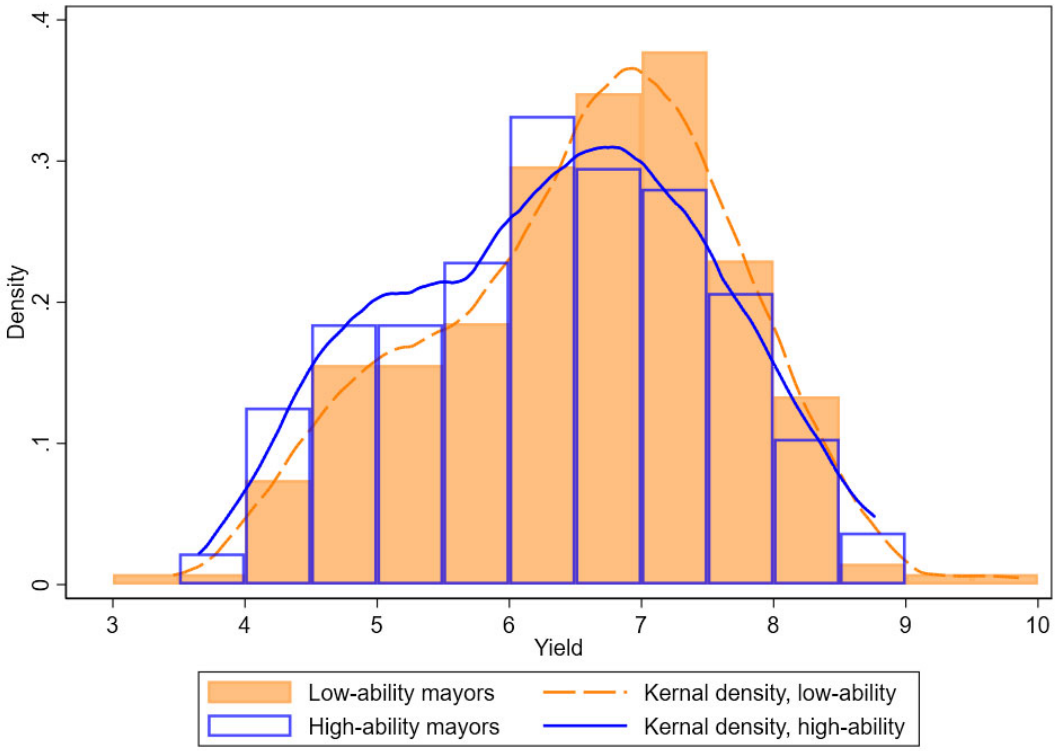


Figure 5. Distribution of politicians' abilities



Note: This figure shows the distribution of abilities originally estimated from the largest connected sample of city officials in the COD.

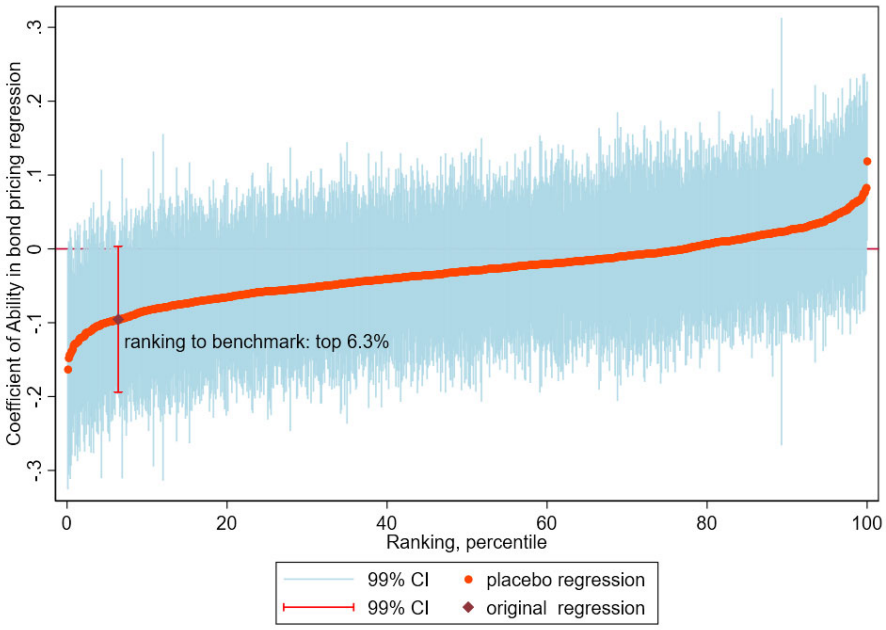
Figure 6. Comparison of yield rates between high-ability and low-ability mayors



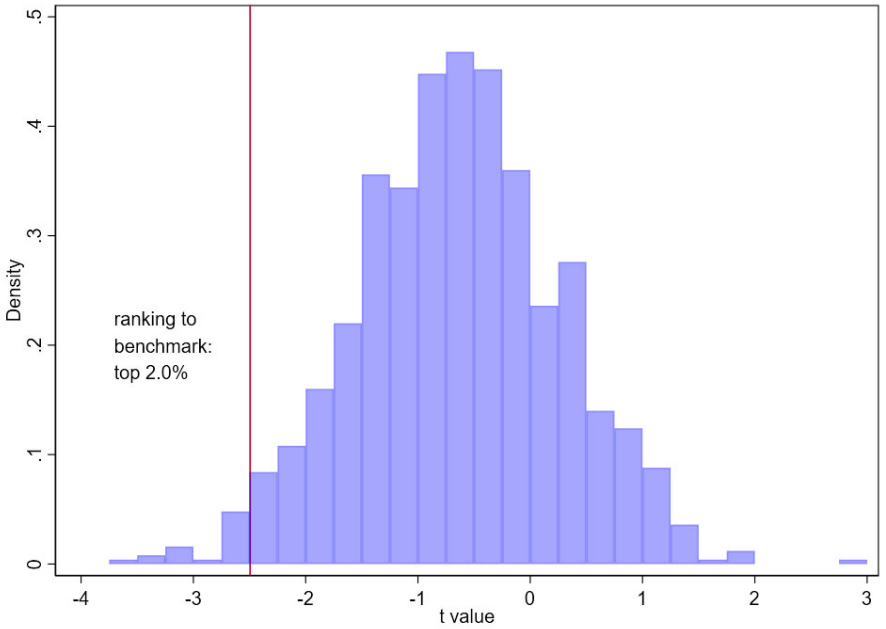
Note: The figure shows the distributions of the yield rate issued under mayors with different levels of ability. Low-(high-) ability mayors are the ones with ability below (above) the median. We take out the regional effects by regressing yield rates on provincial fixed effects and adding the residuals back to the average yield rate, 5.597.

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 issurance (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 ability in the regression sample	541	0.20	3.42	-8.96	10.80

Table 2. Results of simultaneous estimation

	(1)	(2)	(3)	(4)
	3SLS		Reduced-form	
Dependent Variable	(MG) Issuance/GDP (%)	(Investors) Yield rate (%)	Issuance/GDP (%)	Yield rate (%)
MB yield rate (%)	-0.433***			
	(0.156)			
MB issuance/GDP (%)		1.637		
		(1.215)		
Mayor's 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'n 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 FEs	Yes	Yes	Yes	Yes
City FEs	Yes	Yes	Yes	Yes
Observations	4154	4154	4154	4154
Adjusted R-squared			0.821	0.871

Standard errors in parentheses are clustered at mayors' term. * p<0.1 ** p<0.05 *** p<0.01.

Table 3. Heterogeneous effects of mayors' ability on the equilibrium yield rate

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Yield rate	Yield rate	Yield rate	Yield rate	Yield rate
Mayor ability (z-score)	-0.147***	-0.163***	-0.191**	-0.377***	-0.411***
	(0.051)	(0.052)	(0.085)	(0.114)	(0.111)
Mayor ability × Age: 56-57	0.023				
	(0.044)				
Mayor ability × Age: 58	0.052				
	(0.056)				
Mayor ability × Age: 59+	0.115*				
	(0.064)				
Mayor ability × Term: 2nd year		0.042			
		(0.033)			
Mayor ability × Term: 3rd+ year		0.049*			
		(0.029)			
Mayor ability × Issuer: AA+ or AAA			0.165**		
			(0.074)		
Mayor ability × Issuer: AA			0.051		
			(0.063)		
Mayor ability × ln(GDP per capita)				0.151***	
				(0.057)	
Mayor ability × Total social financing/GDP					0.264***
					(0.082)
Total social financing/GDP					-0.076
					(0.148)
Month FEs	Yes	Yes	Yes	Yes	Yes
Issuer FEs	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes
Omitted group	Age: 55 or below	Term: 1st year	Issuer: AA- or below		
Observations	4154	4154	4154	4154	4154

Standard errors in parentheses are clustered at mayor's term. * p<0.1 ** p<0.05 *** p<0.01. Other variables are the same as those presented in Column (4) of Table 2.

Table 4. Measurement of ability

	(1)	(2)
	Personal connections	wild bootstrap SEs
Dependent Variable	Yield rate	Yield rate
Mayor ability (z-score)	-0.091**	-0.095***
	(0.039)	(0.031)
Month FEs	Yes	Yes
Issuer FEs	Yes	Yes
Other controls	Yes	Yes
Observations	4154	4154
Adjusted R-squared	0.871	

Standard errors in parentheses are clustered at mayor's term. * p<0.1 ** p<0.05 *** p<0.01. Other variables are the same as those presented in Column (4) of Table 2.

Appendix 1

Table A1. 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	2151	2151
Adjusted R-squared	0.593	0.655

Standard errors in parentheses. * p<0.1 ** p<0.05 *** p<0.01

Table A2. Simultaneous estimation for party secretaries

	(1)	(2)	(3)	(4)
	3SLS		Reduced-form	
	(Investors)	(MG)	(Investors)	(MG)
Dependent Variable	Yield rate	issuance/GDP	Yield rate	issuance/GDP
Party secretary's ability	-0.030	-0.068	0.013	-0.048
	(0.023)	(0.042)	(0.021)	(0.051)
Yield rate	-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)
Rate of government bonds	0.443**	1.235***	-0.050**	1.132***
	(0.182)	(0.096)	(0.022)	(0.095)
ln(L. Fiscal revenue)	-0.617***	-0.279	-0.278***	-0.876***
	(0.145)	(0.385)	(0.090)	(0.186)
ln(L. GDP per capita)	-0.301**	0.012	-0.183	-0.329
	(0.144)	(0.360)	(0.176)	(0.438)
L. Growth rate	0.010*	-0.051**	0.017***	-0.015
	(0.005)	(0.026)	(0.006)	(0.012)
Month FEs	Yes	Yes	Yes	Yes
Issuer FEs	Yes	Yes	Yes	Yes
Other bond-level controls	Yes	Yes	Yes	Yes
Observations	4154	4154	4154	4154

Standard errors in parentheses. Standard errors in column (3) and (4) are clustered at party secretaries' term level. * p<0.1 ** p<0.05 *** p<0.01. Other bond-level controls are the same as those used in Table 2.

Table A3. Issuance/fiscal revenue replacing issuance/GDP

	(1)	(2)	(3)	(4)
	3SLS		3SLS	
	(MG)	(Investors)	(MG)	(Investors)
Dependent Variable	Amount/Fis. rev.	Yield rate	Amount/ Fis. rev.	Yield rate
Mayor's ability	-0.587	-0.092**		
	(0.369)	(0.037)		
PS's ability			-0.399	-0.067
			(0.356)	(0.042)
Yield rate	-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)
Rate of government bonds	6.89**	1.171***	6.92**	1.177***
	(2.82)	(0.068)	(2.84)	(0.072)
ln(L. Fiscal revenue)	-11.78***	-0.199	-11.60***	-0.056
	(2.34)	(0.499)	(2.28)	(0.526)
ln(L. GDP per capita)	-2.25	-0.315	-2.33	-0.324
	(2.24)	(0.269)	(2.26)	(0.283)
L. Growth rate	0.252***	-0.047*	0.224***	-0.056**
	(0.082)	(0.028)	(0.085)	(0.029)
Month FEs	Yes	Yes	Yes	Yes
Issuer FEs	Yes	Yes	Yes	Yes
Other bond-level controls	Yes	Yes	Yes	Yes
Observations	4154	4154	4154	4154

Standard errors in parentheses are clustered at politician term level. * p<0.1 ** p<0.05 *** p<0.01. Other bond-level controls are the same as those used in Table 2.

Appendix 2: Wild Bootstrap Algorithm

We use Wild Bootstrap method (Davidson and Flachaire 2008; Davidson and MacKinnon 2010) to simulate the data generation process. We first simulate the growth-ability function.

$$growth^*_{ict} = \widehat{a_i} + X_{ict}\,\hat{\alpha} + \widehat{v_c} + \widehat{v_t} + e^*_{ict} \tag{a1}$$

where $\widehat{a_i}$, $\hat{\alpha}$, $\widehat{v_c}$ and $\widehat{v_t}$ are the parameters from original estimation. e^*_{ict} is a bootstrap error term, which is following:

$$e^*_{ict} = \widehat{e_{ict}} \cdot u^*_{ic} \tag{a2}$$

$\widehat{e_{ict}}$ is the residual estimated from original regression, and u^*_{ic} is an iid random variable that follows the two point distribution, and equals to ± 1 with the same probability 1/2. Then the simulated bond pricing function is:

$$\text{yield}^*_{jict} = \hat{\beta} a^*_i + Z_{jict}\hat{\gamma} + \widehat{\mu_c} + \widehat{\mu_t} + \varepsilon^*_{jict} \tag{a3}$$

where $\hat{\beta}$, $\hat{\gamma}$, $\widehat{\mu_c}$ and $\widehat{\mu_t}$ are from the original regression. ε^*_{jict} is the bootstrap error term:

$$\varepsilon^*_{\text{jict}} = \widehat{\varepsilon_{\text{jict}}} \cdot \text{w}^*_{\text{ic}} \tag{a4}$$

Also, $\widehat{\varepsilon_{\text{jict}}}$ is the residual from the original regression, and w^*_{ic} is the iid two-point distributed random variable.

It is worth noting that a^*_i in equation (a1) is the individual FE estimated from equation (1), which is the key point to solve the protential standard error estimation bias. It is the same idea as using wild bootstrap to simulate DGP in a two-stage IV model, where we use the simulated endogenous variable from the first stage for constructing the bootstrapping second stage dependent variable Davidson and MacKinnon (2010).

The whole algorithm is:

Step 1: Estimate the growth function and get $\widehat{a_i}$, $\hat{\alpha}$, $\widehat{v_c}$, $\widehat{v_t}$ and $\widehat{e_{ict}}$. Estimate the bond pricing function and get $\hat{\beta}$, $\hat{\gamma}$, $\widehat{\mu_c}$, $\widehat{\mu_t}$ and $\widehat{\varepsilon_{\text{jict}}}$, where we use $\widehat{a_i}$ as a regressor to get $\hat{\beta}$.

Step 2: Give each official term ic an iid two-point distributed random value u^*_{ic} and constuct the bootstrapping error e^*_{ict} and growth rate $growth^*_{ict}$ following equation (a2) and (a1).

Step 3: Estimate first-stage equation (a1) and get the bootstrapping individual effect a^*_{i} from the bootstrapping sample.

Step 4: Give each official term ic an iid two-point distibuted random value w_{ic}^{*} and construct the bootstrapping error ε_{jict}^{*} and $premium_{jict}^{*}$ for each bond following equationg (a4) and (a3), where we use the bootstrapping individual effect a_i^{*} for simulating $premium_{jict}$.

Step 5: Estimate second-stage equation (a3) using the bootstrapped individual effect a_i^{*} as a regressor and get the second stage parameters β_b^{*}.

Step 6: Repeat Step 2 - Step 5 B times, and the wild bootstrapping standard error for $\widehat{\beta_B}$ is the standard deviation of the $\{\beta_b^{*}\}$.